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HISTORY OF THE HUMANITIES AND EDUCATION

SHORT COMMUNICATIONS

Foreword

Baltic Journal of European Studies (*BJES*), the first issue of which you are holding right now, is the direct successor of the peer-reviewed journal ***Proceedings of the Institute for European Studies, the Journal of Tallinn University of Technology*** (*IES Proceedings*) published by the Department of International Relations of the Tallinn University of Technology until the 2010. One can say that this is, in fact, the same journal on a conceptually higher level. Moreover, *BJES* tries to cherish and continue the traditions created by *IES Proceedings*. There were several reasons why the editors of the journal, upon consulting with the editorial board, decided to change its name. First and foremost, the Tallinn University of Technology underwent some structural changes in 2010 which made the use of the previous name virtually obsolete, but there were also other, weightier reasons for adopting a new name.

Considering the above reasoning and after some discussions with the editorial board, we decided to call the publication *Baltic Journal of European Studies*, emphasizing our determination to represent a larger region. In this connection we are happy to welcome Tove Malloy (European Centre for Minority Issues, Flensburg, Germany), Göran Hoppe (Uppsala University, Sweden), Tatyana Muravska (Latvian University), Vladas Gaidys (Lithuanian Social Research Centre) and Victor Shadurski (Belarusian State University) as our new editorial board members. At the same time we wish to express our special gratitude to these outstanding academics who have agreed to join the editorial board earlier for their assistance and direct help in finding competent reviewers and advice on other issues related to the development of *IES Proceedings / Baltic Journal of European Studies*. The change of name does not actually represent a change of the course or profile of the journal, but rather the journal's willingness to further evolvement, promotion and deepen scientific cooperation in the Baltic Rim as well as in the Nordic countries and the Central and Eastern Europe. European studies in the broad sense of the term will remain the main focus of the journal.

The publication called ***Proceedings of the Institute for European Studies*** has quite a long and remarkable history. The first issue under that name appeared already in 2002. It took several years for the management of the Audentes University (since 2006, the International University Audentes, IUA) and its then Institute for European Studies to come out with an idea to turn this irregularly issued publication into an annual peer-reviewed scientific periodical (a yearbook) of international scope. In 2007, the third issue of the *IES Proceedings* was published following the 5th Audentes Spring Conference. In July 2008, the merger of IUA (together with its Institute for European Studies) with the Tallinn University of Technology took place. In 2009, the Department of International Relations of the Tallinn University of Technology within the Tallinn School of Economics and Business Administration (TSEBA) was established on the basis of the former School of International Relations of IUA. The merger gave fresh impetus to the journal and since then *IES Proceedings* has successfully met the needs of the department and TSEBA.

Since the beginning of 2009, the *Proceedings of the Institute for European Studies* has been issued twice a year. Since 2010, the journal has enjoyed significant financial support from the Dean's Office of the Tallinn School of Economics and Business Administration, which has helped us to raise the level of technical quality and implement the plans for development.

At the beginning of 2009 when the 5th issue of *IES Proceedings* appeared, the publication became a semiannual peer-reviewed journal corresponding to the category of 1.2 as specified by the Estonian Research Information System (ETIS). We have managed to put together an international editorial office in addition to the extensive international editorial board with many distinguished scholars from a large array of countries, and implemented a comprehensive international peer-review system. For two years (2009–2010) the journal appeared under its traditional name, expanding the geographical range of scientific cooperation and gradually gaining popularity among the scholars of other countries.

This is not the first time in the history of *IES Proceedings* / *BJES* for the new issue to come out as a collection of conference proceedings. *IES Proceedings* No. 1, published in 2002, was also dedicated to the conference organized by the Institute for European Studies as the fourth meeting within the framework 'Monitoring Preparations of Transition Countries for EU Accession', Pärnu, 4–6 October, 2002. *IES Proceedings* No. 3 appeared in 2007 as a collection of selected papers delivered at the 5th Audentes Spring Conference 2006, Tallinn, 28 April 2006, but also included other papers submitted in response to our first international call for papers. In this context there is nothing extraordinary in the current issue. *IES Proceedings* No. 9 / *BJES* No. 1, the first issue under the new name, is again a peer-reviewed collection of selected conference papers.

On 8–9 October, 2010, the Tallinn University of Technology hosted the **XXIV International Baltic Conference on the History of Science** and on 17 December 2010 the follow-up seminar of the conference was held (see Mait Talts' paper in the current issue). The Baltic conferences on the history of science have a long history, over half a century, and for the last two decades they have been organized by the Baltic Association of the History and Philosophy of Science (BAHPS) (see Janis Stradiņš's article in the current issue). Peeter Müürsepp, one of the Editors-in-chief of BJES, served as Chair of the Conference Organizing Committee. Most of the papers presented at the conference addressed the history of different branches of science and research from the Baltic perspective. In addition, there was a special section dedicated to the problems of philosophy and methodology of science. The organization behind the Baltic conferences is BAHPS with its Estonian, Latvian and Lithuanian Divisions. Therefore, Philosophy of Science is part and parcel of the event.

The general success of the XXIV Baltic Conference in terms of the academic standard of the papers presented and the geographical diversity of participants gave good reasons to arrange publishing a selection of conference papers in our journal. This move was found to be acceptable by the editorial board as almost all the papers in the current issue fit into European Studies in the broad sense of the term.

The issue consists of the following main chapters: 'Philosophy of Science', 'History of Sciences, Medicine and Technology', and 'History of the Humanities and Education', for example, the history of lexicography of the three Baltic States or the general cultural context of re-establishing the University of Dorpat (Tartu) in the early 19^{th} century. The editors have decided to include all the texts of the plenary talks given by the most prominent speakers, leaders of different international organizations in the History of Science, into a separate subdivision entitled 'General Issues', even though some could have well fitted under some other chapter.

In some cases the process of peer-reviewing was rather painful but that is the only way to ensure academic quality. However, the vast majority, about three quarters of the papers submitted for the current issue successfully passed the extremely rigorous reviewing process. Both the scope and the volume of the current issue are larger than those of our regular journal issues. It has been expanded with the inclusion of pictures to illustrate some papers on the history of science. The selection of illustrative material was left entirely to the choice of authors and was restricted only by technical factors.

The philosophers of science focused mostly on the problems of practical realism. It is interesting to note that the British philosopher Nicholas Maxwell, whose works have not attracted much attention in the Anglophone world, has become one of the most deeply studied authors among his Estonian colleagues. It is important to keep the discussion going between the philosophers of science, who are traditionally critical towards the shortcomings of the scientific method and the historians of science, who normally do not question the validity of the method but just follow the course of its application in different branches of science.

There are some papers, for example, these by Laima Petrauskienė and Jadvyga Olechnovicienė, the content of which is intentionally presented as polemical, in order to promote discussion in some particular field of human activity. Some of the articles (e.g., those by Mikko Kylliäinen, Raivo Kalle and Renata Sõukand, and others) demonstrate true interdisciplinary approach to the problems under investigation. The paper by Epi Tohvri is not a typical research paper but assumes great importance in the Baltic region, especially Estonia and Latvia, in communicating new interpretations of cultural history and the history of ideas. Some other conference presentations did not match the criteria to become full-fledged original articles, but they are informative by all means. These have been included in the subdivision of 'Short Communications'. Since the current issue includes some papers presented at the follow-up seminar of the 24^{th} International Conference on the History and Philosophy of Science, it became necessary to acquaint reader with this event as well.

We sincerely hope that you will find the current issue a fascinating read and approve of its broadened focus. It is important to note that by including 'Baltic' into the title of the journal, we do not intend to limit the range of prospective authors to the citizens of these three countries. By Baltic we definitely mean the wider region of the Baltic Sea countries and even beyond. We are determined to endorse as wide perspective as possible on the European studies, including the humanities aspect of the European studies.

We would like to express our deepest gratitude to Kait Tamm, Piret Frey and Vlad Vernygora for their personal efforts in editing the current issue!

Peeter Müürsepp and Mait Talts (Editors)

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Foundation of the Baltic Association of the History and Philosophy of Science (BAHPS)

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Abstract: *The first attempt to bring together historians of the natural sciences and medicine was undertaken as early as in 1958, during the Khrushchev Thaw. In June 1958, Prof. Pauls Stradiņš (1896–1958) organized a joi<nt conference in Riga with participants from Estonia, Lithuania and Latvia, and guests from Moscow and Leningrad. A program for collaboration was developed, and the tradition was initiated to hold joint Baltic conferences on the history of sciences, successively held in Riga, Vilnius/Kaunas and Tartu/Tallinn. (As of 2010, there have been 24 conferences.)*

During the period of The Singing Revolution, thanks to Estonian initiative, a joint coordination committee of historians of sciences of the Baltic republics was founded in February 1988 by a decision of the Presidium of the Latvian Academy of Sciences, supported by the Estonian and Lithuanian Academy of Sciences. On October 29, 1990, the Association of the History and Philosophy of Sciences of the Baltic States (BAHPS) was founded in Riga, in a session which took place in the Pauls Stradins Museum of the History of Medicine (attended by 33 historians of science). Karl Siilivask, Juozas Algimantas Krikštopaitis and Janis Stradiņš headed the association. Janis Stradiņš was elected its first president.

In 1993, at the 19th International congress of History of Sciences in Saragossa, the BAHPS, a joint organization of three independent countries, was accepted for membership in the International Union of the History and Philosophy of Science (IUHPS).

The article is based on personal recollections about the foundation of the BAHPS and discusses the activities of the association, the primary mission of which is regular organization of the traditional Baltic international conferences of the history of sciences (1991, 1993, 1996, 1999, 2001, 2003, 2006, 2008, 2010).

Keywords: *Baltic Association of the History and Philosophy of Sciences (BAHPS), Baltic conferences of the history of sciences, common roots and research traditions of the Baltics, IUHPS, scientific cooperation of the Baltic republics*

On 29 October 2010, twenty years had passed from the founding of the Baltic Association of History and Philosophy of Science and since its beginning it has been the convener of all the conferences on the history of sciences in the Baltic countries. Such anniversary should not go unmarked, all the more because it was part of the process of restoring the independence of the Baltic States.

At the previous conference in Riga, in October 2008, fifty years of the emergence of the community of the Baltic historians of science was celebrated (Stradiņš, 2010). The first conference of this kind took place on 6–7 June 1958 in Riga and it was organized by Professor Pauls Stradiņš, founder of the Museum of the History of Medicine. The said conference was the start of a 52-year tradition that originated in the brief period of the so-called Khrushchev Thaw. It continued regardless of the unfavorable period for the Baltic States and helped to keep them together. The course of these conferences has been described in detail (Vasilev *et al.*, 1986; Stradiņš, 2010; Viksna, 2010). 1958 saw the establishment of an unofficial Baltic Coordinating Commission on the History of Science and Medicine, which functioned until the years 1962–1965. Afterwards, the branch organizations of the Soviet National Association for the History of Natural Sciences were established in the three Baltic (at that time Soviet) republics. All activities were horizontally coordinated (among the three Baltic republics) and vertically coordinated – with the involvement of the leading Moscow colleagues. Also, during those years, the Baltic scholars actively participated in the IUHPS international congresses of the history of science as members of the Soviet delegations, and in international congresses of the history of medicine (Warsaw–Krakow 1965, Moscow 1971, Tokyo–Kyoto 1974, Bucharest 1981).

In those years Estonian, Latvian and Lithuanian national associations of historians of science firmly established themselves and improved their cooperative horizontal relations, strengthening scientific ties among the Baltic republics. Between 1958 and 1987, the three associations held altogether 15 Baltic Conferences on the History of Science and the conference locations were rotated among Riga, Tartu or Tallinn, Vilnius and Kaunas (Stradiņš, 2010; see Appendix below for the list of conferences). The Baltic scholars jointly published collections of articles *Iz istorii estestvoznaniia i tekhniki Pribaltiki*

(10 volumes, 1968–1992) and *Iz istorii meditsiny* (19 volumes, 1957–1991, both in Russian), studied historical evidence of the development of the natural sciences and technology in the Baltic, and during regular conferences marked the anniversaries of Vilnius University, University of Tartu (Dorpat), the Riga Polytechnicum (Technical University) and Academia Petrina in Jelgava (Mitau). The Baltic conferences were well attended by prominent historians of science from Moscow and St Petersburg (Leningrad), from the Ukraine, Belarus, Georgia, etc. and attracted also several colleagues from Poland, the German Democratic Republic, Finland and Bulgaria.

When Gorbachev's perestroika started, the Baltic historians of science got an opportunity to be independent in establishing international contacts. The earliest initiators of the "liberation" were Estonian colleagues: Professor Karl Siilivask, Dr. Karl Martinson and Dr. Helle Martinson from Tallinn. At the very beginning of 1988, an idea was put forward to set up a coordinating committee of the Baltic historians of science that would be entitled to keep up direct relations with foreign colleagues and organizations. The suggestion was initially submitted to the presidiums of the Latvian, Estonian and Lithuanian Academies of Sciences and to the National Committee for the History and Philosophy of Science of the USSR. The Latvian Academy of Sciences was the first to accept the suggestion after a tough debate at the presidium meeting on 11 February 1988. Both documents, the submitted suggestion and the presidium decision, were quite moderate in their language. When talking over the matter, we should remember that all this took place in 1988, before the joint conference of the creative unions in Estonia, a similar plenum of the creative unions in Latvia and the establishment of Sajūdis in Lithuania. Afterwards more radical views were expressed.

However, as soon as the decision was taken, turbulent political time started in the Baltic republics – it was struggle for economic and political independence that ended with restoration of independence and adoption of Declarations of Independence in spring 1990. The issues of the history of science were set aside; these studies slackened their pace as were regarded as marginal and for a couple of years there was no advancement.

On 29 October 1990, the defense of doctoral (Dr. Habil.) dissertation by Mrs. Helle Martinson finally took place at the Promotion Council of the Latvian Institute of Organic Synthesis in Riga. The dissertation, entitled 'Historico-scientific analysis of the development of chemical sciences and industry in Estonia' (Martinson, 1987; 1990), was a fundamental and problem-oriented work refined with forward visions. The official opponents were Mihkel Veiderma, member of the Estonian Academy of Sciences (who could not be present due to illness), Professor Maria Shimanska from Riga and Karl Siilivask, member of the Estonian Academy of Sciences: Besides, the leading historian of chemistry from Moscow, member of the International Academy of the History of Sciences professor Yuri Solovev and Dr. Sergei Kara-Murza, and Dr. Dmitri Trifonov were co-opted in the Scientific Council and took part in the dissertation defense session (Martinson, 2010, personal communication).

Availing of the opportunity to have so prominent persons together, it was decided to finally establish the Baltic Coordinating Commission on the History of Science and Medicine and, moreover, the independent association, because at that time the Baltic States had already declared their independence (or a firm desire to regain it). We also invited Professor Juozas Algimantas Krikštopaitis, Vilnius, who was at that time Deputy Chairman of the Lithuanian Association of the History of Science, and docent Kārlis Arons, the recently appointed Director of Pauls Stradiņš Museum of the History of Medicine.

Helle Martinson's dissertation defense evolved into a sort of scientific conference – the respondent answered questions for 45 minutes and afterwards a very interesting discussion arose between professor Kara-Murza and the author of this article (I was the Vice-Chairman of the Promotion Council and chaired the session). The discussion topic was the future of science and innovation processes in the Baltic area, and especially in Estonia.

In particular, Dr. Kara-Murza analyzed the case of Hungary and was pessimistic about the future of science in the Baltics; his vision was that many scientists would emigrate to the West, basic science would be replaced by practically oriented science – environmental monitoring, and the like. The main challenges of the coming years, as he saw the crash of science development, would be creating a mechanism for the survival of science, producing "spores" for future science that would recover in the far future. Under the conditions of market economy, native (local) science would become unnecessary for a long time because the enterprises would be able to get high profit without investing in the progress of science and technology, or, if necessary, the technologies could be transferred from abroad. Referring to the example of Hungary he deduced that the first two generations of manufacturers would not be science-oriented. The Baltics would lose the role of an intermediate between Russia and the West, because that role might only be played if the Baltic science were integrated with Russian science. Russia would not need any intermediary: it would create direct relationship with the Western science. He found the optimistic vision, presented in Helle Martinson's dissertation, to be instantly attractive for the Baltic scientists, but he saw it to be unrealistic.

I joined the discussion on behalf of the respondent and rejected Kara Murza's admonition that studies of historical traditions and heritability could not exert influence on future processes. It is particularly important for small countries, as seen from Estonia's and Latvia's prewar experience that maintenance of traditions, particularly during the transition period, favorably influences the minds of the people. Cautious optimism, with particular reference to Estonia, could be much to the point and it might be quite possible that some day one would speak of a special East European science organization model. I found the dissertation by Helle Martinson to be an attempt to view the history of a scientific discipline, namely chemistry, rather statistically determined and, to a lesser extent, personality-driven. Science, however, is interrelated with both socio-cultural situation in general and individualities, too. What we know is that strong individualities, like Karl Schmidt, Gustav Tamman or Victor Palm, are able to make remarkable changes in the world around us. This is the reason why we should, apart from statistical studies, identify and remember great personalities.

I refer to this discussion, written down in my diary (Stradiņš, 1990), in order to show that in the background of the formation of the Baltic Association of the History and Philosophy of Science a heated social debate was taking place. But Helle Martinson herself soon had, as Director of the newly established Estonian Science Foundation, to work on the national science policy that has proven to be the most efficient in the Baltics. In 2009, the Medal of the Estonian Academy of Sciences was awarded to Dr. Helle Martinson "for longstanding and uncompromising activities towards of the Estonian science organization, building of the research support system and protection of interests of science and scientists" (*Estonian Academy of Sciences Yearbook*, 2010, p. 48).

The dissertation defense took place in the morning and the outcome was positive. In late afternoon we, all representatives of the Baltic countries, gathered together in the Museum of the History of Medicine to establish an association. We had very little time, because our host Dr. Kārlis Arons had to catch the evening train to Moscow and then fly to India. We did not invite to the establishing meeting our Moscow colleagues Solovyev and Kara-Murza, so that we could feel more free and avoid long discussions because of time pressure.

The establishing assembly in the museum brought together 33 historians of natural sciences, technology and medical sciences from Latvia, Lithuania and Estonia. My speech of introduction was in French, the working language of the International Union of the History and Philosophy of Science (IUHPS), but many audience members could not follow it and I gave a summary of how we could arrange our joint activities in the Russian language.

Professor Karl Siilivask presented a draft decision (in Russian) on the establishment of the Baltic Association of the History and Philosophy of Science and Juozas Krikštopaitis informed about the organizational matters of the forthcoming XVI Baltic Conference on the History of Science. This conference took place in September 1991, and was the first scientific conference jointly organized by the Baltic historians of science, after responding to the failure of the August putsch the Baltic States had achieved independence. Arons, director of the museum, dealt with the current situation in studying the history of medicine in the Baltic republics. The hurried debate speakers were Karl Martinson, Tālivaldis Vilciņš, Jānis Kristapsons, and Marija Šimanska (Stradiņš, 1991a).

Majority of speakers argued in favor of associating not only historians of science, but also scholars in philosophy and methodology of science. The discussion also dealt with the question whether history of the humanities and social sciences should fall within the scope of the association. It was decided that these should be dealt with as far as they solely concern the general history of scientific centers (universities, academies of sciences, institutes and the like), because the International Society for the History of Philosophy of Science does not categorize them as science disciplines. In after years, when the independence was re-established, the role of national sciences strengthened and that position was categorically revised.

The meeting unanimously adopted a *communique* on the establishment of the association:

1) *The formation of the Association is announced. The Association is comprised of the three presently existing associations of the historians of natural sciences and the registered members of these associations (at that time around 400);*
2) *Each national association keeps its independence and free hand, and engages in cooperation and information exchange with the rest of the association members;*
3) *The BAHPS maintains scientific and other kinds of relations with similar foreign association and joins the IUHPS as a single unit* [indeed, the BAHPS was accepted as a member of this Union at Zaragoza congress in 1993; the unity of three countries eases the membership payments]*;*
4) *The Committee of BAHPS consists of the chairmen, deputy chairmen and scientific secretaries of the three national associations. The Committee is seated, on a rotational basis, in the country which has organized the recent Baltic Conference on the History of Science. The conferences take place every 2–3 years. During this time the chairman of the national association of the presiding country holds also the position of the BAHPS president;*

5) *At each Baltic conference BAHPS gives overview of the performed work and considers recommendations for the next period;*
6) *The efforts of the Association to achieve its goals:*
   - *holding regular Baltic Conferences on the history of science;*
   - *organization of joint conferences, symposiums and meetings dealing with single science disciplines, history of scientific institutions and societies, general problems of science (philosophy of science, science methodology and sociology, "science policy" and others);*
   - *coordination of joint publishing on the history of science; the association should seek how to transform the collection of articles* Iz istorii estestvoznaniia i tekhniki Pribaltiki (Acta historiae scientiarum Baltica)*, issued in Riga, into an Association's almanac, which expenses, upon an agreement, could be jointly covered by the three republics. Similarly, the collection of articles, issued by P. Stradiņš Museum of the History of Medicine,* Iz istorii meditsini *will be transformed into* Acta historiae medicinae Baltica*;*
   - *encouraging works on the history of natural sciences and technics in the Baltic and the contribution of Baltic or Baltic-born scientists to world science to be published abroad;*
   - *strengthening contacts with foreign scientists, participation in international congresses and conferences devoted to the history of science and medicine; philosophy and methodology of science, collaboration with organizations that study the Baltic problems (for instance AABS in the USA)* (Stradiņš 1991b).

The Riga assembly, with participation of authorized representatives of the societies of the historians of medicine of the three Baltic republics, established the Baltic Association of the History of Medicine, which was incorporated, as an autonomous unit, into BAHPS. Two historians of medicine from Estonia and Lithuania – Viktor Kalnin and V. Siūdikas – attended the establishing assembly. The Baltic Association of the History of Medicine has the same objectives as the BAHPS, though specifically in the field of medicine, and an interest to be accepted a full-fledged member to the International Union of the History of Medicine. The BAHPS Committee was commissioned to elaborate the Statutes of both associations, so that they could be adopted at the XVI Baltic Conference on the History of Science.

The BAHPS Committee was set up and its members were: K. Siilivask, A. Kallikorm, K. Martinson (Estonia), A. Buračas, J. A. Krikštopaitis, L. Klimka (Lithuania), J. Stradiņš, A. Krēsliņš, T. Vilciņš (Latvia), V. Kalnin, V. Siūdikas, and K. Arons (representatives of the historians of medicine). The presidency of BAHPS, until the next conference of the Baltic historians of science, was entrusted to Janis Stradiņš.

The Committee of the Baltic Association of the Historians of Medicine included the following members: V. Kalnin, H. Gustavson (Estonia), V. Siūdikas, E. Miežutavičiute (Lithuania), K. Arons, A. Vīksna (Latvia). Kārlis Arons (1933–2005), director of P. Stradiņš Museum of the History of Medicine, became the first president of the association (Stradiņš, 1991a, b).

The creation of a separate Baltic community was acknowledged by the plenary session of the Soviet National Association of the Historians of Sciences and Technology (Moscow, May 1990, spokesperson Janis Stradiņš). In 1993, at the 19th International Congress of the History of Sciences in Zaragoza, BAHPS was accepted for membership in the IUHPS. The main contact person of BAHPS to IUHPS has been Professor Krikštopaitis, who regularly participates in IUHPS congresses and in the activities of European historians of sciences.

On the whole, the basic principles of the BAHPS and its structure have remained valid throughout these twenty years. What has been changed is that the association president has to be from the country that will host the following conference. Besides, a single edition on the history of science is not issued because each country has a one in national language. Also, the Statutes have never been properly elaborated, and its status remains somewhat unclear.

In 2010, at the Tallinn conference four participants of the first general assembly of BAHPS (H. and K. Martinson, J. A. Krikštopaitis and J. Stradiņš) were present.

In the twenty years since the association's establishment, the main activities have been organization of joint Baltic Conferences on the History of Science, and formal and informal contacts of the leadership. Many tasks that were discussed at the establishing assembly, in 1990, have not been executed. For instance, the history of the Baltic scientific centers has not been written and it has not been properly discussed.

Studies of the history of science still remain a nonprofessional activity, and the involved scholars' main interests are focused on the history of native scientific and higher education establishments. In this sense, the recent years have been productive, though the issued books were in national languages. I wish to mention the outstanding monograph by Arvo Tering on students from the Baltic provinces (Estonia and Latvia) studying in foreign universities in the 16th–18th centuries (Tering 2008). The review of research papers 'Ethnic knowledge and genesis of exact sciences in Lithuania' by Professor Libertas

Klimka (2010) and a reference book of Lithuanian historians of astronomy and physics (Makariūniene & Kivilšiene, 2010) deserve special mention. I have written a monograph that covers the early period of the development of science and higher education institutions in Latvia until the end of the 19th century. The book contains some material about Estonia, since both countries once were the part of the former Livonian Confederation and *Ostseeprovinzen*, and also Lithuania (Vilnius) in relation to its influences in Eastern Latvia – Latgale and the Duchy of Courland (Stradiņš, 2009).

Historians of medicine, also from Lithuania and Estonia, are taking part in issuing *Acta Medico-Historica Rigensia* – the recently published edition (2010) was the ninth after 1991 (altogether 28 volumes have been published since 1958). In Lithuania, *Mokslo ir Technikos Raida*, which has an international editorial board, has been issued since 2008. Four volumes of the Biographical Lexicon of Estonian Scientists have been compiled during 1993–2010 by Karl Siilivask and Karl Martinson (compilation of the last volume is in its final stage) (Siilivask, 2000; 2005). Two volumes have been published in book form, the third volume is ready for printing; yet, so far the funds for printing of this monumental book have not been found.

My expectations before the conference were that it would bring new ideas and suggestions on closer cooperation of the philosophers of science and the historians of science, at least within the Baltic, but also with our colleagues abroad. I was thinking about re-establishing a sort of coordination as it once was done. We should more actively consider the initiative, brought forward by the Belgian historian of science Dr. Robert Halleux, to write a collective work *History of European Scientific Community* that has shown no progress after 2000. Admittedly, this project brought about my intention to write a book on the history of regional science in Latvia. In September 2010 my book was awarded the Baltic Assembly Prize for Science (2010), which evidences the necessity of writing generalizing monographs.

A good example of the kind (although describing not the deeper past, but only some crucial decades) is the book *Baltic R&D Systems in Transition. Experiences and Future Prospects* by Jānis Kristapsons, Helle Martinson and Ina Dagyte (foreword by Janis Stradiņš). This book was published with the support of the Swedish Salen and Baltic Sea Foundation and the former Swedish Ambassador in Latvia Professor Andreas Ådahl (Kristapsons *et al*., 2003).

At present time the evolution of the history of science is left to take its own course. Various historical data is continuously accumulated but we have too little common and comprehensive works dealing with the Baltics as an entirety. We have forgotten the Soviet period, though, regardless of the many negative things, it was favorable for the development of science. At that time, "big science", although isolated from the West, saw, to a certain extent, the development also in the Baltic republics. This experience, both light and dark, should be summarized in the context of the U.S.S.R. and the world science. In Latvia, many emeritus scientists have written their memories that will be valuable in the future.

We could discuss, both formally and informally, our cooperation and involvement of young scholars and advance some new projects of reviewing past for our common future. And in conclusion some remarks.

I am afraid that the unity of the scientists in the three independent Baltic states is weakening after we joined the European Union. Due to language difficulties we do not feel ourselves anymore as a Baltic community. The local scientific communities have become somewhat atomized. The integration of the local centers, thus far, is oriented towards the EU or the Baltic Sea region, but a considerable part of research is still oriented to each of our own countries. The mediator's role of scientific centers of the Baltic between West and East, i.e. between Germany and Russia, as it functioned in the 18^{th}–19^{th} centuries (and partly even joining the Soviet regime), is practically missing today.

Science in our independent countries has gained another role; there is little interest to this aspect, and we try to define more the national roots of our regional science or the contribution of local scientists to the world science.

In this respect, the activities and further perspectives of the Baltic Association of History and Philosophy of Science should be discussed and, perhaps, reviewed. I believe, however, that its existence is still useful, taking into account that the concept of 'the Baltic countries' is more familiar in the world than every single country. The common past could strengthen the Baltic unity and it makes me to reiterate the suggestion about writing a regional history of science in the Baltic states, all three together.

Not only common conferences should be organized, but also regular exchange of information about the on-going work in each of our countries. The Baltic Association should perhaps set up a common webpage where local events (local conferences, seminars, new books, etc.) should be mentioned. For instance, I found out about the appearance of the book by Arvo Tering only recently and occasionally.

I would like to propose to establish a Baltic award (medal or diploma) for the best works on the history of science, medicine, higher education, etc. They could be awarded commonly by the BAHPS on decision of a competent common jury, judging commission. The Baltic Assembly Awards, which are presented each year since 1994, miss, as a rule, works on the history of science, since there are a lot of various disciplines: ethnography, archaeology, linguistics, history of arts, of literature, of architecture, and others, which are, perhaps, more recognized as the local history of sciences. Therefore we have to take care about ourselves. Of course, such an award could play some symbolic role.

Also, more attention should be paid to the Nordic countries, especially Finland, as well as Germany, Poland, Russia, and all of us from the Baltic countries have to integrate deeper in the international and European community of historians of sciences.

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Appendix

List of the Baltic Conferences on the History of Sciences

1st Conference – Riga, 6–7 June 1958;
2nd Conference – Tartu, 20–21 January 1959;
3rd Conference – Vilnius, Kaunas, 30 November – 2 December 1959;
4th Conference – Riga, 27–29 November 1962;
5th Conference – Tartu, 18–21 June 1964;
6th Conference – Vilnius, 26–27 October 1965;
7th Conference – Riga, 11–13 December 1968;
8th Conference – Tartu, 1–3 July 1970;
9th Conference – Vilnius, 2–4 November 1972;
10th Conference – Riga, Jelgava, 21–23 April 1975;
11th Conference – Tallinn, Tartu, 18–21 October 1977;
12th Conference – Vilnius, 23–26 October 1979;
13th Conference – Tartu, 17–19 November 1982;
14th Conference – Jurmala, Riga, 25–28 February 1985;
15th Conference – Riga, 29 September – 1 October 1987;
16th Conference – Vilnius, 4–6 October 1991;
17th Conference – Tartu, 4–6 October 1993;
18th Conference – Riga, 17–19 January 1996;

19th Conference – Vilnius, Kaunas, 15–17 January 1999;
20th Conference – Tartu, 30–31 January 2001;
21st Conference – Riga, 13–15 October 2003;
22nd Conference – Vilnius, Kaunas, 5–6 October 2006;
23th Conference – Riga, 9–10 October 2008;
24th Conference – Tallinn, 8–9 October 2010;
25th Conference – Vilnius, *in spe*, 2012.

The European Academy of Sciences and Arts: Its Impact on Latvia

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Abstract: *Soon after the establishing, in 1990, of the European Academy of Sciences and Arts (EASA) its president, Professor Felix Unger, whose family history reaches back to medieval Livonia, initiated contacts with the Academy of Sciences in Latvia. In the frames of Academy cooperation, the European–Latvian Institute for Cultural and Scientific Exchange 'Eurolat' was established in 1993; and regular academic symposiums on topical science issues have been held in Latvia since 1995. The year 2001 saw the institution of the Felix Prize (the European–Latvian Prize of EASA), awarded to outstanding Latvian scholars. At present, EASA membership exceeds 1,300 members across 58 countries, including 20 Nobel Prize laureates, and its Protectors include, since 2009, President of the Republic of Latvia Valdis Zatlers (before him, Vaira Vīķe-Freiberga during her presidentship). The EASA strategy and its place in European science, as well as topics of the symposiums organized in Latvia, are overviewed.*

Keywords: *'Eurolat', European Academy of Sciences and Arts, European values, family history, Felix Unger, international cooperation, Kaupo, the Felix Prize*

Alongside ordinary national academies of sciences, the highest autonomous institution of science in a country, there are also transnational academies of sciences or unions of academies. The European Academy of Sciences and Arts (EASA), *Academia Scientiarum et Artium Europaea* (seated in Salzburg), is not an ordinary academy of sciences. To the wider academic community, it has acquired an unofficial name of 'Unger's Academy', which comes from the name of the academy's founder and president, heart surgeon Felix Unger. The EASA was established on 7 March 1990 and in 2010 it celebrated its 20th anniversary.

Indeed, Unger's Academy is a distinctive body, it is not a "classical" academy of sciences, which encourages and promotes exact, basic sciences and research, but it is the watch tower of European basic values – science, religion and philosophy, and the mission of which is to contribute to the future of Europe and its unity by promoting knowledge, cooperation and tolerance.

The Academy was taking its shape at the time, when the wall between the Eastern and Western Europe fell, the so called "socialist camp", the Soviet Union and Tito's Yugoslavia collapsed and far-reaching changes were started in the Catholic Church–modernization and dialogue with science and other confessional denominations. This process actually started well before the pontificate of Pope John Paul II: it started as early as the pontificate of Pope John XXIII and even that of Pope Paul VI, after the Vatican Council in 1962–1965. In Austria, fresh ideas emerged about the Austrian identity and enlivened reminiscences of the Holy Roman Empire, based in Vienna, and of the emperor Charles the Great, crowned in Aachen. The idea of Pan-Europe acquired topicality and intentions emerged to bring closer Western Europe and Eastern and Southern Europe that were for a long time disunited politically, ideologically and in understanding of basic values (Unger, 2009).

Against that background, then still a youngish and ambitious Austrian heart surgeon Felix Unger (born in 1943), graduate of the University of Vienna (1971), the Fulbright Scholar (1975) and the chairman (since 1985) of the Department of Cardiac Surgery at the Paracelsus Medical University in Salzburg, together with Austria's Cardinal Franz Koening (who was very close to Pope John XXIII) and Nikolaus Lobkowicz, professor of the philosophy of religion, established a new, unofficial academy of sciences and co-opted more persons who shared their views. The Academy has gained international recognition and at present its 1,300 members represent most European countries and other countries all over the world (58 altogether). Nowadays, the Academy membership includes more than 20 Nobel laureates (including Mikhail Gorbachev, former president of the Soviet Union), and, what is quite unusual for an academy of sciences, the current Pope Benedict XVI is the member of EASA (he was elected to membership in 1992 as Cardinal Joseph Ratzinger).

The European Academy of Sciences and Arts names Protectors – heads of states, who have undertaken to support science and art in their respective countries.

Currently among the Protectors of the EASA are such eminent persons as the presidents of the Republic of Austria and the Slovak Republic, the King of Spain Juan Carlos I, Crown Prince Philip of Belgium, the Grand Duke of Luxembourg, the presidents of Greece and Slovenia, and since October 2009 the president of Latvia Valdis Zatlers. In the past, the title of Protector has been awarded to such distinguished statesmen as H. Kohl, A. Göncz, H-D. Genscher, V. Havel, C. Ciampi, J. Santer, R. Prodi, M. Kučan, G. Verhofstadt and also State president of Latvia V. Vike-Freiberga. After the expiry of the term of office as president he or she remains an honorary senator of the European Academy of Sciences and Arts. The current president of the European Parliament J. Buzek is also member of the EASA (EASA, 2009).

Unger's Academy was among the first foreign academies of sciences to establish official contacts with the Latvian Academy of Sciences (LAS) on 13 April 1991, even before the restoration of Latvia's independence in August of that year. Unger visited Riga on his personal initiative (Stradiņš, 1998). Professor Unger's both moral and financial support made it possible to organize the first Congress of Cardiac Surgeons of the Baltic Sea States in Riga in 1993 and the same year the European–Latvian Institute for Cultural and Scientific Exchange 'Eurolat' was established in Riga (its first curators were Jānis Stradiņš and Uldis Viesturs, the scientific secretary was Dr. Māris Jākobsons, 1993–1998, afterwards Dr. Anita Draveniece, 1998 to present). It would be worthwhile to mention here that the late biotechnology professor Uldis Viesturs (1936–2010) was the very first, who became acquainted with Felix Unger in the fall of 1990 and invited him to visit the Baltic countries (Stradiņš & Viesturs, 1998).

Upon recommendation of Professor Unger the first members from Latvia were elected to the EASA, they were: physicist J. Lielpeters, chemist J. Stradiņš, biotechnologist U. Viesturs, heart surgeon J. Volkolakovs, physicist E. Blūms, biologist R. Kondratovičs. When, in 1993, the first members were elected to the EASA, the Latvian Delegation of the EASA began taking shape and J. Stradiņš was nominated the head (ambassador) of the delegation. In later years, historian A. Caune, biomechanist I. Knēts, physicist J. Ekmanis, chemist T. Millers, philosopher M. Kūle, physician J. Vētra, demographer P. Zvidriņš, pharmacologist V. Kluša, lawyer and politologist T. Jundzis and heart surgeon R. Lācis became members of the EASA, and presidents of Latvia V. Vīķe-Freiberga (in 2000) and V. Zatlers (2009) were named the Protectors of the Academy (Draveniece, 2009; EASA, 2009). In 2010, the following Latvian nominees joined the EASA membership: art scholar I. Lancmanis, Rector of the Art Academy S. Naumovs and orchestra conductor M. Jansons.

The EASA includes several members from Lithuania (J. Antanavičius, B. Juodka, J. Poželа, A. Praškevičius) and even more from Estonia (H. Aben, J. Arrak, J. Engelbrecht, K. Haller, A-E. Kaasik, J. Kalda, A. Krikmann, N. Kristoffel, E. Oja, T. Paul, T-A. Sulling, T. Tiivel, P. Tulviste, J. Undusk). Unger's Academy is a member of ALLEA, presently presided by Professor Jüri Engelbrecht (Unger, 2009).

As regards Felix Unger himself, in January 1992 he was elected the foreign member of the LAS and, in 2003, he was conferred the degree of honorary doctor of Riga Stradiņš University. In 2009, he was awarded the Pauls Stradiņš Prize for founding the EASA and for continued generous support to Latvian science (Draveniece, 2009).

What has made Latvia so interesting to professor Unger, why does he have special attitude towards Latvia? Indeed we have close personal relationship since 1991, when professor Unger visited Latvia for the first time and we organized for him tours to Vidzeme, but the true motive behind his deep interest is as follows. Felix Unger family's history reaches back to medieval Livonia, the families of von Lievens and the Ungern-Sternbergs. Felix Unger is a direct, but far-off descendant of Kaupo, the Liv chieftain, whose name is well-known in Latvia's history (von Lieven, 1910/1911). He is described in the thirteenth-century Chronicle of Henry of Livonia (*Heinrici Chronicon Lyvoniae*). It may be possible that in the face of Professor Felix Unger we see some facial features of Livs. The elder daughter of Kaupo got married to knight Johan von Sternberg, who was nicknamed Hungarian (Unger) because he had come from Hungary. In medieval times, von Lievens owned Turaida and Krimulda (nowadays the town of Sigulda), but Kaupo's daughter's descendants – the Ungerns – owned Madliena, Aderkaši, Meņģele and Ogre district (in Latvia). Interestingly, the Latvian toponym Madliena was coined by Ungers' ancestor in commemoration of his sister-in-law, Magdalena, the youngest and unmarried daughter of Kaupo (Ungern-Sternberg, 1872; Taube, 1940). In this place (Madliena) the Magdalena Church was built in honor of Magdalena who was regarded as a saint in medieval Livonia. Professor Felix Unger belongs to the branch of the Ungern-Sternberg family which moved, in the 16th century, away from Livonia to Central Europe, to Austria, and the reason for this step was that during the Age of Reformation they remained faithful to Catholicism and did not wish to convert to the Lutheran faith. The role of Ungern-Sternberg family in the history of Estonia, Latvia and the former Russian Empire is being recognized.

The EASA emblem, which was adopted in 1990, is made up of a quartered shield and the lines that divide the shield form a knight's cross that symbolizes

Christian faith; the top left and bottom right fields carry the seven stars from the coat of arms of von Ungern-Sternbergs, and the top right and bottom left fields carry the three lilies from the coat of arms of von Lievens. Professor Unger himself interprets the stars (six-pointed stars as in the Solomon's Temple in Jerusalem, not five-pointed stars that inspired the French Revolution) to be symbols of metaphysics, and the lilies the symbol of natural sciences, but in the centre there is a big cross because, as he says, there can not be science without a cross, without faith. According to him, blue color is a night's color, color of the humanities, and gold color symbolizes the natural sciences. Thus, the emblem of the most prestigious EASA is made of the coats of arms of knights who resided in medieval Livonia.

From the very beginning the collaboration, initially driven by professor Unger, among the EASA, the LAS and the 'Eurolat' Institute, headed by Stradiņš until 1998 (since then headed by Prof. M. Kūle and recently transformed into a virtual, unfinanced organization), took the form of international discussions/ symposiums which were held every 2–3 years, and in recent years have reshaped into joint meetings of the LAS and EASA that are sometimes named the EASA assemblies (Stradiņš, 2000).

In 2001, a tradition to award EASA Latvian Prizes was established and J. Stradiņš made a suggestion to name the prize after Professor Felix Unger, namely the Felix Prize. Each prize carries a monetary award: the "big prize" of 2,500 euros and the "small prize" of 750 euros. Since then, the prize-awarding ceremony is associated with a scientific conference. The LAS and the EASA have hitherto co-organized the following scientific events / conferences: *Dialogue between Christianity and Secularism in Latvia* (1995), *National Identity and Vision of Europe* (1998), *Safety and Certainty* (2003), *Society between Past and Future: Ageing and Succession of Generations* (2006), *Higher Medical Education and Health Care Policy: Contemporary Challenges for Latvia* (2009). Those who have been honored with the Felix Prize (the so-called "big prize") include President of Latvia, folklorist and psychologist V. Vīķe-Freiberga (2001), philosopher M. Kūle (2003), philosopher V. Zariņš (2006) and physician J. Vētra (2009) and "small prizes" have been awarded to archeologist I. Ose and philosopher I. Šuvajevs (2001), linguist D. Baltaiskalna-Joma and historian Ē. Jēkabsons (2003), ethnographer R. Blumberga and politologist A. Sprūds (2006), philosopher R. Bičevskis and physician A. Irmejs (2009). These events have given considerable impetus to the academic community of Latvia; they have been attended by eminent scientists, public figures, Latvian religious leaders, physicians, ministers and state presidents. The proceedings of two conferences have been published in the Annals of the EASA (*Dialogue between*..., 1996;

National Identity…, 2000). Besides, the EASA also kindly published extended papers of the reports delivered at the 7th Baltic Conference on Intellectual Cooperation (in 1999 in Riga) in a special issue of the Annals under the title *Towards a Baltic Europe* (Stradiņš, 2001) Let us note that the symposium on national identity and vision of Europe, in 1998, gathered 70 participants from six countries. The speeches were delivered by G. Meierovics, founder and honorary president of European movement from Latvia, R. Umblija and V. Birkavs, both ministers of the Republic of Latvia, Professor P. Tulviste, then rector of the University of Tartu, Professor L. E. Larsen, chairman of the Danish Council of Science, and others. The symposium played a role in Latvia's preparation for accession to the European Union. The volume of the Annals which contained full texts of the speeches in the English language, and of which 1,500 copies were printed, was delivered to prominent scientists and to the leading European politicians – members of EASA.

The EASA is located in Salzburg – the city of Mozart and Paracelsus; it receives government subsidies, but it is not Austrian national academy of sciences, it is an independent, transnational academy. EASA is an independent member of ALLEA.

During the past 10–20 years the European Academy of Sciences and Arts has become an internationally recognized scientific institution which associates several small research units in Austria, Germany, Rumania (Transylvania) and Latvia, and several foundations in Germany, Austria and Switzerland lend support to the academy. The EASA holds visiting or jubilee sessions in many European countries (including regular sessions in Aachen dedicated to Emperor Charles the Great), and awards prestigious prizes (Tolerance Prize). The authority and prestige of the academy comes, to a great extent, from Felix Unger's distinctive personality, from his promptitude and seemingly inexhaustible creativity. He, perhaps, personifies the academy itself and builds it rather dissimilar from other academies of sciences in Europe. The mission of the EASA is different from the traditional mission of academies of sciences that includes advancement of research. The EASA mainly deals with the humanities, religion, history of arts, ethics and related disciplines, but it is also highly respectful to medicine, demography and global issues. It is with pleasure to feel Professor Unger's particularly favorable attitude towards Latvia. We should derive benefit from this and popularize in Europe our works in science and arts, done in the Baltic countries, and draw inspiration from the "Old" European culture.

At the festive plenary session of the EASA in Salzburg on 7 March 2010, the Latvian Academy of Sciences was represented by the vice-president T. Jundzis, who read the congratulatory address of the LAS signed by president J. Ekmanis and the chairman of the Senate J. Stradiņš and also passed to Professor Unger a congratulation signed by the EASA Protector V. Zatlers, State President of Latvia.

As an "independent knowledge pool", the European Academy of Sciences and Arts focuses on interdisciplinary discussion across specialized areas, ideologies and scientific cultures, as well as on promoting transnational dialogue and visionary developments of new scientific knowledge and academic thinking. The uniqueness of the EASA lies in its ability to work across boundaries for the aesthetics of science. EASA focuses on three core areas: namely, developing knowledge, disseminating scientific information and implementing major multinational projects. Ethical principles in scientific discussions are fundamental. No one topic is discussed abstractly, but it impacts on cultural, ethical and consensual values and developments are always considered.

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The Joint Baltic Course of Intellectual Activity: A Relevant Subject for Discussion

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Abstract: *The main concept of this presentation could be formulated in a simple phrase: in the global stage local events are neither noticed nor significant. But the results of common local initiatives have a chance to put them in a conspicuous position. There is some reason to maintain that the three Baltic states have a tie with their common two hundred years of experience of forced inclusion in the Russian Empire, and with the independence experience between the two world wars. In the present circumstances, the Baltic joint aspirations would clarify the local regional cultural uniqueness and the Baltic geopolitical significance within the European historical context. The author of presentation deals with the Baltic history of science in the 20th century and onwards by incorporating there the context of political and historical events. After discussing the factual material he suggests two conclusions intended for the first time to the national institutions of the history of science.*

Keywords: *Associations of the History and Philosophy of Science, Baltic states, globalization, history of science, localization*

The historical experience of the three Baltic countries was shaped by the geography and by the changing geopolitical interests of their neighbors. From the declarations of independence in Lithuania, Latvia and Estonia (1917–1918) up to the beginning of the Second World War their development exhibited many common traits. That period saw a successful development of the Baltic states' academic and scientific communities which through international ties with the West fostered modernization (Krikštopaitis, 1996). Taking one with another there is a reason to proclaim at the meetings of the Baltic historians of science that in the global stage local events are neither noticed nor significant. This is important for the three Baltic states because their joint aspirations would clarify the local regional Baltic cultural uniqueness as well as the Baltic geopolitical significance within the European historical context.

Now it is time to contemplate this subject and think ahead on the program of joint intellectual activity. By the way, the choice of a joint course of action with Finland's and other Nordic countries' participation would save Estonia, Latvia and Lithuania from enclosing themselves in their individual cultural and historical circle. Today, such individual activity of locality seems as though a manifestation of pseudo-states with a pretense of real independence.

We know that the three small Baltic states have already lost their full autonomy and have become completely dependent on powerful financial, energy, and political forces that manipulate their independence and political existence. In case somebody wonders why it would be worthwhile to bring in Finland, I would say that the Baltic societies have a tie with the shared two hundred years of experience of forced inclusion in the Russian Empire, and with the independence experience between the two world wars. This total unifying experience becomes clear whenever Baltic scientists interact with Finnish intellectuals. But with the other Scandinavians any such discussion becomes a source of misunderstandings because they did not have the same hurtful experiences in the relations with Russia during the 19^{th} and 20^{th} centuries. In many cases, I privately satisfy myself with this fact by discussing about the historical and political experiences of the Baltic countries with Scandinavian colleagues.

In the Baltic local arena, nearly suffocated by the global information network, lurk unexpected cultural or social breakthroughs stimulated by acts of individual creativity and willful decisions. The results of many investigations confirmed that strong local culture and unique historical experience is the source of unexpected ideas and inventions (Gellner, 1993; Kavolis, 1984; Krikštopaitis & Makariūnas, 2001, pp. 58–60; Lévy-Strauss, 1952). Creative breakthrough in a small state has little chance of becoming an event in a wider world. But in a joint group of small nations, such as the eastern Baltic seaboard, an intellectual breakthrough has greater potential of becoming global or at least on the European scale a significant and meaningful event.

In evaluating the social, economic and political situation in the Baltic countries which has developed in the last decade, the authors (Krikštopaitis & Makariūnas, 2001; Kavolis, 1984) have to recognize that Baltic societies are experiencing dramatic changes. Industry and agriculture, being unable to adjust to free markets are brought to their knees. Obsolete technology and crumbling hopes of investments deepen the economic and financial degradation. The matters related to science and studies, engulfed by endless reforms, are also quite poor. The public having suffered the loss of past values found itself at a new crossroads of choices. After having generalized the local situation in the Baltic countries, let us look at it in a broader context (Bauman, 1988; Friedman, 1995).

The Baltic society, imbedded in its own troubles, was befallen by two expanding world-wide tendencies: *globalization* on the one side and *localization* (autonomous state) on the other. These tendencies present a challenge particularly relevant to small states that have had economic difficulties. Here, a decisive role will be played out through the selection of a suitable strategy and through its careful evaluation. In concatenation of the named situation it is imperative to note: whichever exaltation of the selected direction is dangerous as any other extreme measure is capable of unbalancing the society.

Globalization tendency emerging from the rapid development of information and other high technologies embraces all aspects of activity. In this path of growing civilization the states that have not created a strong foundation for production, economic and political activities will succumb to the onslaught of aggressive bidders and influence (Hobsbawn, 1997, pp. 77–80). Small states will become peripheral pools that perform service and utility functions. Globalization which proceeds along with a cosmopolitan mentality is not conducive to nationally, historically and ethnically oriented consciousness. Here one has to keep in mind that the sphere of Western mentality (particularly in the Anglo-Saxon culture) nationalist concepts are bonded with chauvinism and separatism. In the Baltic countries – because of their specific historical experience – named concepts are distinctly separate: nationalism is connected here with ethnic culture which is understood as a source of stability and strength nourishing the defense mechanisms of the nation (Krikštopaitis, 1996). Fifty years of Soviet rule only strengthened this consciousness.

The second tendency – *localization* – emerges as a search by nation states to independently manage and authentically identify them in the diversified culture of Europe. Localized tendencies emerge as expressions of independent life, as a seeking for autonomy. When considering this alternative tendency to globalization, one has to keep in mind that new ideas, theories, and projects are born as creative acts by talented individuals, i.e. the new creation appears as an autonomous act, locally and personally defined. Later the results of the local phenomenon, having suffered the trials and having spread out further, become a universal value.

Anyway, localization as well as globalization have another side of the phenomenon: there appears a danger to close oneself in peripheral needs and “eternal” convictions, in circles of mythological icons which eventually pushes the society toward the periphery of civilization, thus forming a non-self-reliant – totally dependent on external forces – pseudo state, analogous to an ethnic group that preserves dependence on pleasure industries and human charities. The tendency toward this extreme is one of the courses of the present failures of the Baltics. By saying so I have in mind the past decades: after recreating independence, the three Baltic States took distance from each other. Therefore each of their post-Soviet history developed locally. Seeking an ambitious autonomic expression the three states established their own structures of statehood. Ignoring the common experience of the past century – its rich historical value – they did not create a common economic policy or communication and defense systems. They showed no desire to conduct joint science and research projects, saw no reason to coordinate their activities and to prepare a common strategy for joint actions and activity. (There is one exception: the founding of the Baltic Association of the History and Philosophy of Science during the collapse of the totalitarian system is a splendid example of the Baltic alliance of scientists). The local super-isolationism, thrown in with uncritical opening up to the West, prevented the narrow locales to convert into useful regional co-operation, i.e. a unique alliance of the three Baltic states which would have been useful and interesting for geopolitics to the West, North and the East directions.

While speaking about this it ought to be remembered that before the Second World War an attempt was made to organize Baltic conferences on intellectual cooperation (Kaunas, in 1935). This initiative was again revived a decade ago (Rīga, in 1999). In addition, after the collapse of the Soviet system various initiatives appeared, urging structural unification of the Baltic countries (Stradiņš & Cēbere, 1998). Some are worthy of mention. These are cooperative events, such as meetings of prominent scientists, researchers of the Baltic Sea, joint conferences of chemists and a whole line of other worthy overtures. It must be recognized that cooperative initiatives by scientists began in the wake of universal euphoria resulting from the liberation of the Baltic societies. This is probably why part of these creditable enterprises became just formal events, polite visits and matters of publicity. However, out of this proactive mélange several perspective areas became clear, testifying that the Baltic countries irreversibly became integrated into the European Union. These were the strengthening of independent integration into EU research programs, expansion of active exchange of programs for young researchers along with other steps taken by Baltic science that are being noticed in Europe.

Having stated these propositions and remarks, one can begin to ask for a middle way between the global and the local with a promise for a better outcome.

Today it is still complicated to form a useful concrete scenario for action and for living. However, one can offer a few strategically promising priorities toward which the society of small states could orient itself desiring to preserve its own character and still become an equally worthy partner in the activities with global associations. The author of the article suggested three short titles of priorities: 1) intellectual potential, 2) information and high technologies, 3) institutions of science, research and education.

It follows that the named reasoning would be worthy of organized discussion of the learned communities consolidated by the Baltic Association of the History of Science. I guess the first step on the way of joint activity could be the creation of the common Baltic history of science. Writing and publishing such a history in English could be an important contribution to the European history of science as well as a momentous point for international cooperation of historians.

By stating so I base my statement not only on the affinity of the experience of our three states but also on common actions by our historians of science in the last fifty years. This statement is supported by some obvious facts: in the year 2010 we marked the 20th year from the establishment of the Baltic Association of History and Philosophy of Science which was accepted to The International Union of History and Philosophy of Science in 1993. This event did not appear in a vacuum. It emerged from the accumulation of mutual Baltic experience. Here I will mention only two significant results from this common Baltic experience:

1. In 1950, a research team for investigation in the history of science and technology was organized in Lithuania (Matulaitytė, 2001, p. 127). In the meantime the Latvian and Estonian historians of science began the fast expansion of their activities;
2. In 1958, the three Baltic States began conferences of the history of science, which rotated throughout their scientific centers every three years (Stradiņš, 2010). After 52 years this forum of the Baltic historians of science, the 24th International Baltic Conference on the History of Science was organized in 2010 in Tallinn.

These two outcomes of the Baltic scientific experience have not only initiated research into natural sciences, technology and medical history, but also opened up the possibilities to regularly organize international Baltic conferences as well as enabled us to participate in European and world-wide congresses. Every one of the representatives from three Baltic countries has an accumulated intellectual capital (articles, studies, books and dissertations). The named experience is the resource that can be the vehicle for a joint history of science that would reflect intellectual achievement developed in the unique, social and cultural Baltic environment. Broader discussion on the problem of scientific experience and its application demand a special study on the subject. In place of it the author suggests for publication a short review of Lithuanian experience only.

During the last fifty years more than 3,000 scientific articles and essays on the history of science and technology have been announced, and approximately 400 books, dedicated entirely to history and philosophy of science or very closely related to this thematics, have been published. Multivolume universal encyclopedias and encyclopedias for various fields, manuals and dictionaries containing historical texts have also been published. (Certainly, Estonian and Latvian scientists can claim similar or likely even better results). Now it is worth suggesting a few more thoughts explaining the methods used for raising the qualification of historians of science which has stimulated the growth of such publications.

The Lithuanian Association of the History and Philosophy of Science conducted seminars each month, during which concrete subjects and results of ongoing research were discussed, evaluations of prepared articles and publications made, and also preliminary reflections of dissertations conducted. However, after the collapse of the Soviet system twenty years ago and the re-establishment of Lithuania's state-related functions, the society submerged into a stream of new worries. It became apparent that current times required new methods for the historian's activities. The association has abandoned regular seminars. In their place, two-day conferences *Scientia et historia* were organized for historians and philosophers of science. The best of the texts prepared for the yearly forum are recommended for scientific publication.

Somewhat more difficult is to achieve success in resolving the issues of participating in international conferences and world congresses. Here the fundamental factors standing in the way are limited means of support (financing) and insufficient knowledge of foreign languages. One should hope that the new generation will overcome these prevailing impediments. Unfortunately, there is a decrease in people interested in delving deeper into history of science. The young people are tempted into more profitable things. The Lithuanian community of scientists and educators intend that there will be some positive changes in value orientation.

The outcomes of suggested deliberations:

- First, the historians of science of the three Baltic countries are prepared for a joint intellectual activity. That could consist of not only a publication of the common Baltic history of science but also the results of united efforts of other forms.

- Second, the historical heritage of the past becomes a set of values when each epoch and each generation evaluate, analyze and rethink anew its accumulated experiences. Rethought and expressed in current terms, meaningful values become valuable guidelines useful for problem solving today and at the same time serve as a good projection of possible future courses of common activity.

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Science and Human Normativity[1]

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Abstract: *In this broad and synthetic paper, science is pictured as an expression of human normativity, which means the power of creating new facts and ideas according to certain rules. Moral philosophy (Korsgaard), phenomenology (Husserl), historical epistemology (Bachelard, Canguilhem), and medical philosophy (Goldstein, Canguilhem) are discussed. In the end, we ask the question of the role of logical norms in science, following some remarks by Schrödinger.*

Keywords: *historical epistemology, moral philosophy, normativity, phenomenology, philosophy of medicine*

The term 'normativity' has become highly popular in recent years in moral philosophy all over the world. Normativity means the human power of defining, establishing, and more profoundly, of changing norms – norms of thinking and norms of action. Norms and values are ideas of things which should be the case or ought to be the case, rather than ideas of existing things. This is a very puzzling function of human mind that we are able to think about things which should be the case, and not only about things which exist as a matter of fact. This point was very nicely made by the American moral philosopher Christine Korsgaard in her classical book *The Sources of Normativity*:

> *It is the most striking fact about human life that we have values. We think of ways that things could be better, more perfect, and so of course different, than they are. Why should this be so? Where do we get these ideas that outstrip the world of experience and seem to call it into question* […]*? Clearly we do not get them from experience* […] *And it*

[1] I am very grateful to the Baltic Association and especially to Peeter Müürsepp for having agreed to put this presentation on such a broad topic as science and human normativity on the programme of the conference. I will deal with this theme in a very classical way.

> *is puzzling too that these ideas of a world different from our own call out to us, telling us that things should be like them rather than the way they are, and that we should make them so.* (Korsgaard, 1996, p. 1)

According to Korsgaard, and to many other philosophers, the fact of value remains a mystery. In this article, I will deal with science as an expression of human normativity in the sense that science creates new ideas and new objects according to certain rules which are themselves parts of this creation – so that the reflection on science is part of the scientific process itself. The real issue here is – do these rules change? Do we create new rules of the scientific game? Obviously, yes. The study of this change is what we call 'historical epistemology' – which played a great role in the late nineteenth- and twentieth-century philosophy at many times. The most important founders of historical epistemology were Ernst Mach with his well-known history of mechanics, and Edmund Husserl who had some ideas about the normative power of scientific mind in his writings related to the crisis of European science and about the origin of geometry. Philosophically speaking, Husserl emphasized the normative and ideal character of science which is very clear at the beginning of science in Ancient Greece. A corollary of this idea was the historical character of scientific concepts and theories – which was recognized and much studied by other philosophers like Gaston Bachelard in France at about the same time. So let us speak first about norms, and second about history.

Husserl asked the question: What makes the scientific discourse so unique? He addressed this question again in very peculiar circumstances. In May 1935, he gave a lecture at the Kulturbund in Vienna. The lecture was published with the title *The Crisis of European Mankind and Philosophy*. The historical circumstances of this lecture should be recalled. Husserl suffered from prosecutions in Nazi Germany and had the feeling that any action of him would have an adverse effect on international cooperation. He was reluctant to accept any foreign invitation, but in the end he went to Prague and to Vienna. In his Vienna lecture, he defined the European idea of mankind as the idea of an intellectual and practical development put under the control of normative ideas.

> *Mankind, considered in its soul, has never been and will never be accomplished. The spiritual goal (telos) of European mankind* […] *is situated at the infinite: it is an infinite idea towards which the spiritual becoming as a whole seeks, if I may say, to transcend itself... Consciousness* […] *erects (this term) in a new form of development, put under the control of norms, of normative ideas.* (Husserl, 1950, p. 236)

Husserl thus developed the idea of mankind as a telos, as a normative idea governing future developments. He thought that this idea was deeply linked to the birth of philosophy and science as a new type of intellectual creation in Greece. He was certainly Eurocentric in that respect, but we can understand that given the circumstances.

Husserl is one of the last representatives of German idealism. According to him, "what scientific activity creates or generates is not real but ideal; better, what is generated in this way with its value and its truth becomes immediately the matter of a possible creation of ideals (or idealities) at a higher level" (Husserl, 1950, p. 238) – and this process goes on indefinitely. Mathematics, of course, is the major example of this infinite normative intellectual process. "With mathematics, man has for the first time discovered infinite tasks. This will be, for all subsequent periods, the star which will guide the course of the sciences" (Husserl, 1950, p. 240). Husserl considers mathematics as an ideal construction which goes on indefinitely and which is guided by norms. In 1936, he wrote a text devoted to the origins of geometry which belongs to the group of texts on the crisis of European sciences and transcendental phenomenology. He developed the idea of geometry as the description of finite objects which are considered within the horizon of an open infinity. Within this horizon, each new intellectual object or result becomes the tool for discovering new objects and new results. This process is pictured by Husserl as a historical process, as a process which belongs to the essence of mankind itself as historical process, a process in which everything is historical, as Husserl stresses it – in the particular sense that every new intellectual creation helps to revive the original sense or sense formation of the first intellectual creations.

So here we can understand in which original sense, according to Husserl, in a way which is deeply rooted in his idealism, science is a historical process in which tradition and creation are deeply linked to each other. This is the reason why, according to Husserl, who is fighting against purely positivistic theories of science, the dogma of a gap between epistemology and history should be strongly criticized and abandoned. In this way, and within his own idealism, Husserl began to define the programme which was later called 'historical epistemology' and developed in a less idealistic and more positivistic form by Gaston Bachelard in France and later on by Thomas Kuhn in the United States.

Now, if we go back to normativity, which means the power of creating and changing norms, we may find a slightly different meaning of normativity in a biological and medical context. In the first half of the twentieth century in Germany, the fields of philosophy of medicine and of theoretical medicine were created and developed by a whole school of different thinkers. The most prominent ones were Kurt Goldstein and Viktor von Weizsäcker. They developed a theory of the organism as a whole – a whole endowed with properties of regulations which allowed it to adjust to various circumstances, including pathology, and so to keep some sort of vital value. The idea of life as a value taken in a more biological and medical sense met philosophical developments about values, which may be summarized in the following statement by Reininger: "*Unser Weltbild is immer ein Wertbild*" (Our worldview is always at the same time a picture of values; cf. Canguilhem, 1972, p. 117). These kinds of ideas were received, deepened, and broadened by a French philosopher of medicine, Georges Canguilhem, who in his MD thesis in 1943 made some strong statements: "Life is polarity and as such unconscious position of value." With the term polarity he meant a dynamic polarity between the organism and its environment. "Life is in fact a normative activity […] In the full sense of that word, normative is what sets up norms. In this sense, we propose to speak of a biological normativity." (Canguilhem, 1972, p. 77) This property of normativity has quite an extension, since, according to Goldstein and to Canguilhem, pathological states are still endowed with some kind of normative power. The organism strives to reorganize itself in order to keep going in spite of major defects. This is a deep insight from a physiological standpoint.

An immediate consequence of this idea is that the organism may function on norms different than its usual ones. In physiology, the limits between the normal and the pathological may be extremely flexible, as a consequence of individual variation. For instance, people can live very long and normal lives with quite high blood pressure. At least some people can. The physicians say that the norm for blood pressure is about 130/80, with some variation, of course. And they give you drugs in order to decrease or increase your own blood pressure so that you adjust to that norm. Medicine plays with the organism's original normativity – but according to Canguilhem, instead of defining norms, medicine should recognize the organism's own normative power rather than trying to define an objective science of pathology – which does not exist since, according to him pathology is only a matter of subjectivity (a rather radical thesis). It is easy to observe that these kinds of ideas had and still have an influence in some parts of medicine. Anyway, people like Goldstein and Canguilhem made clear that normativity has a biological and physiological content before having a psychological and social one.

This being said, my purpose now is to go back to the problem of normativity in science, since we just recognized that in physiology and in medicine normativity is mostly the power of modifying or restoring norms. Does such a property of changing norms apply to science? In other words, do epistemological norms and values change – and to which extent do they change? This is a subject of historical epistemology. However, the classical answers given by the founders of the field such as Gaston Bachelard and Thomas Kuhn are perhaps not sufficient. Bachelard proposed the concept of 'epistemological rupture' which designates the process by which a given field of enquiry acquires a true scientific character. A well-known example of that is the case of Mendelian genetics as pictured by Canguilhem. In 1865, Mendel made the new hypothesis of discrete genetical characters, certainly the best hypothesis to interpret his own results. This is an extremely well-known example of an 'epistemological rupture' at the foundation of a new scientific field, but this is certainly not an example of major changes in epistemological norms or epistemic values – although such changes do certainly exist. Thomas Kuhn's concept of scientific revolutions and paradigm changes is certainly closer to that aim of identifying major changes in epistemological norms. More recently, there were many discussions on epistemic values like simplicity, coherence, non-contradiction, etc. Are there still intellectual norms in science? Or are there only social norms governing the process of scientific production? This is a real question, which was also faced by Thomas Kuhn and by others after him. There are certainly intellectual norms, but they became much more flexible after major events like the development of quantum mechanics, and internal developments of logic. An open question remains: Is logic still normative for science? In this respect, I will rather make some comments on earlier developments of quantum mechanics and their logical and philosophical aspects, and take as an example Erwin Schrödinger's discussions in some of his more popular lectures.

Schrödinger was perfectly aware of the almost contradictory character of quantum mechanics. In his Nobel lecture in 1933, he tried to explain the fundamental ideas of wave mechanics, and he was ready to recognize that conceptual difficulties were at the bottom. Old concepts like real and purely possible (real and possible trajectories) should be strongly qualified. Schrödinger pictured the difference between the ordinary point mechanics and the new wave mechanics as a logical one. In ordinary mechanics, the 'either–or' logic is an absolute rule. In wave mechanics, mutual exclusion is no more the case. Things could be at the same time something and something else quite different as well. This is the logic of 'as well as'–'*sowohl als Auch*', which is quite peculiar to quantum mechanics (Schrödinger, 1967, p. 99). Schrödinger was ready to admit this kind of logic without too much trouble. Like his colleagues, he was deeply puzzled by the wave/particle dilemma about the nature of reality. He asked a deep question: What is real, '*Was ist wirklich?*', and in the end he became quite sceptical about the physicist's ability to capture reality by mental images. Anyway, between the 'either–or' logic and the 'as well as' logic, Schrödinger, at the end of his Nobel lecture, did not want to choose, and he fancied that only in extreme cases like the experimental ones, nature had to show only one aspect at the same time. Nowadays, the logical situation of quantum mechanics is much worse. The so-called Greenberger-Horne-Zeilinger paradox is a straight contradiction to ordinary logic (Balian, 2009, p. 66). Does this mean that logic is no more normative? Or could logic be extended in directions like quantum probabilities which could help to go beyond these difficulties, if not really overcome them? If this would be the case, would that mean that we would be able to create new norms? Norms with extended validity which would be lawful for a while – but only for a while? Would this mean that in the end we would be forced to accept relativism? Or to become sceptics like Schrödinger in his old age? To recognize that human normativity has its own limits? To admit that human normativity, instead of reflecting the order of nature, is only a social construction – a theory which became quite popular in recent years? Is this only a matter of taste? And which are the arguments? These are the many questions.

Let us go back to historical epistemology, and to the evolution of epistemological norms. Throughout centuries, logic was normative for natural science. The best example of that is certainly Kant's *Critique of Pure Reason*, which is a fixed system of conceptual structures and of intuitive spatio-temporal structures. We do not live in such a world anymore, even if we continue to teach it. We became able to understand that new norms are required by new sciences, and that sciences are not driven by epistemological norms, but by experiments and by conceptual innovation. The recent debates on epistemic values (values rather than norms, which makes them less compulsory, values like coherence, simplicity, etc.) has shown that even the strength of these values has been questioned. Complexity dominates the landscape of contemporary science, and scientists (mostly computer scientists) have to be extremely creative to devise new tools in order to cope with the increasing complexity. The neurophysiologist Alain Berthoz (2009) recently coined a new word, 'simplexity', to designate this state of affairs, this mixture of structural complexity and functional simplicity. Coherence is much more difficut to apply in a world which is characterized by a plurality of reality levels, every level having some kind of autonomy, which is quite clear in biology and in social sciences. This raises the question of the most appropriate description of contemporary science. Philosophers from earlier generations, who emphasized the role of human normativity in the progress of science, like Husserl, Bachelard, Canguilhem, and others, were deeply rationalists. They were rationalists precisely in the sense that they thought that unreal things like norms and values should become real, that things which ought to be the case would become real thanks to individual or collective action. Canguilhem, of course, based his own philosophy of normativity on some physiological, and thus naturalistic, grounds. Presently, cognitive neuroscientists are more and more interested in the problem of the sources of human normativity, which they study at the level of child development. This kind of study is performed at the Max Planck Institute of Evolutionary Anthropology headed by Michael Tomasello in Leipzig. For instance, children at the age of two are able to understand the rules of game and to react when these rules are not obeyed (Rakoczy *et al.*, 2008). Norms are very likely the products of both innate dispositions and social constraints, which makes sociological relativism not really, or not entirely, true.

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Towards a Practical Realist Philosophy of Science

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Abstract: *Both traditional scientific realism and empiricism, together with the idea that the development of science lies in constantly discovering new facts about the world and, by creating theories, connecting these facts in a logical manner, achieving a more complete and exact knowledge, so to speak, approaching the waiting truth or its "surrogate" – empirical adequacy –, have receded from the treatment of science, although they are not entirely gone. The post-Kuhnian philosophy of science, practised under different names, mainly those of qualified realism (such as 'critical', 'constructive', 'experimental', 'non-representative', 'referential', 'naturalistic', but also the ones referring directly to practice – 'pragmatic' and 'practical realism'), tends to be practice-based one way or the other. It seems appropriate to speak about practical realist philosophy of science. However, the notion 'practical realist philosophy of science' should be specified. In this paper the following questions are briefly discussed: (1) Sami Pihlström has shown that pragmatist philosophy of science can be interpreted as a variety of realism – pragmatic realism. Are there any reasons to differentiate 'pragmatic realism' from 'practical realism'? It is emphasised that the roots of practical realism can be found in Marx's conception of practice; (2) Joseph Rouse is developing practice-based philosophy of science as a radical philosophical naturalism. Are there any reasons to differentiate practical realism from Rouse's conception? (3) Ilkka Niiniluoto's 'critical scientific realism' also seems to be close to practical realism, though he is known as a defender of the standard scientific realist correspondent theory of truth. What is actually the point of the criticism of classical correspondence in practical realism? 4) Nicholas Maxwell is known as a critic of so-called 'standard empiricism' associated with 'the philosophy of knowledge' and proponent of 'aim-oriented empiricism'* *and, more generally, of 'aim-oriented rationalism' associated with 'the philosophy of wisdom'. Perhaps this conception can actually be also seen as a 'practical realist philosophy of science'?*

Keywords: *empiricism, Kantianism, Marxism, metaphysics, naturalism, philosophy of science, practice, pragmatism, scientific realism*

Introduction

In a sense this paper can be regarded as a continuation of the presentation at the 22nd Baltic Conference on the History of Science in Vilnius (Vihalemm, 2006). That was a reflection, focusing on the conception of the practical nature of science, on the development of philosophy of science in Estonia. Estonian philosophy of science was born in Soviet times – that is, in abnormal conditions when the Soviet-style Marxist philosophy was compulsory. However, in the field of philosophy of science it was possible to almost ignore the official dogmatised Marxism. Besides practising 'Foreword Marxism' (i.e. being a Marxist-Leninist only declaratively, presenting the obligatory viewpoints in the foreword and concluding remarks, but practising substantially, so to speak, normal research), one could also proceed genuinely from Marx's ideas, especially and first of all from the conception of practice (though consistent proceeding from this conception was actually considered heresy). The conception of practice (although mainly not in association with Marx) can be seen as the origin of several approaches also in contemporary philosophy of science in which the practical, being simultaneously social and historical, nature of science is acknowledged, empiricism criticised and scientific realism defended.

Both traditional scientific realism and empiricism, together with the idea that the development of science lies in constantly discovering new facts about the world and, by creating theories, connecting these facts in a logical manner, achieving a more complete and exact knowledge, so to speak, approaching the waiting truth or its "surrogate" – empirical adequacy –, have receded from the treatment of science, although are not entirely gone. The post-Kuhnian philosophy of science, practised under different names, mainly those of qualified realism (such as 'critical', 'constructive', 'experimental', 'non-representative', 'referential', 'naturalistic', but also the ones referring directly to practice – 'pragmatic' and 'practical realism'), tends to be practice-based one way or the other. It seems appropriate to speak about practical realist philosophy of science.

However, the notion 'practical realist philosophy of science' should be specified. In my earlier papers I have characterised 'practical realism' by five main theses. I would point these out here as well:

(1) science does not represent the world 'as it really is' from a god's eye point of view;
(2) the fact that the world is not accessible independently of theories – or, to be more precise, paradigms (practices) – developed by scientists does not mean that Putnam's internal realism (or social constructivism) is acceptable;
(3) science as a theoretical activity is only one aspect of it (of science) as a practical activity whose main form is scientific experiment which in its turn takes place in the real world, being a purposeful and critically theory-guided constructive, manipulative, material interference with nature;
(4) science as practice is also a social-historical activity which means, among other things, that scientific practice includes a normative aspect, too, and that means, in its turn, that the world as it is actually accessible to science is not free from norms either;
(5) though neither naïve nor metaphysical, it is certainly realism as it claims that what is 'given' in the form of scientific practice is an aspect of the real world.

In this paper I will briefly and provisionally discuss the following points:

Sami Pihlström has shown (1996; 2008) that pragmatist philosophy of science can be interpreted as a variety of realism – pragmatic realism. Are there any reasons to differentiate 'pragmatic realism' from 'practical realism'?

Joseph Rouse (1987; 1996; 2002; 2003) is developing practice-based philosophy of science as a radical philosophical naturalism. Are there any reasons to differentiate 'practical realism' from Rouse's conception or naturalism in general (cf., e.g., Giere's naturalism)?

Ilkka Niiniluoto's (1999) 'critical scientific realism' also seems to be close to 'practical realism', though he is known as a defender of the standard scientific realist correspondent theory of truth. What is actually the point of the criticism of classical correspondence in practical realism?

Nicholas Maxwell is known as a critic of so-called 'standard empiricism' associated with 'the philosophy of knowledge' and proponent of 'aim-oriented empiricism' and, more generally, of 'aim-oriented rationalism' associated with 'the philosophy of wisdom' (Maxwell, 1998; 2001; 2004; 2007). Perhaps this conception can actually be also seen as a 'practical realist philosophy of science'?

First of all I will try to comment on Sami Pihlström's analysis of pragmatic realism from the viewpoint of practical realism.

'Pragmatic' or 'practical' realism?

Naturally the issue whether there are any reasons to differentiate 'pragmatic realism' from 'practical realism' does not raise much interest when reduced to purely terminological difference, but this is what should be studied – whether it is really so. True, terminologically speaking I prefer 'practical realism', because 'pragmatic' – as is known, was once noted by the founder of pragmatist philosophy, Peirce himself – is associated with a vulgarised meaning, which refers to orienting solely on the expediency, to the practical consequences or concerns in the narrower sense, ignoring so to speak higher principles or theoretical aims and considerations, etc. Besides, the term 'pragmatic' is not appropriate for naming a variety of realism, because pragmatism in philosophy of science is often identified also with instrumentalism, understood (although incorrectly) as a denial of scientific realism. Coming back to Peirce as the founder of pragmatist philosophy of science once more, then Pihlström, for example, characterises Peirce as "a precursor of scientific realism" and even that in "an important sense, Peirce is a classic of what is today known as scientific realism" (Pihlström, 2008, p. 30), admitting, on the other hand that "Peirce was […] also a speculative metaphysician" (Pihlström, 2008, p. 29) and that "widely different interpretations [of his views] can be defended, the tension between realism and idealism remained, in any event, a real tension for him […]. As we have seen, his definition of 'reality' or 'the real' was in one sense realistic but, in an idealistic fashion, he seems to have identified the real and the knowable." (Pihlström, 1996, p. 62)

The essential question is how is practice understood? And then also, of course, how is realism understood in the realist philosophy of science? Or rather, whether and, if so, then how is it considered possible to recognise realism proceeding from practice, and moreover – even emphasise it? Pihlström's analysis indicates, and I agree with him, that pragmatist philosophy of science – it has to be emphasised – *can* be interpreted as a variety of realism, pragmatic realism. However, it is not obvious that pragmatist philosophy of science as a philosophy proceeding from the understanding of science as practice *is* a variety of realism at all. According to Pihlström, "[t]he only thing that is clear is that pragmatism, as such, is no enemy of (moderate) scientific realism" (Pihlström, 2008, p. 59). And he hopes that there is a "need to see [...] the realism issue as a genuinely pragmatic, and even pragmatist, one" (Pihlström, 2008, p. 61). For instance, Putnam's 'internal realis m', which he also called 'pragmatic realism' belongs, however, to the tradition of Kantianism; that is, it is actually not realism at all (and above I have excluded Putnam's 'internal realism' from the 'practical realism' as I see it) as it scarcely succeeds in avoiding conceptual idealism without a rational reconstruction. I agree with Ilkka Niiniluoto's criticism of internal realism and his reconstruction of this view as 'critical scientific realism' (see Niiniluoto, 1999, ch. 7) which in its turn belongs, I think, to the conception that one might call 'practical realism' in the philosophy of science as it can be interpreted in the context where the practical nature of science is stressed. (But the relationship between Niiniluoto's 'critical scientific realism' and 'practical realism' needs yet to be clarified; I shall return to this issue below). Pihlström also writes, "[i]t is not easy to say, after all, whether Putnam thinks that the world 'objectively' or 'mind-independently' exists" (Pihlström, 1996, p. 29). But one cannot speak of a position as realist in philosophy of science without accepting this thesis and – it should be added also, I would like to emphasise – interpreting it materialistically in the sense that this position excludes not only subjective idealism, but objective idealism and dualism as well. So, the expression 'practical realism' is actually synonymous with 'practical materialism' (and perhaps also with 'practical naturalism').

According to practical realism (or practical materialism), consciousness, thought, mind or spirit cannot exist before or independently of the social-historical practice and this practice cannot be "outside" of objective reality. Practice-based approach criticises, of course, the naïve, or non-critical realism and metaphysical realism, because in the case of these it is claimed to be possible to somehow "see" the world "outside" of practice. The practice-based approach also accentuates the difficulties in traditional comprehension of knowledge, language and the truth. These difficulties arise from knowledge being seen – one could say, non-naturalistically – in an abstract manner as only the content of concepts and truthful statements expressed in language, unrelated to practice, in which knowledge and language are formed in reality, whereas what this knowledge or truthful content of linguistic expressions is, how it is found or how, if at all, it is connected with reality (language and the knowledge somehow contained in it are as if outside the real world) remains unexplained.

Practical realism proceeds from the notion that knowledge cannot be understood as a representation of a world independent of the cognitive subject and neither can the cognitive subject be comprehended independently of the cognisable world. The knowledge, as well as the cognitive subject and the cognisable world are formed in practice. To speak about the world outside practice means to speak about something indefinable or illusory. It is only through the means of practice that the objective world can really exist for humans. Knowledge must therefore be regarded as understanding how the world is formed in practice, how it becomes defined. From the viewpoint of traditional realism it may seem as giving up realism and cognisability of the world, accepting Kant's viewpoint, according to which an objective world independent of the subject remains a 'thing-in-itself'; the only world accessible to knowledge is the empirical one formed by the subject in cognition. But the position of practice is, in principle, different from that of Kant. Proceeding from practice helps to explain that in reality, the objective world cannot be for knowledge an ungraspable 'thing-in-itself', but appears as a 'thing for us'. The notion 'thing-in-itself' is an empty abstraction where the inexhaustible objective world has been made indefinable by excluding any contact with the subject.

Karl Marx on practice

Speaking about practice it is still necessary to emphasise that although pragmatism is practice-based philosophy by name already, it is neither the first nor the only discipline of philosophy that sees practice as the basic concept of philosophy. Practice is the starting and base conception of Karl Marx's philosophy. Up to now the most significant works in this relation are *Theses on Feuerbach* (Marx, 1845) and *The German Ideology* (Marx & Engels, 1845). For instance, Sidney Hook, one of the developers of pragmatism, who calls it experimental naturalism, has also found that Marx's critical theses about Ludwig Feuerbach – Hook has provided a thorough analysis of these in his *From Hegel to Marx: Studies in the Intellectual Development of Karl Marx* (Hook, 1976) – contain an important turning point in the history of philosophy.[1] In the first thesis, Marx writes,

> *The main defect of all hitherto-existing materialism – that of Feuerbach included – is that the Object* [der Gegenstand]*, actuality, sensuousness, are conceived only in the form of the object* [Objekts]*, or of contemplation* [Anschauung]*, but not as human sensuous activity, practice* [Praxis]*, not subjectively. Hence it happened that the active side, in opposition to materialism, was developed by idealism – but only abstractly, since, of course, idealism does not know real, sensuous activity as such. Feuerbach wants sensuous objects* [Objekte]*, differentiated from thought-objects, but he does not conceive human activity itself as objective* [gegenständliche] *activity. In* The Essence of Christianity [Das Wesen des Christenthums]*, he therefore regards the theoretical attitude as the only genuinely human attitude, while practice is conceived and defined only in its dirty-Jewish form of appearance* [Erscheinungsform]*... (Marx, 1845)*

1 See Hook, 1976, p. 273: "I believe that Marx's critical theses on Feuerbach represent *in nuce* a turning point in the history of philosophy."

In the second thesis:

> *The question whether objective truth can be attributed to human thinking is not a question of theory but is a* ***practical*** *question. Man must prove the truth, i.e., the reality and power, the this-sidedness* [Diesseitigkeit] *of his thinking, in practice. The dispute over the reality or non-reality of thinking which is isolated from practice is a purely scholastic question. (Marx, 1845)*

At the same time Marx also criticises the abstract, individual-based understanding of human being, and emphasises that in reality, it is the ensemble of the social relations. “All social life”, he writes in his eighth thesis, “is essentially *practical*. All mysteries which lead theory to mysticism find their rational solution in human practice and in the comprehension of this practice” (Marx, 1845). This kind of social practice is historical by its nature. Speaking about history, *The German Ideology* first and foremost emphasises that “[o]ne can look at history from two sides and divide it into the history of nature and the history of men. The two sides are, however, inseparable; the history of nature and the history of men are dependent on each other so long as men exist.” (Marx & Engels, 1845) Further, human history is defined as

> *nothing but the succession of the separate generations, each of which exploits the materials, the capital funds, the productive forces handed down to it by all preceding generations, and thus, on the one hand, continues the traditional activity in completely changed circumstances and, on the other, modifies the old circumstances with a completely changed activity* (Marx & Engels, 1845).

The difference between understanding Marxist and pragmatist practice is mainly seen in the fact that the first emphasises the social and historical character of human activity – even in case of an individual –, as conveyed by material and intellectual culture; pragmatism, however, usually concentrates on activity – even in case of social activity – from the viewpoint of an individual.

Like in terms of pragmatism, which Pihlström has characterised very well, the relationship between practice and realism has been understood differently, Marx’s approach on practice and also his realism or, to be more exact, materialism, have also been perceived in quite different ways. Unfortunately, an important disturbing issue still lies in the fact that Marx’s approach on practice is often perceived not in the context of serious philosophy, but rather an ideological basis of a failed political doctrine.

Practical realism and naturalism

Indeed, as was mentioned already, practical realism can be regarded also as a kind of naturalism. Pihlström has said the same concerning pragmatic realism. And above I referred to Sidney Hook, who has written that he regarded "the philosophy of experimental naturalism [...] as a continuation of what is soundest and most fruitful in Marx's philosophical outlook upon the world" (Hook, 1976, p. 1). But this is, of course, so to speak, practice-based naturalism, not some kind of biological or reductionistic approach. It is an anti-metaphysical approach in the sense that it rejects any attempts to accept something like 'first philosophy', metaphysical foundations, THE ONTOLOGY I appreciate Joseph Rouse's practice-based philosophy of science and in this connection his radical philosophical naturalism as well (Rouse, 1987; 1996; 2002; 2003). It seems to me that it corresponds, in principle, with the ideas of practical realism.

Rouse – and also, e.g., Giere – have referred to Kuhn as advocating actually, though not explicitly, a 'naturalised' philosophy of science (Giere, 1988, p. 33), but have emphasised also that his ideas should be developed further in this direction of naturalised and practice-based account of science, "further [...] than he himself would be happy with" (Rouse, 1987, p. 27). As for Kuhn himself there is reason to speak about the wrong turn in the development of his thought:

> *Kuhn* [...] *started out with a strong naturalistic streak* [...] *in order to build his accounts of scientific change and the nature of observation and scientific thought. But by the 1970s Kuhn's work had taken on a much more purely philosophical, a priori, tone.* [...] *I suggest, nonetheless, that Kuhn's most valuable contribution is to be found in The Structure of Scientific Revolutions and not in his later work, and that the naturalistic direction of the former* [...] *deserve[s] further study.* (Bird, 2002, p. 443).

According to Pihlström, too,

> *It was Kuhn in particular, I suggest, who smuggled pragmatist ideas into the philosophy of science, making possible a (Deweyan-like) historicist pragmatic naturalism* [...] *In the field today, thinkers like Rouse carry this task forward, usually without explicitly linking their views with the pragmatist tradition. This makes Rouse's take on Kuhn somewhat unpragmatist* [...]*, which is unfortunate* [...] (Pihlström, 2008, p. 60).

Maybe, however, there is no need to interpret and develop Kuhn's approach further along the pragmatist line, but do so along the practical realist naturalist line? As Pihlström (2008, p. 56) also concedes, "Rouse may have his own reasons for *not* wanting to label his position 'pragmatist' at all." It seems to me that it would be appropriate to label his position as 'practical realist'.

Practical realism and critical scientific realism

As said above, I agree with Ilkka Niiniluoto's criticism of Putnam's internal realism. There is an essential difference between internal realism and practical realism (or Niiniluoto's critical scientific realism), as the former belongs to the tradition of Kantianism and cannot actually be qualified as realism at all. It is acknowledged that the scientific account of the world is mediated by our practical and theoretical activity, which means, indeed, that our descriptions of the world, our 'world-versions' are always relative to us. This does not imply, however, that the world itself (we can call it THE WORLD) is relative to us in the sense that our 'world-versions' cannot be versions of THE WORLD (see Niiniluoto, 1999, pp. 218–226). Our scientific 'world-versions', although they represent the world through conceptual frameworks or, more precisely, through paradigms in the Kuhnian sense, interpreted in its turn as practices, still do tell us something about THE WORLD, as do theories we have constructed, which, in their theoretical models, contain experimentally substantiated idealisations, since theoretical models are similar to the real systems in specified respects and to specified degrees (see Giere, 1988, p. 81). As Niiniluoto (1999, p. 216) writes, "Conceptual frameworks are selected on the basis of our cognitive and practical purposes, and they can always be improved and made descriptively more complete". If we use the cookie-cutter metaphor we can say, "A cake [THE WORLD] can be sliced into pieces in a potentially infinite number of ways, and the resulting slices [say, natural kinds and laws of nature identified by us] are human constructions made out of the parts [unidentified (complex, inexhaustible) objects, their properties and relations] of the cake" (Niiniluoto, 1999, p. 222).

However, from the practical realist view, Niiniluoto's approach which is language- and logic-centred, seems to be too abstract as the context of practice is not thematised in it; more precisely: Niiniluoto's scientific realism is not based on the conception of practice, though a few arguments from practice, referring to Marx (1845) and Engels (1886) are used (see Niiniluoto, 1999, pp. 39, 275). His critical scientific realism shares the standard scientific realist correspondent theory of truth according to which "[t]ruth is a semantical relation between language and reality. Its meaning is given by a modern (Tarskian) version of the correspondent theory, and its best indicator is given by systematic enquiry using the methods of science" (Niiniluoto, 1999, p. 10). Niiniluoto emphasises that this thesis separates the semantic realists from all kinds of pragmatists, who replace this realist account of truth with some epistemic surrogate (Niiniluoto, 1999, pp. 11–12). This standard realist understanding of knowledge, the world and their relations outside practice should be revised, I think.

I cannot speak for pragmatists, but in practical realism, "truth" can be interpreted in a deflationary way and this interpretation is compatible with semantic realism. I agree with Joseph Rouse (1987, p. 147) that reasons for accepting deflation should be "perhaps somewhat different from those of most deflationists". He writes,

> *If I think that there are no substantive issues concerning truth, it is because I see the issues situated on the right side of the Tarski equivalence instead of the left. There are no fundamental philosophical issues peculiar to the concept of truth, for they are the same issues that arise concerning how things have any determinations at all. What is it for snow to be white?* [Standard] [r]*ealists think that things have such determinations independent of our practices, desires, and beliefs.* [...] *I think that what there is cannot be entirely separated from who we are and what we do.* (Rouse, 1987, pp. 147–148)

Niiniluoto also emphasises that it is important to make a distinction between unidentified and identified objects. THE WORLD contains unidentified objects which are identifiable, but not "'self-identifying objects' in the bad metaphysical sense [...]: they are potentially identifiable by us [see the cookie-cutter metaphor above, again]" (Niiniluoto, 1999, p. 221).

In order to better understand the practical realist account of truth and reality it is appropriate to quote Rouse (1987) again. It seems to me that Niiniluoto could agree with that. Rouse writes,

> [t]*he predicate 'true' can be applied only to sentences in language.* [...] [A language] *connects assertions with truth conditions but does not determine whether those conditions obtain. Similarly, what exists depends upon the field of meaningful interaction and interpretation within which things can be encountered. This configuration of practices (including, of course, linguistic practice) allows things to show themselves as they are in a variety of respects.* [...] *The*

recognition that the possible ways a thing can be depends upon the configuration of practices within which they become manifest should therefore not reinforce the realist's fear that we are being described as 'world makers'. The language we speak does not determine which of its sentences are true. The practices that constitute our 'world' likewise do not determine which things exist, with what properties. (Rouse, 1987, pp. 160–161).

Actually Niiniluoto (1999, p. 275) also refers to Engels' often-quoted statement on practice as the criterion of truth which is relevant here:

If we are able to prove the correctness of our conception of a natural process by making it ourselves, bringing it into being out of its conditions and making it serve our own purposes into the bargain, then there is an end to the Kantian ungraspable 'thing-in-itself'. The chemical substances produced in the bodies of plants and animals remained just such 'things-in-themselves' until organic chemistry began to produce them one after another, whereupon the 'thing-in-itself' became a thing for us… (Engels, 1886)

Uncompromisingly against standard empiricism: how does it concern metaphysics?

In my opinion also the above-mentioned Nicholas Maxwell's approach on science (Maxwell, 1998; 2001; 2004; 2007) can be, and is, interesting to be viewed within the framework of practical realism. Maxwell proceeds from science as practice in the sense that he intends to make explicit presuppositions, aims and methods which are implicit in scientific practice and thanks to which its – as an aim-oriented rational action – progress has actually been achieved. He also argues that

the current deep division of Sociology of Science and Philosophy of Science would entirely disappear; these two disciplines, still at loggerheads with one another, would become one and the same [methodological] *discipline* [called, as was said here in Introduction, 'aim-oriented empiricism' and, more generally, 'aim-oriented rationalism']. *The current dispute between Sociology and Philosophy of Science is a symptom of the deep malaise from which the whole academic inquiry* [where the philosophy of knowledge is dominant]

> *suffers, in seeking knowledge rather than promote wisdom by cooperatively rational means* [which presupposes the philosophy of wisdom]. (Maxwell, 2007, p. 9)

Maxwell does not explicitly speak about practice-based philosophy of science, bearing in mind the practical realist philosophy of science, nor does he refer to the authors that can be considered practical realists, but the coincidences of his views with practical realism in several important points are very obvious. When we look at the five previously mentioned points characterising practical realism (see Introduction), then Maxwell clearly acknowledges points 1 and 2; he does not explicitly emphasise point 3 and thus does not proceed explicitly from practice in his approach, although, speaking about science in terms of his 'aim-oriented empiricism' he does, of course, refer to and presume the experimental basis of science, the character of science as a purposeful and critically theory-guided practical activity. Points 4 and 5 are obviously, again, very important for him. Unfortunately, considerations of space prevent me to dwell on Maxwell's ideas and their connection with practical realism a little more thoroughly in this paper. I will here very briefly touch upon only his uncompromising criticism of standard empiricism, asking whether this criticism needs to be associated in a sense, specified by Maxwell, with metaphysical considerations.

First of all I would like to emphasise that Maxwell's criticism of standard empiricism meets with approval in practical realism. However, in practical realism the question does not arise – as Maxwell actually puts it – in the form of a dilemma: either standard empiricism, or a metaphysically oriented conception.[2] Maxwell argues that "science makes a metaphysical assumption, using 'metaphysical' in exactly the standard way it has come to be understood in philosophy of science, after Karl Popper. A proposition is metaphysical if it is empirically unfalsifiable." (Maxwell, 2009, p. 108) Sure, that is correct if we understand the question in such a standard philosophy of science context in which science is regarded as a system of statements created for a scientific representation of the world, whereas the only link between the world and its

[2] To prevent misunderstandings it is important to note that Maxwell is bearing in mind metaphysical component in science itself, i.e. he does not contrast here metaphysics to science, but sees that correctly identified scientific method contains implicitly also a component which qualifies from the viewpoint of standard empiricism as a metaphysical one. Maxwell writes, "According to standard empiricism, the critical study of the aims and methods of science — the philosophy of science — is to be sharply distinguished from science itself, just because ideas as to what the aims and methods of science ought to be are not, in any straightforward sense, empirically testable theories." (Maxwell, 2007, p. 258)

representation seems to be sense experience.[3] In the context of practical realist philosophy of science, however,

> [t]*he question is not how we get from a linguistic representation of the world to the world represented. We are already engaged with the world in practical activity, and the world simply is what we are involved with. The question of access to the world, to which the appeal to observation was a response, never arises. The important categories for characterizing the ways the world becomes manifest to us are therefore not the observable and unobservable. We must ask instead about what is available to be used, what we have to take account of in using it, and what we are aiming toward as a goal.* (Rouse, 1987, p. 143)

Therefore in the context of practical realist philosophy of science, where science is not construed abstractly as a system of knowledge, but as a practical activity, the abovementioned dilemma – empiricism or acceptance of metaphysics as part of scientific knowledge – never arises either.

The empiricism/metaphysics problem seems to be rooted in the traditions of the Cartesian conception of mind, together with his dualism, and the Humean conception of experience. When one clearly gives up these traditions, there will be no getting stuck in Kantian dualism of the empirical world of phenomena (observables), and the world regarded from the transcendental (metaphysical) perspective as the transcendent world of noumena (unobservables). According to practical realism, as shown above, there is one real world which is complex, inexhaustible, and can manifest itself in practice in a potentially infinite number of ways, i.e. in principle there can be an infinite number of real 'world-versions'.

Maxwell also criticises the Cartesian–Humean–Kantian traditions and emphasises that there is one real world: "The very distinction between 'the physical universe' and 'the world of human experience' is, as it were, an artefact of our understanding rather than something that exists in reality" (Maxwell, 2007, p. 282). Maxwell (2001) deals especially with "the human world/physical universe problem" which is, as the author emphasises, "*the* fundamental problem of philosophy" (Maxwell, 2001, p. 18). Here we can see an analogy with "the great basic question of all philosophy" formulated by Engels in the Marxist practice-based philosophy as the question of the relations of thinking and being, examined from two, so to speak, ontological and epistemological aspects, while accepting also that the "most telling refutation of [...] all [...] philosophical crotchets is practice" (Engels, 1886, ch. 2).

[3] Cf. Quine, 1975, p. 75: "Whatever evidence there is for science is sensory evidence."

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Knowledge in Science and Non-Science

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Abstract: *It may seem obsolete to address the old question 'What is science?', once again. However, it is the very basic question of the philosophy of science and we must know our roots. In what follows is not an attempt at a consistent historiographical analysis of this basic question. Rather, in order to create a Baltic connection, an explanation is offered for why it is only physics that is considered science proper. Rein Vihalemm has introduced an interesting conception called 'φ-science', which is a theoretical model of science. It is a concept of an idealized science, just like a model can be. The characteristic feature of φ-science is the idea that the researcher constructs the object for himself or herself to study. However, he or she does so still on the basis of the empirical experience that she has obtained from objective reality. The model has been elaborated on the basis of physics. It is preferable to apply a neutral model here as physics itself, a developing science, may transcend the borders of what once was called science proper. At this point in time, however, we are in the position of declaring physics (in its idealized form) the only science fitting entirely into the model of φ-science. What about everything remaining that is often called science as well? All of this part of intellectual activity can be called 'non-science', although it can be divided into several subgroups of non-science.*

The high reputation of science is often due to the belief that scientific knowledge is especially valuable because it is true, it is well-justified, it is trustworthy. If so, it is physics that produces the best kind of knowledge we can imagine. If we evaluate scientific knowledge more highly than any other, physics is being brought into a special position that it is not ready to share with any other field, even mathematics or chemistry. It is true that mathematical knowledge may be even more trustworthy than physical. But mathematicians do not normally claim presenting knowledge about the objective reality. Their *knowledge concerns the mathematical language itself. Chemistry, however, does not unfortunately fall under the scope of φ-science or, to be more correct, can be called φ-science only partly. We can have knowledge based on social science and the humanities as well. Creation of such knowledge, however, cannot be based on the model of φ-science. The article is going to analyse, in further detail, how to understand non-scientific knowledge, what can be its relationship to scientific knowledge and is it knowledge that has to be the goal of our intellectual efforts after all. Perhaps, from some point 'wisdom' would be the correct word.*

Keywords: *knowledge, knowledge-inquiry, wisdom-inquiry, Nicholas Maxwell, φ-science, physics*

Introduction

The basic question of the philosophy of science 'What is science?' has been studied from very many aspects. Normally, these analyses have focused directly around the problem of demarcation, namely, the problem of differentiating 'science' from 'non-science'. This is the topic that we have to start with. However, the main issue here is knowledge. The core problem, therefore, can be stated as follows: What is the role of knowledge, if any, in solving the problem of demarcation? Is scientific knowledge in any way different from non-scientific knowledge? If so, what kind of difference is it? Is it something that can contribute to the traditional solutions of the problem of demarcation based on defining a scientific method or language?

Now, before we can proceed to the main issue, it is absolutely necessary to make it clear where we are going to draw the demarcation line between science and non-science. First, it has to be noted that by 'non-science' we shall mean everything that is not going to be included into science in the narrow sense modelled by idealized physics here. However, from time to time we have to account for some subdivisions in non-science, i.e. differentiate between social science and the humanities in order to keep the focus on our main purpose. The question of 'pseudo-science' will not become an issue for us because the conception of producing knowledge in the classical sense would hardly be an issue here. Pseudo-science can only produce pseudo-knowledge.

What is science?

There is a broad and a narrow perspective we can follow here. The broad one would mean that we include the entire natural as well as social science under the scope of science as such. However, we shall be narrowing down, at least for the beginning. An easy, but by no means obsolete, answer to the basic question for us here is that science is everything that copes with the model of φ-science. Naturally, this statement requires further explanation as the notion of φ-science is not generally accepted or even known among philosophers of science so far.

The term was coined by the Estonian philosopher of science and chemistry (not the same thing) Rein Vihalemm, who speaks about the model of science he has called φ-science. Naturally, the model is not identical to the original. "The model is an idealization, an abstract, non-linguistic entity, which resembles the real object in certain respect and to a certain degree" (Vihalemm, 2007, p. 227).

Vihalemm also introduced another distinction—namely, the two main types of cognition:

1) scientific (more precisely φ-scientific) cognition, being of a constructive-hypothetico-deductive character;
2) non-φ-scientific (or natural historical) cognition, being of a classifying-historico-descriptive character (ranging from classical biology to the humanities) (Vihalemm, 2007, p. 230).

The basic idea is the following: φ-science is a model for framing the constructive-hypothetico-deductive type of cognition. This means that we are speaking about an intellectual activity that constructs the object of research for itself rather than relying on reality as it appears to our senses.

Rein Vihalemm specifies:

> *The theoretical study of science in the narrow sense can, indeed, identify its object on the basis of the relevant aims and methods, and it does not depend on the peculiarities of objects or spheres of reality; when the aims, methods and principles of inquiry are very different, the descriptive studies have to differ accordingly, and, consequently, no unified general theory can be proposed* (Vihalemm, 2007, p. 229).

In the analysis that follows we shall adhere to the position that it is just some specific intellectual fields that are close enough to the model of φ-science that qualify as science, namely physics and a specific part of chemistry. Anything else is non-science. At a later point, however, we probably have to differentiate inside non-science. Biology is by all evidence still quite different from social science or the humanities, not to mention literature, art or music. The main purpose of the latter trio, however, is not to provide us with knowledge, at least not in the classical sense of a true belief, which has to be justified, i.e. in the meaning of knowledge that can be called scientific. They are important components of human culture that contribute to the development of our intellect. But they do not attempt to provide us with an account of how the world is or what is true about it. Rather their purpose is to raise our quality of life, contribute to the human wisdom.

What is knowledge? Our core question concerning knowledge

In order to get started, it has to be noted that we adhere to the classical Platonic definition: knowledge is justified true belief. Obviously, we can have a true belief about anything and concerning anything based on any intellectual discipline. "Virtually all theorists agree that true belief is a necessary condition for knowledge" (Honderich, 1995, p. 447). Therefore, the core of the problem is justification. It was once thought that justification yields a necessary and sufficient condition for knowledge. Its sufficiency, however, was disproved by Gettier (1963, pp. 121–123). Still, contemporary epistemology has provided us with ways of analyzing and defining knowledge that avoid the Gettier type problems (see, for instance, Lemos, 2010, pp. 27–43). We can fine-tune our main question as follows: is knowledge acquired by means of applying a φ-scientific method in any way better than any other type of knowledge, i.e. whether it can be justified in a better (more rigorous) way in any sense compared to justifications that can be applied in non-φ- or non-science? Obviously, the formulation of the main question engages us with propositional knowledge. Acquaintance knowledge and 'how-to' knowledge do not play any significant role in our analysis.

What do we get to know as the result of research in science and in non-science?

Science, as defined above, enables us to obtain knowledge that can be called physical in the sense of the discipline of physics. What kind of knowledge is that? It is rigorous knowledge, which often has been experimentally tested and therefore well-justified based on application of a relatively well formulated method. Such knowledge is a well-justified true belief in essence, almost by its definition. Sounds good, does it not? However, in the current context 'justified' does not mean 'verified' or 'falsified'. By 'justified knowledge' we mean knowledge that has been produced following some clear and strict rules as it is when we apply the scientific method. This does not necessarily mean that the result cannot be refuted by means of applying a different, possibly more advanced, method.

What is the content of scientific knowledge? In principle, physics covers everything. But it is only a highly selected aspect of everything as Nicholas Maxwell puts it:

> *Physics, and that part of science in principle reducible to physics, is concerned only with what may be called "causally efficacious" aspect of things, that aspect which, ultimately, everything has in common with everything else, and which determines (perhaps probabilistically) the way events unfold* (Maxwell, 2010, p. 54).

What is left once we single out the causally efficacious? It is the look of things, the feel, the smell, the sound, the sense, and what it is to be such and such a complex system of cells, of interacting molecules. "Physics fastens onto the wavelength of light and ignores its colour; it specifies vibrations in the air and ignores the sound of the human voice, and ignores, too, what the person says" (Maxwell, 2010, pp. 54–55).

This critical evaluation by Nicholas Maxwell can be viewed from two angles: negative and positive. Maxwell has his own reasons for being critical, which will not be analyzed here. But his criticism is well formulated from an objective point of view. Physics has its own definite approach to worldly matters concentrating on everything "physical" and leaving the non-physical out of the picture as irrelevant from the scientific point of view. Anything non-physical is simply not rigorous enough for being looked at with a "scientific eye" as the classical scientific method cannot be applied rigorously enough. It is true that the hypothetico-deductive method can be applied to the so-called cultural objects as well. In that case, however, there are two options: these objects are either not specified clearly enough to be called scientific or they are constructed to the degree that would justify their being called physical. The latter is probably a rare development, if ever applied at all, but it definitely remains a possibility. The positive side of Maxwell's criticism, however, rests on the excellent line of argumentation on what physics is about. In this context we can just extend it slightly and claim that this is what science is about. "Physics might cover all the incredibly complex *physical* processes going on inside my head, but it says nothing about what it is to *be* me, what it is I experience, feel, think, see, hear, imagine, understand, desire, fear, intend, decide" (Maxwell, 2010, p. 55). So the sphere of science has been very clearly specified by Maxwell. There is something that is inside it and there is something that is clearly left out. Everything of importance from the point of view of a human being's everyday life remains outside the scope of science in our current narrow sense. Worse than that, to paraphrase Maxwell loosely, we might claim that science is not about what I know. Fortunately, this does not mean that we cannot have scientific knowledge.

Now, we are facing the question: what is more important? Should we care more about a unified theory of everything or some method or discipline that helps us directly in the matters we are constantly facing in our lives. In our broad context we have to ask: what kind of knowledge is more important, physical one or the one concerning issues we really do care about?

One of the main goals of scientific research is prediction. If we are able to predict, we get to know what would happen in the future. That would really be most valuable knowledge. But what about the situation concerning objective reality? Can science (physics) predict new phenomena? Well, physics can predict the evolution of only the very simplest of systems. This is due to the problem of the initial conditions. There is always some inevitable imprecision in the initial conditions of any system, even the simplest ones. The reasons for that imprecision are not important in this context, but, to briefly mention, there are two main reasons: First, the initial conditions of any physical system have their history, which physics is normally not able to account for. Second, while expressing the values of the initial conditions in decimal fractions, we always have to round the result. No device at our disposal, not even the fastest modern computers, is able to account for infinite precision and never will be. This is an everlasting fundamental problem, not anything we can hope to overcome some day. It is not any kind of deficiency in our standard of knowledge. (This issue has been addressed in more detail in Näpinen & Müürsepp, 2002, p. 473.)

True, there is an approach in contemporary physics, advocated mostly by Ilya Prigogine and his followers, according to which the deterministic simplicity of the classical physical approach has been severely criticized and overcome in a way (see, for instance, Prigogine, 1997). Still, even Prigogine has not succeeded in making physics anything else than a constructive-hypothetico-deductive science and probably has not attempted to do so after all.

Science—that is, physics and a definite part of chemistry—helps us to obtain a special kind of knowledge, scientific knowledge. It is a kind of knowledge that can be taken apart and analyzed, criticized and corrected if necessary, even though it is a simplistic kind. As most scientists claim, the silence of physics about the experiential means that sensory qualities do not exist objectively out there in the world and, at best, exist only in us, as sensations (Maxwell, 2010, pp. 59–60). This is true. Physics has its own (physical) reality. It does correspond to the rational reality of physicists, but does not correspond to how an average human being experiences the world around. There is a very clear demarcation line. Now, if we take a closer look at the essence of knowledge, we are facing this line as well. Probably there is even another one. This hypothesis rises from the question, what kind of mental condition does knowledge represent? What is the content of knowledge so that it would not disturb the classical definition we promised to adhere to above?

The classical definition of knowledge does not specify what we need to have the justified true belief about. It can be about physical reality, it can be about mathematical relations, it can be about studies in comparative literature, art or music, and last but not least—it can be about the way how we experience the world out there. So, by all evidence, we are back to the basic question of practical epistemology, the problem of justification.

Obviously, physical knowledge can be justified relatively well. 'Relatively' applies because of the fact that mathematical knowledge can be justified even more rigorously, although even mathematical rigour has its limitations, as specified for instance in Imre Lakatos' *Proofs and Refutations* (Lakatos, 1976). As far as the rigour of the method is concerned, however, there is no match for justification, in the sense pointed out above, in either mathematics or physics. (We are including logic into mathematics here.) Therefore, knowledge connected to these intellectual fields has special quality. Does that mean that this quality is higher compared to knowledge in any other field, however, remains an open question.

The role of explanatory power

Let us confuse the discussion by bringing in the phenomenon of explanatory power. Here, science has the upper hand over non-science, at least seemingly so. Normally, scientists can explain their findings quite well. Even if they go wrong, there normally is an explanation as to why the failure happened. In any kind of non-science, there are great problems with this issue. Of course, it is always possible to come up with an explanation. But explanations in those fields remain subjective and do not necessarily work universally.

It appears that we have discovered an aspect that has a lot to do with the quality of knowledge. Still, it is possible to question this issue based on the scepticism whether explanatory power has anything to do with knowledge. Well, an easy answer here would be that explanatory power may not have anything to do with 'true belief', but while dealing with justification it is difficult to deny the connection. A belief the truth of which is explained can definitely be better justified than just some belief that happened to turn out to be true. Therefore, we can claim that the greater explanatory power, the higher the quality of the corresponding type of knowledge. The claim is not a universal one as the more explanatory theory need not be better supported empirically.

However, there is an "old" new problem that disturbs the picture. It is old in the sense that it has been addressed above already. The problem is in the value of the pieces of knowledge we are able to collect. Or, to put it differently, that what is the essence of the quality of knowledge. For instance, we just found that explanatory power has a lot to do with the quality of knowledge. Are we justified to believe that greater explanatory power necessarily means higher quality of knowledge, remains an open question. Why cannot we say that the real measure of the quality of knowledge is its value for the human being in their everyday life? Well, probably we can, but then a new, and a bigger, problem arises—namely, the question, what is of value for a human being? Is there and can there be any general measure at all? By all evidence, there can be a general measure, but its universal nature can still constantly be questioned. Maybe it is still scientific knowledge that constitutes the highest values for us all in the long run.

A possible solution

An interesting framework of a possible solution to the 'value problem' has been proposed by Nicholas Maxwell by his conception of cutting God in half, separating the God-of-Cosmic-Value from the God-of-Cosmic-Power (Maxwell, 2010). It is science (physics) that is the realm of the God-of-Cosmic-Power with all of its shortcomings pointed out above. It is the God-of-Cosmic-Value that can help us to come forward with the solution to the problem of what is of real value in the human life, including the question of knowledge—that is, what do we really need to know.

But what is the God-of-Cosmic-Value? Nicholas Maxwell gives a long ten-step explanation at this point. Our task is not to analyze Maxwell's definition. Let us just concentrate on those aspects of Maxwell's explanation that have a connection to our main problem, that of knowledge. At first it seems that anything concerning value has nothing to do with knowledge. Knowledge must be objective, after all. If we know something then that is how it is. In order to discover what is of value, however, we need to attend to our desires and feelings (Maxwell, 2010, p. 86). Desires and feelings tend to be individually unique. That is something that can hardly apply to knowledge. But desires and feelings cannot just be a chaotic mass. We must still know something. How can we make the connection? According to Maxwell: “But this does not mean that value features of things are irredeemably subjective, and do not exist objectively, in the real world” (Maxwell, 2010, p. 86). Maxwell is quite right in claiming that value features are like perceptual features such as colours, sounds, and tactile properties of things. The perceptual sensations (visual, auditory, tactile) we need to have in order to perceive these features cannot be purely subjective. Obviously, we can exchange thoughts about issues based directly on perceptual sensations and make sense of our thoughts. This would be impossible in a chaotic world of subjective images.

But still, what about knowledge? Each of us can hope to know something, to know at least a fragment of all that is of value in existence. The crucial moment is knowledge and appreciation of another person. Here we need our powers of empathy, intelligence, imagination and perception. “We need to know the other person from within, as it were, so that we have an imaginative experience of the other person’s hopes and fears, joys and sufferings, relationships, struggles, feelings and desires, their life, history and world” (Maxwell, 2010, p. 88). This would be knowledge of real value. Unfortunately, physical science cannot provide it. In order to achieve knowledge of this novel type we need to apply something else: the humanities, arts, social science.

It may seem that social science would not do the job either, that it is not ‘subjective’ enough. Still, contemporary social science makes use of methods that are said to enable us to measure complicated and personal phenomena, like achievement. Of course, this is measurement in a completely different sense compared to measurement in physics, but still provides some degree of objectivity into the results of the enterprise of social research. We get into touch with objective knowledge about the real human condition here, but it is almost as remote connection as in the case of physics. The only difference is that physicists quite openly construct the object of research for themselves. They construct the objects applying the empirical data that they have obtained. Therefore, they quite possibly still retain connection to the world out there. Even if they do not, they are dealing with a kind of reality—namely, scientific reality. Social scientists are somewhat in between here. They cannot construct their objects, human individuals, but can still play around with connections and trends they are interested in.

As a matter of fact, the process of knowledge creation in social science has been coined after the model of the methodology of natural science. What do we get in this way is the only possible result, that is, a vague copy of the results obtained by physicists. The results of the physicists correspond to the reality of the physical world, although a constructed one. The results of social science hardly correspond to the social reality. They rather show something pseudophysical about society, some trends and phenomena that may even be useful to know from the pragmatic point of view of social engineering. Anything really important from the individual human being's point of view, however, does not come to the fore. In order to reach for knowledge about social issues, a new approach has to be invented. This new approach does not necessarily need to be, may be even should not be, anything like research. What it has to be remains an open question so far. The call of Nicholas Maxwell for wisdom-inquiry seems to be looking for a way to bypass the quest for knowledge in social science and taking a different path.

Basically the same applies to the humanities. The current situation here is easier in a way. Although there have been voices advocating taking the method of physicists as an example here as well, nothing special has been done yet. There is no general universal method in the humanities.

The existence of the definite method is the main reason why physics has become the most fundamental science. Now, in order to get to know about the real needs of humans, in order to face the global problems effectively, may be even to solve some of them, we should turn the situation around here. Namely, we have to make the humanities the most fundamental field of intellectual activity, a field of knowledge of real value.

How to achieve the solution?

The short answer is that we have to overcome knowledge and keep reaching for wisdom. According to Nicholas Maxwell, intellectuals have to surpass knowledge-inquiry and apply wisdom-inquiry as the goal (Maxwell, 2010). What does Maxwell mean by this? He claims that all scientific research based on the classical method has been knowledge-inquiry, pursuit of knowledge in the sense of the classical definition.

There are two great problems of learning that confront humanity: learning about the universe and ourselves as part of the universe and learning how to become civilized (Maxwell, 2010, p. 164). The modern scientific method concentrates solely on the first problem and deals with finding the solutions quite efficiently. That is very acceptable for science in the narrow sense, φ-science. For the development of the humanities, however, we need to achieve wisdom, not just knowledge. Therefore, knowledge in non-science cannot be an achievement. It is rather something like knowing 'what is the date today' or recognizing a person walking on the other side of the street. We have to aim higher, namely at wisdom.

How to understand wisdom-inquiry compared to knowledge-inquiry? Nicholas Maxwell gives the following answer:

> *Whereas knowledge-inquiry demands that emotions and desires, values, human ideals and aspirations, philosophies of life be excluded from the intellectual domain of inquiry, wisdom-inquiry requires that they be included. In order to discover what is of value in life it is essential that we attend to our feelings and desires.* (Maxwell, 2010, p. 182)

It would be a grave misunderstanding, however, to leave knowledge out of the picture. We have to be able to assess critically our feelings, desires and values. As we know, not everything that feels good is good by all measures.

How can we know, what kind of subjective good is objectively good? Unfortunately, the short answer to this query is that we cannot. As fallible creatures, we, the human beings, can never be sure that any good we discover is objectively that. Still, once again, it seems that the solution is possible. We need to follow Nicholas Maxwell's aim-oriented rationality. The point of takeoff is traditional rationalism, of course. From that we have to proceed to sceptical rationality and include emotional aspects of life, that is, emotional honesty. This way we achieve the interplay of mind and heart (Maxwell, 2010, p. 183). This is the essence of aim-oriented rationality. It produces a kind of rational faith, consisting of knowledge and emotion. The role of knowledge becomes reduced to the formula, 'I know what I want, what I like, what I desire'.

Knowledge becomes mixed with emotion in the sense of involuntary occurrent individual mental states, leaving dispositional or lasting emotions out of the picture. It may seem at first that this development confuses the classical idea of knowledge as justified true belief. How could emotion be rationally justified? There is, however, another possible interpretation. We may look at the situation as emotion being added to justified true belief. In the humanities we can do this with ease. The issue of social science is more complicated. In the direct sense, emotion cannot be included. But the methodology of social science provides us with an understanding of how to measure emotion. The problem is, however, that the emotion of the rational faith is meant to be the nonmeasurable component here.

Therefore, achieving knowledge in social science is a task that still has to be accomplished. What we can say today is that the classical definition of knowledge is inadequate for social science, not to mention the humanities.

Instead of a conclusion

We have proceeded from the classical definition of knowledge, which is trapped in the Gettier problems into a new understanding of what is really important to know. We may still call 'What is knowledge?' the key question. But the classical definition does not satisfy us any longer. It has lost its significance. Formal-analytical justification is not what we need to be looking for. It is rather the knowledge of the other person's hopes and fears, joys and sufferings, feelings and desires, the whole life, history and world. Formal justification is not needed here. The Gettier problems have been solved by surpassing them.

We really do know what is knowledge in (φ)-science. We do not yet know what knowledge is in non-φ-science. We are still looking for the most appropriate approach, either a direct one or a bypass. In that sense, scientific knowledge is better, but it is more sterile as well. Does it provide us with what we really need (to know), do we need to keep the platform of knowledge in order to be able to advance towards wisdom, will remain important open questions.

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On the Unfitness of the Exact Science for the Understanding of Nature

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Abstract: *It is argued that the exact science – if we according to Rein Vihalemm define it as a theoretical object or an idealized model coming from physics (since Galileo) – is searching for objective laws formulated mathematically and confirmed experimentally and because of that it does not include the understanding of nature. The exact science functions like a simple categorical syllogism and contains only explanation and prediction. The understanding of nature (as well as of society) can be only personalistic, i.e. it can be achieved through man's own individual experience and self-knowledge. In personalistic understanding man uses himself/herself as a model for the world and human(s) in it.*

Keywords: *exact science, φ-science, explanation, understanding*

Introduction

In this paper I want to argue that contrary to usual opinions among many scientists and science-based educators, developing and teaching logical, mathematical and scientific methods, the exact science does not deal with and must not deal with the understanding of the natural-historical world, because exact scientists themselves construct their objects of investigation, which are idealizations, not the reality itself. Idealized objects are real only in connection with a process of idealization, carried out by a scientist. The constructing of idealizations is a specific character of the exact science, not a drawback.

What is the exact science

By the words ‘exact science’ I shall mean mainly an idealized physics-like science, which since Galileo has existed as a component of many actual sciences, like physics, chemistry, molecular biology. The idealized physics-like science does not depend on natural characteristics of natural systems, but proceeds entirely from a mathematical projection. All the physical-mathematical sciences can be treated as the exact science. The non-exact sciences are all the other sciences from chemistry (partly) and biology (for the most part) to many social researches and to all the humanities. The exact science uses mostly the language of mathematics, but may partly use also the natural language. Mathematics in the exact science is primary and basic. The non-exact sciences use (mostly) the natural language, whereas the symbols are used only in a small part. All the non-exact sciences depend on their objects of research and because of that differ largely from each other. Only the non-exact sciences (which are the natural history type of sciences and the social-humanitarian investigations) are *forced* to strive for *understanding* their objects of investigation. The exact science strives for *modelling* (starting from possibilities of mathematics); the understanding does not belong to its goals. This is so because the exact science, according to Rein Vihalemm (2008), is a theoretical object, an idealized model got from mathematical physics (since Galileo) and is named by Vihalemm φ-science. Vihalemm (2008, pp. 189, 414) says that the aim of φ-science is not getting the true picture about some object in all its diversity, but discovering the laws: what, how, to what extent is subordinated to laws, what according to these laws is possible and what is impossible. Shortly, the exact science is an idealized model called φ-science and it may be discovered as a component in many different actual sciences, including even the social sciences. But in their nature social sciences as well as the humanities are not such kind of theoretical object as the exact science is.

If we look at the history of the exact science from the philosophical point of view, we may realize that all the existing physical-mathematical theories – classical and quantum physics, nonlinear dynamics, chaos theory, and others – are based on the same two assumptions that contradict our (i.e. human individuals’) everyday experience: first, time is as symmetrical as space; and second, geometry can represent, with certainty, the physical world. The exact science is based on mathematics and uses experiments, and nothing is wrong with this. Scientists strive for the exactness, the precision, and serve the special purposes: to model the physical objects by means of mathematics in a way that it were possible, firstly, to predict certain tendencies and to explain certain quantitative aspects of systems and, secondly, to use nature for the needs of man. Science since Galileo, i.e. the 'physical-mathematical science' (φ-science, according to Vihalemm), replaced the Aristotelian qualitative cosmos with quantitative physical universe – with mathematical structure that may not grasp the whole world. It is indeed certain that science has led to useful technical and industrial achievements. But as the exact science is founded on the principle of identification, a discovered phenomenon is identified with a phenomenon already known. It makes it impossible to describe the emergence of novel appearances that we as human individuals can observe in our daily life and practice. As the historian and philosopher of science Thomas Kuhn has explained, the 'normal science' does not strive for discovering the new, but, in contrary, it attempts to place the world into the framework of thinking (a paradigm) already obtained.

The exact science investigates the purely quantitative aspects of nature, the aspects of nature that can be expressed mathematically, that can be measured, represented and reproduced experimentally. But such characteristics of nature (*physis*), connected with humans and their everyday life and experience, like irreversibility, contingency, instability, irregularity, unobservable complexity, creative chaos, qualitative diversity, spatial and temporal nonuniformity, nonrecurrence, historicity, creativity, novelty, uniqueness, unpredictability, and others, with which the representatives of synergetics – the theories of self-organization (works of I. Prigogine, M. Eigen, H. Haken, S. Kauffman and others) – confronted, cannot be manipulated and therefore cannot be described by mathematical formalisms. The understanding of these characteristics does not proceed from mathematics, because it presupposes describing (in the natural language) the real world *as it is* (in all its diversity and complexity) and is based on *personal* experience. The exact science (as φ-science) does not strive for and must not strive for such kind of description at all; it is searching for the laws to be formulated mathematically in a way that explanation and prognostication were possible.

Philosophical understanding of the exact science as φ-science reveals the limits of the exact science in describing the reality as grasped by laws, i.e. in a predictive and logically explaining way. Or, in other words, the limits begin from the phenomena of reality, which are unpredictable, unstable, non-recurrent, accidental and so on. To describe nature as it is, the *ceteris paribus* assertions must be abandoned and researchers must acknowledge the essential fact of *our* (i.e. human persons') being in nature (and finally in the whole cosmos) and realize that the exact science, as well as technology, is unnatural (see, for instance, Sismondo, 2004, Chapters 15 & 16), because scientists organize experimental and theoretical systems to fulfil their expectations (proceeding from the possibilities of the exact science) and exclude the *chaotic* behaviour of nature. The exact (mathematical, in ideal) scientific knowledge is indeed powerful, but only in ideal and artificial conditions; it does not reflect the natural objects and natural processes. Now, when during several decades already humankind has had to grapple with ecological and other crucial problems, needed to be overcome as quickly as possible for the survival of humankind, researchers in their theoretical and practical activities cannot ignore the "given" (through the social-historical practice; independently of the methods of the exact science) objects that manifest their natural qualities in natural environments and in natural conditions. The natural characteristics of the "given" objects become evident by other than the exact scientific type of explorations. It means that the exact scientific approach (φ-science) has its limits and is not fit to understand nature (*physis*) to which also the humans belong. What is needed for the long-term flourishing of humankind is the synthesis of the understanding of nature (that is not based on mathematical and experimental construction of idealized objects) and the wisdom that touches the human's aims, human values and ways of living (worthy of a human being) in the natural-historical world. (About wisdom I have shortly written in Näpinen, 2004, pp. 156–157.) All of us (including representatives of the exact science) must acknowledge the fundamental indeterminacy of the whole history of nature and human society.

The exact science as an idealized model (φ-science) deals with prognostication and explanation, but not with understanding. Explanation and prognostication is founded upon mathematically formulated 'laws of nature' (which are objective and scientific) (see Vihalemm, 2008, pp. 414–416) and upon arbitrarily fixed 'initial conditions' measured as exactly as possible. The exact science functions according to a simple categorical syllogism. The understanding of nature is compatible with, but irreducible to physical-mathematical explanation or prediction.

What is the understanding of nature?

There is nothing wrong with creating useful working mathematical models, but the true understanding of nature demands something different: the scientific 'how'-question (search for laws) is not sufficient for this. Instead, Aristotle's four-component 'why'-question is needed here. Only through Aristotle's philosophical 'why'-question we can see the world as a whole to which also the humans belong. Remember that Aristotle's 'why'-question consists of four questions: "What is it made of?", "What is it?", "What was the source of change to it?", "What is it for?". Only after understanding nature scientists may try to model some of its aspects. It means that the understanding of natural-historical process must precede its modelling. We must regard man as a creation of nature and as belonging to the whole cosmos. The cosmos might be comprehensible in a quasi-Aristotelian way, as being required to fulfil an ultimate cosmic goal. A scientific worldview gives evidence only to conscious human goals. Here it is mistakenly thought that only humans can realize their goals if they know the so-called laws of nature formulated mathematically. However, all the self-organizing systems have their own goals and these goals do not depend on humans' consciousness. Evolutionally non-conscious goals preceded conscious goals. The classical exact science (what is based on idealizing the *reversibility* of fundamental objective processes) does not demand the understanding of natural-historical processes, but the non-classical exact science (the theories of self-organization) is possible only after the natural-historical processes are somehow understood.

But what is the understanding? Let us try to answer this question. (About understanding of the world in relation to the scientific paradigm of self-organization I have already written in some works, see, for instance, Näpinen, 2001; 2002; 2004; 2007.)

The exact science is based on thinking about ordered relations, but not on understanding of reality, which contains *chaotic* relations. The exact science is constructing idealized objects and includes only deductive and inductive thinking. The theories of the exact science are called 'hypothetical-constructive-deductive'. The hypothetical part of the exact science is inductive logic. An exact scientific method cannot get knowledge of the whole, because this knowledge cannot be deduced from facts about the parts. The exact science can get solutions of some mental riddles. The solutions are the result of using logical, mathematical and scientific (searching for laws) methods. The theories of the exact science can help to manipulate and control the physical environment, but controlling is not understanding.

Understanding, however, is more than thinking in the framework of ordered relations. Understanding cannot be fully objective; it is mainly and primarily subjective. Robert Priddy (who researched and taught philosophy and sociology at the University of Oslo in 1968–1984, until retired) in his online book (Priddy, 1999a) originally entitled *Beyond Science* and also named *The Philosophy of Understanding* opposes science and metascientific understanding.

Let us find out some main points/ideas of Priddy's book. Priddy begins with a statement that "[m]odern education, with its predominantly [...] scientific leanings, mostly undervalues the practical, interpersonal, moral and intercultural dimensions of understanding". Priddy is in agreement with Martin Heidegger's statement that "[a]ll understanding has a subjective basis" and things lack meaning for humans if they cannot be related to humans' lives in some kind of purposive way. He emphasizes that understanding embraces a much greater sphere than inductive and deductive thinking; understanding lies "in identifying and relating all kinds of means and ends, actions and […] consequences". (Priddy, 1999a, Chapter 1, p. 4 of 13) Priddy strictly says that the quality and depth of a person's understanding of the inner and outer world and other persons is more important than the extent of factual knowledge. In the physical sciences there is no understanding of people as persons and subjects. The meaning and purpose of man and society scientists consider as meaningless. But this is not so in phenomenology where understanding cannot avoid the great questions of life, as Priddy (1999a, Chapter 4) says.

Priddy (1999a, Chapter 5) does not forget to mention also the principles of hermeneutics, first of all the primacy of the text and the author's intention. Priddy (1999a, Chapter 1, p. 2 of 13) claims that all attempts to understand nature, other people and even the cosmos are based on some goal-oriented activity. (Priddy has added here the following footnote: "The first and foremost presentation of this was by Martin Heidegger in *Being and Time* (trans., New York, 1962), to whom the present exposition is obviously indebted." [Priddy, 1999a, Chapter 1, p. 13 of 13]). Priddy (1999a, Chapter 1, p. 2 of 13) explains that "Heidegger implied that there can be no meaning in anything independently of us and our purposes or 'projects'". But "all that has meaning or purpose for us may well arise in and through the human mind, but this does not prove that there is no meaning or purpose in created nature" (Priddy, 1999a, Chapter 1, p. 3 of 13). The mind is itself a part of nature and finally of the cosmos. The cosmos is the greatest whole what we can imagine. All the diverse operations and resources of the mind – thought, memory, interpretation, intuition, etc. – make up human understanding. Understanding is holistic (i.e., according to Priddy, understanding never excludes non-cognitive elements: personal identification, ethicality, respect for others, and so on) and because of that it cannot be deduced from facts about the parts. Creative intuition is needed here. Priddy emphasizes that human understanding is the individual person's achievement. It demands long personal experience and self-knowledge. Only a person's understanding involves self-knowledge whereas a collective human knowledge does not involve it. Understanding embraces practicality, insight, evaluation and many other abilities. Developing only logical, mathematical and scientific (searching for laws) methods does not give a proper understanding. Understanding must not be detached from *individual* participational and practical activity. In order to understand things and relations between them mind must be a questioning mind. Primarily and basically a person must take under question his own imaginations. Mind can never grasp all the aspects of reality, because reality is infinite and inexhaustible. According to Priddy, reality, being, the cosmos is the ultimate whole: one final or absolute whole. The concrete content of the conception of this ultimate whole, as Priddy writes, depends upon many circumstances of culture, personal experience and self-knowledge.

It is obvious that Priddy defends some kind of personalistic understanding (what author himself calls 'metascientific') and opposes it to scientific methods as searching exact laws and prediction. In his second 13-chapter online book, *Science Limited*, Priddy (1999b, Chapter 10) himself admits that the uniqueness of historically-situated human actions demands wider, 'softer' observational methods in social and human science.

Rein Vihalemm (2008, pp. 418–419) also promotes personalistic understanding. He strictly referees Chapter Five from Nicholas Maxwell's book *The Human World in the Physical Universe: Consciousness, Free Will, and Evolution*. Let us see what Maxwell himself has written. About personalistic understanding that Maxwell (2001, p. 104) has also called 'person-to-person understanding', author says: "Personalistic explanations seek to depict the phenomenon to be explained as *something that one might oneself have experienced, done, thought, felt*" (Maxwell, 2001, p. 103; author's emphasis). If many scientists characterize personalistic understanding negatively as a "folk psychology", then Maxwell writes:

> *Physical understanding is (a) objective, (b) impersonal, (c) factual, (d) rational, (e) predictive, (f) testable, and (g) scientific […] Personalistic understanding, by contrast, may be held to be (a) subjective, (b) personal, (c) emotional and evaluative (and thus nonfactual), (d) intuitive (and thus nonrational), (e) nonpredictive, and (f) untestable. (Maxwell, 2001, p. 109)*

If the representatives of standard empiricism claim that personalistic understanding is an intellectual disaster, then Maxwell believes that in cooperative activities personalistic understanding is more fundamental than physical explanation. Personalistic understanding may be characterized as wisdom, because wisdom can realize what is of value in life, for oneself and others. Scientific (physical) and technological knowledge is not enough for a good and wise life. Maxwell, like Priddy, has also mentioned the tradition of hermeneutics and even used the term 'empathic understanding' as a synonym for the term 'personalistic understanding'. As Rein Vihalemm (2008, pp. 418–419), following Maxwell, says, in personalistic understanding man uses himself/herself as a model for understanding the other and others in (co)acting in the real world.

Conclusion

In this paper I have differentiated understanding from scientific explanation and prognostication. I have said that nature (*physis*) to which also the humans belong can be understood personalistically and only some *aspects* of nature can be explained or predicted scientifically. I have briefly characterized personalistic understanding by the medium of Robert Priddy's and Nicholas Maxwell's writings. Priddy does not use the term 'personalistic understanding', but uses the terms 'person's understanding', 'interpersonal understanding', 'holistic understanding', 'metascientific understanding', and others. Maxwell uses directly the term 'personalistic understanding', which is a synonym for the term 'person-to-person understanding'. Evaluating and developing personalistic understanding (especially by Maxwell) seems very promising. I think that personalistic understanding has not been and is not forbidden to anybody, including representatives of the exact science. The exact science makes it possible to manipulate and control (to some extent) the real world; personalistic understanding can help us to understand each other in cooperative activities in the real world.

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Some Aspects of Religiosity in Science

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Abstract: *If religion and science are discussed, they are mostly presented either in opposition or in dialogue. People usually tend to think that 'religiosity in science' usually refers either to scientists who are followers of some religion, novel forms of religions, or the anarchistic view of science. In the current paper, this term is not used in any of these meanings. In comparison with the concept of science, the concept of religion is even more unclear and context-sensitive, including sometimes also the so-called civil religion.*

This paper is based on the stance that the notion of religion can be defined without relying on belief into gods or a supernatural force. Different religions may be alike in their religiosity. If we define religiosity as certain kinds of beliefs and believing, we might find it outside religions, even in science. The concept of religiosity, as used in social philosophy, can also be applied in the study of science, albeit in a slightly different way, as we can find unperceived religious attitude in trusting beliefs and feelings of sanctity among scientists. Religiosity in science can be analysed via multidimensional scales of religiosity as presented by Glock and Stark. Our use of the concept of religiosity in this wider sense may be substantiated by brain studies, and the existence such phenomenon may be confirmed by sociometric analysis, employing the abovementioned multidimensional scale.

In science, religiosity is present mostly in its unperceived form, sometimes allowing us to talk about the civil religion in science. The recognition of religiosity in science enables us to gain better understanding and control of the scientific process, and opens some possibilities to defend science from pseudo-sciences.

Keywords: *beliefs, civil religion, dimensions of religiosity, philosophy of science, religiosity in science, sociology of science*

When I was clever, that is to say, young and a physicist, we, the scientists, were called to arms. No, not against religion, for that war seemed to be over, but against pseudo-sciences. Yet despite our struggle, pseudo-sciences seem to be flourishing. For me, it correlates with my own decline. When I used to lecture on the glory and achievements of science, I was a very popular lecturer. But now that I often talk about human stupidity, my popularity has decreased enormously. Most likely it is due to the fact that some propositions are perceived as unpleasant in spite of their truth value. Unfortunately, the same effect can be observed amongst scientists, unscientific elements in the minds of scientists are not restricted to certain emotional stances. They can refer to strong convictions that basically can be unperceived, yet are quite influential contextually. As part of the scientists' worldview, these can influence not only their daily life, but also their scientific activities. Such convictions can create uneasy paradoxes that are hard to notice within the confines of a scientific discipline because most of the professionals share the same beliefs, yet these remain also well-hidden from the outsiders because a non-specialist cannot say to which extent the asseverations of a scientist are based on so-to-say 'pure science', and to which extent they are founded on the scientist's general worldview. For example, if you ask from a natural scientist if s/he knows anything perfect in nature, s/he answers 'no'. Yet a scientist is ready to believe in the existence of perfect laws of nature that cannot be confirmed by any experience, for it is unclear if an experimental error was due to a mistake by the scientist or a fluctuation in the law of nature. I think this exemplifies the scientist's unperceived religious mentality. Maybe the law of nature happened to be a little bit more tired on Friday evening than it used to be on Monday morning. That problem has been dwelt on in length by Prigogine (for a short roundup, see Prigogine, 1989).

The structure of the current paper will be the following. In the first chapter, the question about possible religiosity in science will be presented and various definitions of religion will be dwelt upon. The concept of 'civil religion' used mostly in social philosophy and the concept of 'religiosity' deserve our interest. On the basis of pragmatist epistemology we will attempt to show that religion and science are overlapping concepts.

In the second chapter, we will try to analyse 'religiosity in science' using the ideas of Glock and Stark (1965) – religiosity on a five-dimensional scale. We will attempt to use the general term 'civil religion in science' to name religious phenomena occurring in science, that are often present in an unperceived form.

In the third chapter, we will aim to demonstrate the necessity of perceiving the presence of civil religion in science. The recognition of religiosity in science enables us to (i) gain better understanding and control of the scientific process, and (ii) distinguish disciplines in which religiosity is a rather misleading phenomenon that has to be transcended from the others that are genuinely built on religious convictions and claims to truth; also, this opens for us some possibilities of defending science from pseudo-sciences. Finally, we shall demonstrate the possibilities of handling religiosity in science as a scientific problem: brain studies can analyse the justification of the term, while sociometrics will help us analyse this phenomenon on the basis of a multidimensional scale.

On the concepts of 'science', 'religion' and 'religiosity in science'

In the dialogue of science and religion, a strong asymmetry reveals itself: Religion has to be "modernised" and synchronised with science, yet science may accept the existence of religion and recognise some of its value, but religion has nothing useful to add to science. Still, it might not be quite so true.

When we talk about religiosity in science, I would like to mention that scientists accept the use of such notions while criticising pseudo-sciences, yet do not take it kindly in the context of "true" science. According to a widespread opinion, the notions 'science' and 'religion' have no common references.

The concept of science is widely used nowadays and understanding it seems to pose far less problems than defining the same notion.[1] Yet here it would be nice to provide at least some kind of definition. Presuming that the notion 'science' is actually familiar to the reader, I would provide here its institutional definition: science consists of the number of activities the financing of which is called financing science in the developed countries (see, e.g., *Frascati Manual*, 2002). This definition does not exclude the similar or same types of activities from science, which take place also elsewhere and which may be subsidised also from different sources, but an attempt to put it into words might make our definition too extended.

The usual idea of religion was based on widespread notions like this: *a religion is a system of beliefs, norms, customs and institutions that centre on divine, holy or supernatural forces and basic values that arrange the relations between a human being and Universe.* Such a definition can be easily combined from everyday sources, e.g. online encyclopaedias. It seems that such definitions

1 From the long list of possible names I would point out, e.g., Chalmers, 1999; Niiniluoto, 1999; Maxwell, 2010; van Fraassen, 1980; etc.

of religion cannot usually bypass gods or other supernatural forces that by scientists' account have no place in science, or at least should not have.

However, religiosity can be considered to be wider than a mere belief into one or several gods. According to Atran, religion is "(1) a community's costly and hard-to-fake commitment (2) to a counterfactual and counterintuitive world of supernatural agents (3) who master people's existential anxieties, such as death and deception" (Atran, 2002, p. 4). Other authors, too, have stressed the need for a wider concept of religion, including Barbour (1990).

Indeed, we can get by without anything supernatural at all. According to Geertz,

> *a religion is: (1) a system of symbols which acts to (2) establish powerful, pervasive, and long-lasting moods and motivations in men by (3) formulating conceptions of a general order of existence and (4) clothing these conceptions with such an aura of factuality that (5) the moods and motivations seem uniquely realistic* (Geertz, 1993, p. 90).

Geertz's definition is general enough to include those phenomena that are similar to religious yet are connected neither to religious institutions nor the supernatural.

The concept of civil religion as religion outside the religious institutions was first used by Rousseau in 1762. Phenomena of civil religion may include, for example, monuments of national importance connected to the mythology-like stories about important statesmen or the special state of a nation, so-called romantic nationalism (Jewett & Lawrence, 2004, p. 328).

In the case of civil religion we can ask if we are dealing with the 'real' religion or is it just something religion-like, properly called a para- or quasi-religion. In the same way, certain pseudo-scientific or esoteric belief systems have been labelled (see, e.g., Greil & Robbins, 1994). As such, para-religious phenomena involve expressions of ultimate concern but no supernatural beliefs. That is why practices like psychotherapy and ritualistic consumerism do not claim to be religions. On the other hand, quasi-religions like occultism, New Age, and scientology make supernatural claims yet are anomalous in the context of the folk category of 'religion'. The first author to use the term 'the invisible religion' was Luckmann (1963). This particular concept denotes that although religion remains an important feature of modern society, it is not restricted to mere church-going. Its main function is the creation of meaning that is adopted as objective by culture, thus transcending people's immediate experience.

Such disputes can be discarded, because the necessity to differentiate between religion and quasi-religion is more important for theologians or social scientists. For a scientist who aims at atheism, there should be no difference whether a person believes in Christ or spiritual beings. It seems to me that the necessity for such a differentiation is somehow religious by its nature and when analysing science there is no need for it because of the relative similarity of the attitudes. Different religions love to describe the others as wrong religions. We can say that religions may be very different but religiosity is far less varied, as they all share common religious stance. Therefore, it would be better to speak about religiosity outside the religious institutions.

The notion 'religiosity' in ordinary English is mainly connected with terms describing the strength of faith, e.g. faith, belief, piety, devotion, and holiness. Experts use the term 'religiosity' depending on their specialty. A theologian would define 'religiosity' by faith (Ratzinger, 2000), a psychologist might use such vocabulary as devotion and piety, while a sociologist would mention church membership, church attendance, and doctrinal knowledge. According to Glock and Stark, religiosity is multidimensional, whilst different dimensions can have little interdependence. For example, one might believe in the core doctrines of a certain religion, yet not attend church (Glock & Stark, 1965, pp. 20–21). Glock and Stark (1965, p. 4) give a new definition of religion, "religion, or what societies hold to be sacred, comprises an institutionalized system of symbols, beliefs, values, and practices focused on questions of ultimate meaning". The number of dimensions of religiosity has been increased later and this question has been studied in depth (see, e.g., De Jong *et al*., 1976, p. 867).

Defining 'religion' and 'religiosity' more closely will remain outside the bounds of this article. McClendon and Smith (1994) have said that one should be cautious of people who claim that the word 'religion' or the adjective 'religious' refers to a single quality or a single trait of character or a single essence. What should this quality be? An awkwardly strict sense of duty? But there are other fields of human activity associated with this, such as playing delicate musical instruments. Loyalty to God or gods? Some religions are atheist. Caring about the sacred? Not all phenomena dubbed 'religion' are interested in this. We only want to claim that for any single trait – ritual, myth, ethical care, sense of social unity, sacrifice, consciousness of the numinous – there is at least one 'religion' with no such trait. (McClendon & Smith, 1994, p. 15) Roy Clouser argues in a similar manner while describing the more common conceptions of the nature of religion: if one associates religion with ethics, then it is possible to point out religions with no teachings on ethics; not all religions are associated with religious services; the issue of ritual and myth takes us into a train of thought that compels us to recognise religious rituals in order to find religious beliefs while we have to recognise religious beliefs in order to define which rituals are religious; belief in a Superior Being is not common to all religions; when it comes to respecting gods, then there are religions indifferent towards gods or even hate them. (Clouser, 2005, pp. 10–15) The aim of this article is to point out that it is possible to search for the religious in science and that this may prove necessary. This article does not aim to prove the religiosity of science. Proof should perhaps better be sought using scientific methods.

The possible intersection of science and religion can be substantiated on pragmatist grounds, as expressed by William James: "Grant an idea or belief to be true, what concrete difference will its being true make in anyone's actual life? How will the truth be realized? What experiences will be different from those which would obtain if the belief were false?" (James, 1907, p. 142)

Indeed, it seems that perceiving some circumstances would offer 'true' sciences possibilities to notice contextual fallacies, and they reveal the inner anti-scientific nature of popular pseudo-sciences. The often exploited semantic triangle by Ogden and Richards (1923, p. 11) is too simple. Actually, we have to consider that both you and I have each our own personal triangle. Apparently, we need a more complicated system. Skipping long historical introduction, I would like to borrow a well-founded and visually informative scheme from semiotics: Johansen's pyramid of anthroposemiosis, as it was modified by Deely (2009, pp. 106–107).

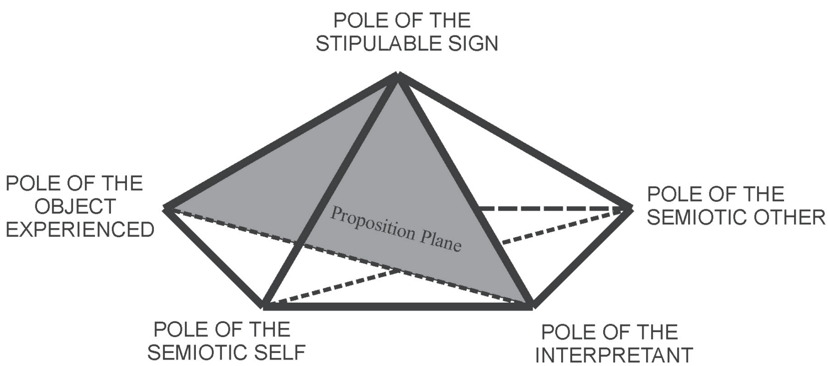

Figure 1. The pyramid of semiosis. The edges of the pyramid illustrate relationships between vertices. In our context a word or phrase can be taken as a conventional sign, the role of interpretant being signified by intersubjective meaning agreed by individuals. The proposition plane of the pyramid of semiosis illustrates the situation we are interested in (intersubjective semantic triangle).

Although there exists an individual term in each subject's mind as the object of thinking, the social practice, being named language-game by Wittgenstein, is possible only if the intersubjective signs (words) and conventional intersubjective interpretants exist. For instance, one who loves cats and one who is allergic to them agree that by saying 'cat' they mean a small furry feline predator. Now both can compose mutually comprehensible propositions.

Figure 1 has been presented to point out that one should be cautious in using the words 'religion' and 'religious' if the discussion is held between persons with different worldviews. "In fact, when an alternative perspective gives a more detailed explanation of more things, that only makes it seem false in greater detail to someone, who rejects it" (Clouser, 2005, p. 82).

An analogy can be drawn in the connection 'reality—statement—proposition', whereas proposition appears in a similar role with the intersubjective statement compared to interpretant. In order to make the right decisions and live in a right way it is not indispensable to connect the truthfulness of proposition with the reality.

A proposition can be considered to be true if it is in accordance with intersubjective experience and the text that expresses it (stipulable signs) keeps to the rules of actual language-game. For example, the proposition 'John is an ape' might be contextually true even if John is actually human. Now, we can try to define the types of beliefs we are interested in:

> *A belief can be considered to be knowledge, if it is in accordance with intersubjective experience and keeps to the rules and context of actual language-game.*
>
> *A belief can be considered scientific if it is in accordance with intersubjective experience and keeps to the rules and context of the language-game of the actual discipline.*
>
> *A belief can be considered religious if it corresponds to Geertz's definition (see above).*

As the concepts of scientific belief and religious belief are described by different characteristics, there is no rational justification to believe these concepts should be exclusive. Still, if these concepts are overlapping, we might have a justified need to study their intersection, its extension and intension.

Dimensions of religiosity and religiosity in science

While discussing 'religiosity in science', people usually tend to think that this notion usually refers to: scientists who are followers of some religion (so-called believers); novel forms of religions, such as scientology or creationism; anarchistic view of science that may consider science to be a form of religion. I do not use this term in any of these meanings.

I am interested in beliefs that represent religiosity in science: traits that are immanent in the modern, fundamentally atheistic and materialist science, yet still resemble religious tenets. Studying religiosity in science, we attempt to apply the dimensions of religiosity as described by Glock and Stark (1965, pp. 20–21) to science, looking for appropriate examples for each and every dimension.

1) The experiential dimension. It includes personal religious experience: the feeling of sanctity, the feeling of belonging and the sense of truth. Revelation of solutions via knowing "how things really are" – revelation-like events similar to 'religious experience' are well-known in science. Scientific creativity is not much more scientific than in antiquity. In practice of science there appears to be present an odd and contradictory combination of materialistic worldview and half-mystical creative force, the source of the latter being, to put it mildly, unclear for a scientist and suspiciously similar with divine revelation of truth.

In science, 'sanctity' can occur in several ways. When somebody shows up doubt in a steadfast conviction, it elicits emotional stress and reaction far beyond the ordinary reactions on an everyday blunder or even a personal attack. This phenomenon reveals the scientist's 'sense of truth': she has a feeling that she knows some things are truly real. This combines further with the 'sense of belonging': no scientist is an island; s/he is part of the everlasting scientific progress that brings us the truth. The existence of sanctity in science can also be seen in the creation of martyrs of science like Bruno, or saints of science like Newton.

2) The ritualistic dimension. This includes the worship in community, rituals or procedures. This aspect is perhaps the least represented in science. The rituals of defending a scientific degree or awarding one might be an example, but these are usually not taken too seriously. Maybe rituals followed in laboratories serve as a better example: no one grounds them rationally, but the elder teach the younger to observe these rules.

3) The ideological dimension. It includes adherence to the principal beliefs of the doctrines, steadfast believing. In science, steadfast conviction appears in the validity of certain principles and trusting belief in the existence or lack of certain entities. Some theories were necessary in their contemporary science, staying influential for millennia, but started to seem quite strange later, such as the epicycles theory authored by Apollonius (Pannekoek, 1961, pp. 133–144). According to Plato and Aristotle, planets may move only along a circumference. But the theoretical movement of the planets was not in accordance with what was seen in the sky, so astrologers were in distress. In the 3rd century BCE, Apollonius made planets move around an empty point along a small circumference called an epicycle. The centre of the circumference in turn moved along another circumference centred on the Earth and was called a deferent. But why should a planet move around an empty point in space?

Sometimes, clinging to the principles has justified itself, for example, when Neptune was found through the disruptions in the movement of Uranus. Sometimes it has not, for instance, when the drift of Mercury's perihelion was explained via a complementary planet. Scientific revolutions are somewhat similar to religious reforms as certain propositions and interpretations are allowed only after the reform (Kuhn, 1962). Steadfast conviction in principles is revealed during scientific revolutions. Old paradigms usually die only with their proponents. Popper's idea of a functional falsification is disproved by the actual history of science.

4) The intellectual dimension. This includes religious knowledge about the basic tenets of person's faith and sacred texts: that is, history, sacraments, and morality. Belief in perfect laws of nature also seems to have its origin in theology. Historically, that connection was not easily noticed since the success of science seemed to depend on its departure from theology. The Copernican principle of simplicity, considered by its author to be a proof of the existence of God, seemed to lead science towards atheism (Jaki, 2005, p. 46). In the wake of Laplace, God was dismissed as an unnecessary and complicated hypothesis. It was not easy to see, however, that the godless natural science had lost its foundation. In the history of science we can see strong conviction that human beings are able to understand the Universe. Yet how could Newton claim that absolute space is infinite and eternal? How much of that infinite Universe did he traverse and for how long of that eternity did he live? Newton's claim is not scientific; it is the claim of a deeply religious man who believes firmly in the existence of absolute truth and the possibility of perceiving it. (Velbaum, 2006)

5) The consequential dimension. It describes the effect of religion on the life of individual. According to Glock and Stark (1965, pp. 20–21), the two final dimensions are closely connected. Being in science demands commitment and leading the life of a scientist. To justify the ethics of science also religious argumentation is used, because in a purely materialistic way people just cannot see the harm due to, for instance, faking data, which enables one to earn a lot of money and fame and then, using these resources, make a great discovery. Discarding the truth causes problems in science, especially in the field of ethics in science. If science is not a search for truth, then nowadays it is perhaps a kind of business. In this case the best science is the one which ensures the biggest profit. At the same time science is often attributed the role of saviour and redeemer. Unfortunately one cannot be redeemed without being ready for redemption, pursuing goals that are incompatible with redemption. Even if everyone had a spaceship, many would be unhappy because their ship is a few meters shorter than someone else's.

Some doubt has been cast on the existence of dimensions of religiosity (e.g., Clayton & Gladden, 1974). In the current paper, I do not asseverate the dimensions of religiosity to exist as objects on their own accord; they are tools that help us to comprehend this complex phenomenon. Discussion about the true form of their existence could be considered prudent rather in a religious, not scientific context.

It seems that almost all forms of religiosity are to a greater or lesser extent evident in science. However, using the expression 'religion in science' might be misleading in this context, reminding us the forms of institutional religiosity. It is less misleading to speak about 'civil religion in science'.

Currently, civil religion dwells unperceived in science. In my opinion, scientists need to perceive such beliefs and religiosity in science.

Exploring religiosity in science: why and how?

On the basis of my personal experience, I can assure that amongst the scientific community, the notion 'religiosity in science' prompts a rather negative attitude. In the following discussion, we dissert that criticism in a certain logical order, taking each point under consideration after dissecting the previous one:

1) the problem of definition: by 'religion' and 'religiosity', people usually mean belief in gods or the supernatural. Wider definitions are unfamiliar or considered to be meaningless;
2) the problem of the field of meaning: the notion 'religiosity in science' is equated with one or several of the usual meanings described at the

beginning of the previous chapter and decided to have no application in science;

3) the problem of existence: should the two previous problems be overcome, the question arises if the matter is not far-fetched, as such phenomena might actually not exist;
4) the problem of importance: if 'religiosity in science' is indeed a meaningful expression, such phenomena might still be marginal or unimportant for science;
5) the problem of purpose: why should we study such matters and in whose interests would it be? It might be that science could get by very well without such research;
6) the problem of methodology: can 'religiosity in science' be only the subject of philosophical disputes or could it be actually studied by scientific methods?

The first kind of criticism was already answered in the first chapter, the second kind at the beginning of the second chapter. We can add, brushing also the sixth point, that the wider fields of meaning of the notions 'religion' and 'religiosity' might be substantiated scientifically, for example, by brain studies using methods of functional tomography. One possible approach could be the comparison of the altered states of consciousness respective to belief and the sense of sacredness amongst scientists and the so-called believers. Both similarities and differences would give interesting material for analysis.

The third and fourth criticism may be addressed by studying to what extent do scientists themselves perceive and accept such phenomena. Listening to the (often unofficial) remarks and opinions of my colleagues, I have form the impression that there is a lot of problems in science that are caused by human error, funding, government, etc. – but science itself is basically all right and all these problems will eventually be solved. In such cases, I am reminded of the worldview of a loyal Soviet citizen. Such a person would admit that one can meet problems everywhere in the U.S.S.R., yet all these problems were quite particular and fundamentally solvable, because the system as a whole was still quite right and good. Sociological research could help to address the third criticism but even the analysis of the writings and speeches of scientists could be fruitful. Worry about science seems to be an arising trend but it should be studied how important are the phenomena denoted by the notions 'religiosity in science' and 'civil religion in science'. The limits of this article will not allow us to demonstrate more evidence or give further explanations. However, appropriate examples are available in treatises already published. For example, the book by Roy A. Clouser (2005) concentrates on the hidden role of religious belief in theories.

Against the fifth criticism, at least two kinds of arguments can be used. The first one is concerned with the question to what extent should scientists perceive their beliefs to make the process of scientific discovery even more scientific than it currently is. A scientist should try to notice and verbalise his/her axioms of trusting belief, and to check if those axioms are indeed axioms for him/her or have they, perchance, changed into dogmas. The objects of science become all the more complex, hence we might have to control the scientific process more accurately as it is still not much more scientific in its execution than it was in Plato's time (Kasak, 2008, p. 71).

The second kind of arguments is concerned with the obligation of scientists to take metaphysical stances in front of the general public. Most of the questions the public poses to scientists force the respondent to leave the framework of the specialty-related facts. It looks as if scientists are under social pressure to accept the image of metaphysicists. Quite often a scientist presents to the audience her views on metaphysics, which are based on the scientist's personal worldview but are not philosophically deeper than those of the audience. Sometimes, the expectations of the general public might even be better satisfied by a professional propagandist. For various reasons the same methods are used in school education, where it is, for pedagogical reasons, very important to convey convictions. Such activities are often based on the religious feeling of truth. Such unperceived religiosity supports the demagogy in scientific propaganda that a malicious opponent could call lying in the name of truth.

Fight against pseudo-science would be much more successful if we perceived the hidden religiosity in science, and if the apologists of science kept science apart from the ideology that paradoxically claims there is no ideology in science, but only "maximally objective reflection of reality", as Wolpert (et al., 2006) likes to say.

The sixth criticism might be answered by using the multidimensional models of religiosity in sociometric studies. For the sake of reliability and verifiability, the original questionnaires of the authors should be used (see Hill & Hood, 1999). As a pilot project, the scientific religiosity of students of different fields could be measured. In the long run, such quantitative studies could be conducted on the scientific community, yet such studies should be international to gain reliable results. In order to demonstrate that a religiosity similar to that of other domains exists in science, it is possible to carry out textological studies that concentrate on texts authored by scientists that strive to be popular and persuasive. In order to compare the religious states of mind, using methods of functional tomography may be considered.

The study of 'religiosity in science' may come to be an object of study in a discipline tentatively called 'the unscientific features in science'.

In sum

The purpose of the current paper was to propose that:

(1) There are beliefs in science that resemble religious tenets. We may refer to those by the notions 'religiosity in science' or 'civil religion in science'.

(2) Religiosity may be analysed using the five-dimensional scale of religiosity by Glock and Stark (1965).

(3) Studying the religiosity of science is possible and necessary.

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Identity and Rationality: Towards Normative Cultural Studies of Science

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Abstract: *In traditional epistemology of science, scientific knowledge has been depicted as the result of research process independent of local historical and cultural context. In naturalised philosophy of science, the 'context of discovery' has been taken into account, and even more so in the science and technology studies (STS). The latter provide descriptions of various epistemic cultures without critical analysis, and thus without a perspective for improvement of the scientific practices. In social epistemology, naturalised epistemology is combined with normative critical approach. Helen E. Longino, Joseph Rouse, Kristina Rolin, and others have developed a critical approach which, on the one hand, provides a theoretical account of scientific knowledge, and on the other hand, relates the account with cultural and historical environment of research practice. In my paper I discuss some empirical findings of the project UPGEM (Understanding Puzzles on Gendered European Map: Brain Drain in Physics through the Cultural Looking Glass) with respect to their relevance for normative naturalised philosophy of science. Cultural variation of the physical sciences in national cultures has been studied before from an anthropological point of view by Sharon Traweek. The main goal of the aforementioned empirical research project was to identify the reasons for abandoning a career in science. In the qualitative study, issues like changes in science policy, organisation of work, workplace culture and identity were addressed. It appeared that the scientists' images tend to be largely stereotypical; in Estonia, three stereotypes for physicists prevailed: physicist as a priest of truth, physicist as a blacksmith, and physicist as a playful boy. Those not able to identify themselves with the stereotypes have experienced* *difficulties with fitting in to a particular research culture. The Estonian physics culture has suffered from the poor communication between age groups due to the missing generation. In my current follow-up analysis, I reconsider these empirical results and point out ways how those findings are relevant for normative approach.*

Keywords: *epistemology and cultural studies of science, science as a workplace, scientists' identities, stereotypes, transformative criticism*

How is culture relevant for the analysis of scientific rationality?

My point of departure in this paper is in naturalised social epistemology which sees scientific rationality as part of scientific practice. Contrary to the idealised view of science which sees scientist as having a priori rational principles for justifying his/her intuitions for scientific judgements as it was developed in traditional epistemology of science, naturalised epistemology focuses on the real scientific practice. Scientific rationality in this approach is a natural human rationality or hypothetical rationality as Ronald Giere (1988, p. 7) has used the term which simply means effective use of available means for achieving desired goals. Science is a type of activities directed on creating new knowledge about the world. In history of philosophy, scientific knowledge has been conceived either as a result of logical manipulations with passively received evidence, or as response to the scientists' queries to nature/research object. In the naturalised practice-based account of science, scientific knowledge should be seen as a result of the scientists' collective research activities which consist of constructing and manipulating – both theoretically and experimentally – the research objects with research instruments in material reality. Thus, the rationality of these activities could be estimated via the measure of achieved goals. Naturalised epistemology of science aims to understand and explain the choices of actual scientists in their actual practical, social and cultural circumstances instead of trying to formulate general principles of rationality for an ideal scientist as traditional epistemology has been doing. Assuming that such a naturalised epistemology makes philosophy of science closer to the sciences than philosophy in the traditional sense, one might want to call it science of science or theory of science. However, as long as philosophical issues of knowledge-making are addressed, this meta-analysis of science should be regarded as a philosophical activity.

In one respect the difference between traditional and naturalised epistemologies is especially salient – if the traditional epistemology sees the scientists' task to be providing correct representations of the world in the form of theories and models, naturalised epistemology takes it to be finding the best strategy among multiple alternatives for achieving one's cognitive aim. Only the naturalised approach displays the variety of different solutions to a problem – it is a pluralistic view. Every choice among the alternatives is viewed as rational to certain degree, and each of those is considered worth meta-analysis. In traditional epistemology, the only alternatives would be justified, that is, rational choice *vs.* unjustified irrational, since the traditional view is essentialist, seeking rationality as the essence of science while the naturalised approach does not assume science (or knowledge) or rationality to be a natural kind category with a kind-specific essence.

Naturalised epistemology can be developed in various ways: some philosophers have focussed on the psychology of cognitive processes, others have discussed knowledge production in the evolutionary context of human beings – what is common to all these kinds of naturalised epistemology is that philosophy is regarded as a discipline closely related to empirical sciences, the difference between philosophy and the sciences is not one of kind but rather one of degree. My approach belongs to the practice-centred study of science in which research is viewed as an activity, as work in a scientific community which in its turn is related to some wider social environment. Practice-centred account of science is not just providing descriptions of the scientists' goals and goal achieving activities, it includes a normative aspect as well, analysing the possibilities for improvement. Authors like Ronald Giere (1988) and Philip Kitcher (1993) conceive the success and growth of science as an evolutionary process with necessary self-correction mechanisms. Also, Helen Longino has developed an account of science with self-correction mechanisms. Those mechanisms are described in her formulation of the epistemic conditions for assessment of the substantive, methodological and regulative assumptions which rely behind particular scientific judgements. As she assures:

> *The epistemological problem is not determining which of a set of alternatives is always the superior one, but rather specifying the conditions under which it is appropriate to rely on a given set of assumptions. The approach utilizes the social character of inquiry to address this problem. Those assumptions are epistemically acceptable which have survived critical scrutiny in a discursive context characterised by at least four conditions. These conditions are (1) the availability of venues for and (2) responsiveness to criticism, (3) public standards (themselves subject to critical interrogation), and (4) tempered equality of intellectual authority.* (Longino, 2002, p. 206)

In an earlier work, Longino (1990) has characterised these conditions as necessary criteria for transformative criticism. The possibility of transformative criticism, in its turn, is a warranty of objectivity of scientific knowledge. At the same time, it is namely the assumed possibility of transformative criticism via fulfilment of the above conditions which enables one to relate epistemology with the cultural contexts of scientific practice and thus establish the link between the contexts of justification and discovery. It is so because the conditions are, on the one hand, normative prescription for achieving rational and objective knowledge, and on the other hand, they are realised in particular cultural contexts.

The requirement for transformative criticism is a normative epistemological principle. How it is realised in practice in particular cases, is a matter of analysis for cultural studies of science. For example, the existence and functioning of the recognised venues for criticism like public forums qua journals, research conferences and seminars, public degree defences, etc. becomes relevant for epistemological explanation of a scientific judgment. And therefore philosophy of science should be interested in contributing to the sciences and help to find the best ways to organise an inclusive and critical dialogue within a scientific community.

The second of Longino's four requirements for transformative criticism, that of responsiveness to criticism, assumes not only the correction of obvious mistakes but also a response of the wider community to the sciences in the form of public recognition like awards for outstanding work and sanctions in case of fraud.

By the condition of public standards, Longino means the influence of both epistemic and social/cultural values on research activities. The way the scientists' cognitive goals are interpreted and the strategies designed for achieving the goals depends on wider contextual or cultural values and ideologies. The wider contextual values may include, for example, understanding of the task of science in the society, the approved mechanisms of quality assessment (agreement on the merits which count for assessment such as the number of publications in certain period of time, citations, innovations, etc.), interpretation of gender ideologies with respect to the particular science, attitudes towards those, researchers' identity and self-reflection – what one can do and how.

The requirement of tempered equality of intellectual authority relates epistemology to the cultural aspect of science concerning the possibilities of different perspectives or voices to be noticed or heard. Failure to recognise cognitive authority might make one to ignore important scientific findings. Therefore, scientific communication is both culturally and epistemologically relevant, and as Kristina Rolin (2004) especially insists, the social dynamics of scientific communication should be thoroughly discussed in epistemology.

The sociality and cultural aspects of science are epistemologically relevant in a number of different ways. As scientists work in groups, cognitive division of labour necessarily occurs both within groups and between multiple groups. So the division of effort is an important issue to analyse for its epistemic and cultural impact, since different groups focus on finding different solution paths to the problems, their mutual creative criticism and competition enables them to improve the overall quality of science. (See Kitcher, 1993; Solomon, 2001 and Rolin, 2004 about the division of effort.)

Social dynamics of scientific communication and the division of cognitive effort are both related to general styles of work. As empirical studies show, styles of research work vary between scientific disciplines and even in smaller sub-disciplinary groups (see Fuchs, 1992). Rolin (2008) has pointed out that critical reflection on the work styles is a necessary part of research organisation in order to avoid domination of particular styles that prevent dialogue and division of labour. If a group favours a competitive style, important resources contradicting this style might be overlooked; on the other hand, a group with strong group identity and protective style might miss important criticism. Thus work styles and reflection on those play a significant cultural role in knowledge gaining processes.

The collective nature of science displays itself also via the assumed mutual trust in the scientific community. As objective trustworthiness and social credibility of an individual researcher do not necessarily coincide – sometimes critical dialogue in the group might be disturbed by prejudices – further empirical investigation into the credibility creating processes is needed. Scientific community plays a significant role here not only for elimination of contingent mistakes but also for facilitating dialogue in order to be able to discuss and balance various aspects of the styles of work such as competiveness, a chilly climate, aggressive style, exclusive gender stereotypes which tend to limit the communication between individual scientists. (See Rolin, 1999; 2002.)

The social and cultural aspects of scientific practice served as a basis for the explanation of scientific knowledge in the sociology of scientific knowledge and social constructivist science and technology studies. However their approach has been rather different – empirical STS aim at explaining particular scientific views via the social and cultural conditions of adopting the views. Some of the STS research has also touched upon the material and experimental aspect of scientific research but only qua an environment in knowledge production. The social constructivist science studies seem to interpret scientific communities qua consensus communities. Research groups are taken to be socially homogenous, their scientific views and activities are seen to be shaped by the same external social interests or other shared cultural factors. In practice, it really is not the practices of the research groups investigated in the social constructivist STS, but only the belief formation of group leaders as individuals in comparison with other groups (leaders) who hold some radically different belief. In the analysis, the solution of such a controversy between the two opposite views is regarded to be due to the strength of respective social network. Such an analysis is unavoidably one-sided, and this is not the only shortcoming of the empirical STS approach. Even more important is its failure to provide normative evaluation (apart from pointing to the strength of the social network) to the activities of a research group. However, this is not to say that empirical cultural studies of science are not valuable at all, but for the sake of improvement and critical transformation, a subtler cultural analysis is needed. For the relevance in social epistemology, Joseph Rouse (1996) has indicated another perspective of the cultural and gender studies which regard the research communities as consisting of many culturally fragmented identity groups: "heterogeneous alignments or solidarities that do not reduce to either shared beliefs and values or tolerance for individual difference" (Rouse, 1996, p. 111). Only the latter approach in the analysis of scientific practice makes it possible to reveal the real diversity of identities, at the same time promoting normative criticism.

In the rest of the paper, I shall give some examples of an empirical cultural study of science in order to show some types of cultural conditions which may appear highly relevant for philosophy of science if studied further in greater detail. I wish to emphasise that for proper epistemic evaluation of the findings, further empirical research is necessary, nevertheless, the indication of the kinds of conditions and directions which need to be studied into, might have its own value.

In the following section I shall introduce the concept of workplace culture and the methodological framework for the empirical study of physics culture which was applied in the international cooperation project UPGEM, carried out in 2005–2008.

The method of culture contrast in the study of science as workplace

Workplace cultures have been studied first of all in such a discipline as organisational studies as something the organisations involve or have, as given cultures, or as sets of values, symbols and rituals for some organisation defined by their managers (Schein, 2004). In the EC 6th Framework Programme project UPGEM ('Understanding Puzzles in the Gendered European Map: Brain Drain in Physics through the Cultural Looking Glass') the approach was different. Culture was seen as a category which itself needs analysis. At the same time, culture serves as an analytic tool which enables us to analyse and understand "what makes people think-feel-talk-mean-act in ways that everyone in their group takes to be normal" as historian and anthropologist of science Sharon Traweek (1992, p. 440) has defined the concept. Cathrine Hasse and Stine Trentemøller (2011) describe the UPGEM perspective as follows:

Our approach thus diverges from the general field of organisational culture by focusing on what informants tell us about what they do and how these doings can be related to what we analytically find informants perceive, but not necessarily accept, as the cultural values, norms and traditions of the everyday life at the workplace (Hasse & Trentemøller, 2011, p. 11).

During the project, 239 qualitative interviews in five European countries (Denmark, Estonia, Finland, Italy and Poland) were conducted (*Draw the Line! Universities for male and female researchers in Europe*; Velbaum *et al*., 2008, p. 14). For the analysis, transcriptions of all interviews were uploaded in the analysis programme Atlas.ti. As the project was aiming at identifying the cultural reasons for leaving the academic career, approximately half of the informants were selected from among former physicists who by the time of the interview had left their research career. The method of analysis suggested by Hasse is called the method of culture contrast, and it consists in the cultural analysis via both locally and cross-culturally identified contrasts. In a cross-cultural perspective, three main contrast axes were defined: (1) the 'stayers' and 'leavers'; (2) men and women, who were also equally represented among the interviewees; and (3) a major contrast between physics as research culture with its general disciplinary characteristics, and physics in national cultures, that is, in particular countries. (Hasse & Trentemøller, 2009, pp. 47–49)

For the analysis with the programme Atlas.ti, statements from the interviews were selected as quotations and labelled with the relevant thematic code(s), as for instance 'competition', 'mentor', 'mobility', etc., altogether thirty-four codes. Thus a database of over sixteen thousand coded quotations was formed. The analysis was first carried out at the national level, in each project country, resulting in five national reports, and after that mainly by the coordinating team in Denmark at meta-level resulting in the cross-cultural conclusions and recommendations (Hasse & Trentemøller, 2008; Hasse *et al.*, 2008).

My current analysis of the UPGEM project material with respect to its relevance for naturalised philosophy of science makes up a part of an independent follow-up study. In the following section, I am going to present some empirical findings about the physics culture in Estonia and show their relevance for normative account of science. However, the relevance is not unilateral: in order to make changes in the research practice, the local cultural circumstances need first to be discussed from the normative perspective, thus the philosophical analysis is relevant for scientific practice as well.

Lack of communication in Estonian physics culture

Many interviewed former physicists as well as those active in physics today recognised the lack of communication possibilities at their workplace as a serious issue. On the one hand, many researchers appreciate the independence and free choice of working hours as it allows one to deal with complicated research topics individually, for long hours undisturbed, either at home or in the laboratory, just as one prefers. On the other hand, many informants complained about the lack of inspiring intellectual atmosphere. Motivation for more group work was strongly expressed, and the need for better coordination and division of labour at their workplace was often mentioned. For example, a female 'leaver'[1] said in the interview:

> *I liked working in physics, it's a purely mental job. And very interesting. And I liked to work in a team, team work. Like that. And that was, of course a problem, as when I came to Paramount[2], there was no team here. Very few physicists. Just me – my supervisor was xxx. And there was a moment when I asked him, "Who could I discuss this with? Who could I communicate with?" And he said, "Just me." That, of course, was a problem.* [Laughing] *Because when you have a team and everyone moves on together and there's, like, cooperation. I'd*

[1] In the quotations the following abbreviations are used: FL – female leaver, FS – female stayer, ML – male leaver, MS – male stayer.

[2] Research institution.

> *like that. When it appeared I was alone and there was no demand for that, it's not clear whether anyone needs that and whenever you have to go somewhere, problems arise immediately.* (P322/FL) (Velbaum et al., 2008, pp. 187–188)

Some physicists described the regular social gatherings at foreign universities as very important venues for information exchange and informal communication with both colleagues and students. Differently from other UPGEM project countries, the younger generation Estonian physicists especially seem to suffer from the missing generation, caused by institutional reforms in the 1990s:

> […] *Another problem has emerged, that just that, as one generation is missing among physicists in science, the generation that left Estonia in the beginning of the 90s, then in some sense* – […] *That generation is about now, I'm of course generalizing because the number of these people is not so big, it is this kind of a personal view of mine but it, it's this kind of a 40-year-old physicist who somewhere at the end of the 80s was about 25 to 30.* […] (P312/MS) (Velbaum et al., 2008, p. 162).

Young physicists highly respect the older generation but communication between the old and young researchers is restricted very narrowly to professional matters:

> *There are many people alone. Actually, they're all such individualistic people. Maybe something like, we do not feel we have anything to talk about. They're all old people, 50 or 60. I have no idea what to talk about with them, just work.* (P300/FS) (Velbaum et al., 2008, p. 162)

From the interview material, it appears that more women than men are distressed by lacking feedback on their work. How important it can be is evidenced by the following quotation:

> Interviewer: *What about now that you went to xxx, did you have a supervisor there? Or how did the studying process work out there or did you have to do everything on your own?*
>
> *Mostly on my own and there were people, well, my supervisor said that this needed to be done and that was it, he left. He's a xxx and he had all those meetings all the time. So I went and found someone, they'll help, lots of guys work there* [laugh]. (P300/FS) (Velbaum et al., 2008, p. 191)

And especially women appreciate their mentors' support very highly:

> […] *In the sense that she's an older woman and she has actually been to me, as she has no children of her own, she's been to me–. We established a very good emotional contact and I was really like a daughter to her. She helped me in a real way and, let's say, during the essential work, but she's given me a lot of good advice on how to get along well in this man's world* [laughing]*, because this discipline really is relatively, well, it's mostly men here engaged in this discipline and.* (P308/FS) (Velbaum et al., 2008, p. 190)

Missing a mentor might easily lead a young researcher to leaving academic career, as it happened to an interviewee whose supervisor had died in the early 1990s (Velbaum *et al.*, 2008, p. 192).

At some workplaces the communication is restricted because of a chilly work climate which might lead to social and intellectual isolation as it happened to a female leaver:

> Interviewer: *And who, were there other people in the room?*
>
> *Yes.*
>
> Interviewer: *Did you interact with these people?*
>
> *Yes. But there were still few people, we didn't interact much. Well, with other, other people whom I didn't have much to do with, well, I didn't, like, interact with them.* (P324/FL) (Velbaum et al., 2008, p. 188)

The problems related to restricted communication in science as workplace, where either some relevant parties, or individuals, either ideas, or practices, are not included, or have not been given the necessary authority for participating in the dialogue, are highly relevant for the aforementioned conditions of transformative criticism. The missing generation, for instance, might cause inequality of authority in the research community in the sense that the generations mutually do not consider each other as possible sources of expertise. On the other hand, in the circumstances of inequality, the representatives of the old generation might be trusted on the basis of their authority as being old without necessary professional criticism. In the analysis of particular scientific judgements these issues may turn highly relevant both epistemologically and culturally. In this paper, I can only hypothetically assume how these particular workplace features may shape certain problem-solving research situations – I do not have sufficiently specific data about the research problems the interviewees were solving, but the interview material still reveals the general types of communication problems which would deserve further research.

Identities and stereotypes in Estonian physics culture

As analysed in a number of earlier papers (see, e.g., Velbaum *et al*., 2008; Lõhkivi & Velbaum, 2008), the images of physicists in Estonia bear a masculine undertone. In the analysis of the interview material, three basic types of images emerged: physicist as a priest of truth, physicist as a playful boy, and physicist as a blacksmith. The first two categories have been identified also in other studies (Wertheim, 1995 and Hasse, 2002, respectively), although the nature of the image of the priest varies from one context to another, having connotations with the ultimate authority of church whose real domain truth is in some cultures, and referring to humble serving and pursuing for the truth in others. The image of physicist as a blacksmith was suggested by an Estonian interviewee; however, during the last couple of years, authors such as Pettersson (2011) have also identified similar images. Pettersson sees the strongly masculine image being a result of consistent gender ideology of particular sub-disciplines of experimental physics, for example, that of plasma physics.

Both the Estonian image of physicist as a blacksmith and that of plasma physicists in the U.S. laboratory involve cultural stereotypes of hands-on hard work of constructing and maintaining, “manually thinking”, and mastering the dangerous complicated experimental systems, plus carrying heavy vessels, cleaning up mess in the laboratory:

> *Well, let’s say this that this man exactly matched those ideas of a physicist I have used when alluring the young this way. This means that, yes, I – if I have had to explain why it’s good to be a physicist then I have used the expression of one of my colleagues, who introduced himself like this that do you know, I’m a blacksmith for the fourth generation, a physicist is also a blacksmith.* [Laughs] *Something like that. Well, well, actually the idea is that as in a village community, rural community, blacksmith was the one, who was able to do all the jobs, found the solution to every problem. Let’s say to all the problems related to iron and smelting it, related to metal and smelting it, all that in general surpassed the skills of the average person. And in this way a physicist should also be a person, who finds solutions to problems that appear in inanimate nature and that surpass the skills of the average person. Well, you see, it should be like that in principal. So, yes, in my opinion this person matched exactly with this kind of an idea and also was able to present his subject very well and make it interesting and well, of course the ability to present*

oneself is important for a person. Well, for a teacher first of all and well, let's put it shortly that he made the boy want to be like him. [Laughs] (P329/MS) (Velbaum et al., 2008, p. 179)

The image of physicist as a playful boy involves taking risks, solving problems easily, as in a game, having fun and enjoying solving complicated research problems at work. With these two stereotypes, a playful boy and a smith, female interviewees found it difficult to identify themselves with. The physicists' career survey shows that women tend to avoid the technical side of physics, and it was also expressed in the interviews in a similar way, as demonstrated in the following quotation:

Well, I still think it isn't, but it's actually the same at the university, I mean, physics is a really wide subject. And at the university they teach you, they try to teach everything to everyone and that might not be right for everyone and as for me personally, electronics was really not for me during the university studies, it was so–. And let's say, the part of physics that is concerned with very technical issues, that was not for me, I don't like that part, but the part that is connected to nature, I like that. Now, as to the master's studies, I also went back to environmental physics, as this is more connected to the real living environment. (P308/FS) (Velbaum et al., 2008, p. 182)

For women, it was somewhat easier to relate oneself with the image of priest; nevertheless, as the priesthood originally still refers to men rather than women, this stereotype is perhaps the most complicated one. It is neutrally alluding to the pursuit of truth, but at the same time, as characterised by Traweek (1992), hiding the conservative view of the 'culture of no-culture'.

For the argument of this paper, however, it is not even necessary to analyse the complicated nature of the metaphors, images and their possible consequences in depth. In order to prove the relevance of cultural studies into the identities, images, stereotypes and gender ideologies of the scientific practice, for philosophy of science, only discovering that stereotypes, gender ideologies, etc. exist in scientific practice, and moreover, showing how they possibly may constrain transformative criticism, should suffice. Transformative criticism might be restricted due to the particular mechanisms of inclusion and exclusion which leave some relevant voices unheard on the ideological or cultural grounds. Therefore, diagnosing these mechanisms via the local cultural and epistemic analysis might serve as a useful tool for the improvement of the quality of scientific research.

Conclusions

In this paper, I argued from the perspective of practice-centred naturalised epistemology that empirical cultural studies of science are relevant for philosophy of science and vice versa: without the normative approach one cannot improve scientific research, therefore one needs to study both the identity of the scientists and their local goal achieving rationality at the same time in order to understand and evaluate particular scientific judgments and suggest future developments. Based on the theoretical views of Longino (1990; 2002), Rouse (1996) and Rolin (1999; 2002; 2004; 2008) in social epistemology, I presented some examples of the empirical study of the workplace culture of physics in Estonia, indicating how the lack of communication in scientific community might restrict the prospects for transformative criticism which is a necessary precondition for achieving as objective knowledge as possible. Another kind of examples – the stereotypical images of physicists in the Estonian physics culture – was selected with the intention of shedding some light on the cultural mechanisms of inclusion and exclusion of people, ideas and practices in the sciences. Also these mechanisms when left without sufficient analytic attention, limit the transformative criticism and hinder improvement of scientific research, and are thus not only culturally interesting but also epistemologically significant.

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Worrall's Rule and a Critique of Standard Empiricism[1]

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Abstract: *'Standard empiricism' is a name that Nicholas Maxwell has given to the methodology which insists that in science no substantial thesis about the world can be accepted as a permanent part of scientific knowledge independent of evidence and certainly not in violation of the evidence. Maxwell suggests that standard empiricism is a current, official, orthodox conception of science and it is very widely upheld. He also argues that standard empiricism has some fundamental deficiencies and it is untenable. On the other hand, Nicholas Maxwell admits that standard empiricism is rather immune to his criticism as it has a strong defensive mechanism built in it, the mechanism which does not allow any metaphysical discussion into science.* (Maxwell, 1998)

However, there have been studies that allow us to believe that standard empiricism itself is not consistent with the norms it states. In other words, anthropological, sociological and historical empirical studies show that it is very hard to find such an "ideal" science. The aim of my article was to explore implications of this belief. I tried to assess how strong this 'empirical' argument is and whether it is applicable to standard empiricism at all. The tool I used was John Worrall's "rule" which says, "Other things being equal, working scientists have accepted the theory A as a better theory than B if, and only if, A was better than B; moreover, we can tell whether A was better than B by applying the criterion of scientific merit supplied by the methodology M" (Worrall, 1976).

[1] This article proceeds from my master's thesis *Possibilities of Critique of Nicholas Maxwell's Concept 'Standard Empiricism' in Comparison With Aim-Oriented Empiricism – Metaphysical and Empirical Arguments*, which was supervised by professor Rein Vihalemm and docent Endla Lõhkivi and was defended at the University of Tartu in June 2010.

Keywords: *contextualism, empirical argument, Hume's guillotine, Nicholas Maxwell's standard empiricism, normative methodology, "Worrall's rule"*

Introduction

One of the distinction lines used in the mapping of the twentieth-century philosophy of science is a position based on which different authors describe their relationship between methodology and practice of science. By and large the views may be divided into two opposite groups. The first of them favors separating methodology and practice of science completely – that is, normatively prescribing rules to which argumentation should correspond to be called scientific. According to the second approach, practice of science is preferred as the basis for characterization of successful scientific work in epistemology, the normative account is supposed to emanate from what is actually going on in scientific communities, institutes, and so on.[2]

Any particular theory of science (in the sense of metatheory) can position itself between those opposite views in different distances. Most such theories of scientific method have both sides represented, the only question is to what degree.

Approaches where the normative aspect is strongly present can be analyzed, valued and criticized with philosophical tools by showing the strengths and weaknesses of norms under question and inferences following from these norms. Approaches with the main focus on what actually is happening in the scientific practice can be criticized by describing (empirically) practices which collide with the specific account of science. (This kind of approaches risk falling into relativism of only locally validated claims in which case it is actually not criticizable at all, as critique is in some ways universal.)

Therefore it seems that a normative methodology has certain likable traits; a normative methodology can theoretically give something to science, for example, pointers for negative or positive heuristic if we are looking to the future. If we are concerned with the past, it can give us some other kind of understanding of science and knowledge which attempts at explaining what the reasons for success of scientific enterprise are.

2 Positivists are probably the most famous representatives of normative epistemology and the Strong Programme of SSK with a relativist sociology of science is on the other end of this scale.

One of the most important features of a normative methodology is that it is possible to criticize it using philosophical arguments; at least we are entitled to suppose that. But this is not always the case. In my opinion there is a plausible situation of norms being fixed in a way which makes it impossible to criticize them. I agree with Nicholas Maxwell's point of view that the current official and orthodox conception of science is what he calls standard empiricism. Standard empiricism is a methodology which insists that in science no substantial thesis about the world can be accepted as a permanent part of scientific knowledge independent of evidence and certainly not in violation of the evidence (Maxwell, 1998, p. 37).[3]

Nicholas Maxwell (1998) has presented solid arguments against such kind of conception of science and has proposed as an alternative an aim-oriented empiricism, an approach free of problems of standard empiricism.[4]

If history of science has allegedly shown the success of science, then history of philosophy of science has shown its own weakness. This is exactly what philosophy of science has frequently been accused of. My question is: if Nicholas Maxwell's diagnosis of science is adequate and scientists actually accept on declarative level only claims that can be empirically tested, which means any philosophical critique to standard empiricism has no power at all, then what can be done to evaluate this methodology (so that it could have any influence on scientific practice)?

If the empirical evidence is primary, then it should at least be possible to criticize scientific norms in the cases where discrepancy between declarative conception and actual scientific practice is increasing and to do so by referring to empirical (anthropological, historical, sociological) studies.

In principle, this 'empirical argument' is borrowed from non-normative approaches to science. I am aware of this problem, therefore I am not claiming that 'empirical argument' could in any way replace traditional philosophical analysis. My aim is much less ambitious. I would like to suggest one additional possibility of critique and investigate under which conditions this possibility can be used. The latter is my main goal as empirical arguments are used anyway.

[3] Nicholas Maxwell distinguishes between two different types of standard empiricism: bare and dressed. Bare standard empiricism is what I have cited here (and at which the following 'empirical argument' is targeted); dressed standard empiricism allows simplicity considerations in addition to empirical consideration to determine the choice of theory of science. (Maxwell, 1998, p. 37)

[4] These problems are the problems of induction, the problems of simplicity, the problems of evidence, and the problems of scientific progress (Maxwell, 1998, p. 45).

To be more precise, if we simply have a norm "only empirical evidence can determine what should be considered as part of scientific knowledge and what not", then under what conditions can we say that "historical or sociological studies have shown that actual practice of science does not correspond to that norm"? Hereinafter I am going to use this claim also in the wording "standard empiricism does not correspond to its own norms".

For this purpose, I will provide an overview of the classic gap between a description and a norm, and try to overcome it using a tool that Rein Vihalemm (1981) calls "Worrall's rule".

I will conclude that for criticizing standard empiricism, Worrall's rule has quite a limited power as standard empiricism will most probably be confirmed by the rule and also this rule combined with standard empiricism may not escape the circularity problem.

Hume's guillotine

If there is a need to attack a norm with a description, the first and most obvious obstacle to overcome was formulated already in the 18th century. Nowadays it is called either Hume's law or Hume's guillotine. This law expresses that normative claims cannot be derived from descriptive claims. Here it points to the fact that it is impossible to say that standard empiricism is a weak theory of method by relying on the evidence found to the claim that actual science does not meet these requirements. But is this gap impassable?

Hume's law was written as a small comment at the end of a chapter[5] dealing solely with moral issues. This part of the volume tells about virtue and vice in general and Hume's argument as to what leads to his so-called law consists of a conviction that moral distinctions are not derived from reason.

Hume thinks that it is commonly presupposed that reason has no power to influence our actions and affections. The effect of moral decisions on our acts, on the other hand, is very direct. Reason is passive in relation to actions and moral decision is active. The basis of an active principle can by no means be an inactive principle. And if a principle is inactive it stays so irrespectively to what it has been applied: moral sphere or the natural world. (Hume, 2003, p. 294)

[5] Book 3. *Of Morals*; Part 1 'Of virtue and vice in general'. Sect. 1. 'Moral distinctions not deriv'd from reason', see Hume, 2003, pp. 293–302.

Reason is utterly inert and cannot incite or impede any action or passion, because reason is discovering truth or falsehood. Truth or falsity is a correlation or disagreement with the actual relation of ideas or with matter of facts. Thus everything to which such correlation or disagreement cannot be applied, is not true or false nor is it object of our reason. Hume believes it to be obvious that such correlation or disagreement is not applicable to our passions, wishes or actions, as they are primary facts and realities, complete in themselves and do not hold any relation to other passions, wishes or actions. Hence it is not possible to consider them either true or false and, accordingly, consistent or inconsistent with reason. (Hume, 2003, p. 295)

If morality proceeds from truth or falsity, then the source of immorality would be a factual error and there would not be different levels of moral assessment (more immoral, less immoral) because morality can then only be concordant with or contradictory to reason. (Hume, 2003, p. 296)

At the end of this chapter there is a passage referred to when speaking about Hume's law or Hume's guillotine. This passage expresses a disputable thought that the transition from 'is'-claims to 'ought'-claims is not right.

> *I cannot forbear adding to these reasonings an observation, which may, perhaps, be found of some importance. In every system of morality, which I have hitherto met with, I have always remark'd, that the author proceeds for some time in the ordinary way of reasoning, and establishes the being of a God, or makes observations concerning human affairs; when of a sudden I am supriz'd to find, that instead of the usual copulation of propositions, is, and is not, I meet with no proposition that is not connected with an ought, or an ought not. This change is imperceptible; but is, however, of the last consequence. For as this ought, or ought not, expresses some new relation or affirmation, 'tis necessary that it shou'd be observ'd and explain'd; and at the same time that a reason should be given, for what seems altogether inconceivable, how this new relation can be a deduction from others, which are entirely different from it. But as authors commonly do not use this precaution, I shall presume to recommend it to the reader; and I am perswaded, that this small attention wou'd subvert all the vulgar systems of morality, and let us see, that the distinction of vice and virtue is not founded merely on the relations of objects, nor is perceiv'd by reason.* (Hume, 2003, p. 301)

Hume's law has been disputed in moral philosophy[6] as well as concerning any normative propositions. Here I would like to point out two possible solutions to overcome this gap.

Jonathan Harrisson finds in his book *Hume's Moral Epistemology* that it is even logically impossible to accept certain factual claims and to deny normative conclusions arising from these. For him it is not an accidental double meaning of the words 'right' and 'wrong' – on the one hand these terms are the main concepts of the moral realm, but on the other hand these words also mean the 'right' or 'wrong' means for some specific purpose. And the latter is logically derivable from the actual matters of fact. It would be utterly irrational to choose a 'wrong' way to Rome if the goal is to arrive in Rome, or to give purposely incorrect answer to the question about the time. (Harrisson, 1976, pp. 74–76)

Would this approach help us to criticize standard empiricism? Unfortunately not, because in order to criticize methodology of science with this kind of instrumentalist account we need to know what is the aim of the science as whole. If we know the overall aim, we could assess the means of achieving it, that is, to assess whether the methodological norms will help to reach that aim.

As there is no agreement about such general aim, it is possible to "borrow" the purpose from the methodology under question, that is, from standard empiricism. The aim of science according to this methodology is to gain as much trustworthy (empirically proved) knowledge as possible. For that, on the other hand, some kind of general (independent from empirical evidence) presupposition about the world is needed to be able to infer from it a question whether standard empiricism helps us to gain trustworthy empirical data. Standard empiricism in principle forbids this kind of presuppositions.

Another possibility to overcome the gap of Hume's law is the suggestion Tõnis Idarand makes in his article 'Põhjendamise probleem ja empirism väärtusfilosoofias' (The problem of grounding and empiricism in axiology, Idarand, 1993) where he tries to find an answer to the question: is it possible to admit applicability of deductive-logical justification model in grounding of value-claims and at the same time agree with Hume's law? Finding the answer to that question rises from the fact that the moral discussion actually uses logic. Idarand suggests contextualism as one possibility. Contextualism solves the problem by accepting among assumptions also value claims in addition to factual claims. The assumption is taken as an axiom and is not substantiated in

[6] See, e.g., Searle, 1964.

itself which ensures logical transition from presumptions to value-inferences. (Idarand, 1993, p. 67)

Hence to make a connection between descriptive and prescriptive or to say that the argument "standard empiricism does not correspond to its own norms" is correct, an additional assumption is needed which would build the bridge across the gulf. John Worrall proposes exactly such kind of additional assumption for assessing methodologies.

Would Worrall's rule help to bridge the gap?

John Worrall (1976) presents in his article "Thomas Young and the 'refutation' of Newtonian optics: a case study in the interaction of philosophy of science and history of science" one way to overcome the gulf of normative and descriptive claims. He thinks that the method which "does the job" lies in adding to assumptions a sentence according to which practicing scientists confirm with their choice of theory (rather with estimation of the rationality of this theory) the value-estimation prescribed by a methodology.

Description of Worrall's rule

John Worrall tries to show that methodology can be presented in a historically testable way. He wants to convince readers that although historiography is by large driven by normative thoughts, it does not mean that all history claims are normative or that testing philosophy against history of science is circular. Worrall believes that normative methodology can improve history of science.

The rule under question is as follows:

* Other things being equal, working scientists have accepted theory A being better than theory B if, and only if, A was better than B; moreover, we can tell whether A was better than B by applying the criterion of scientific merit supplied by the methodology M.

In a footnote on page 167 Worrall gives a formal explanation to his "rule".

He uses the marking 'CP' to express presumption that other circumstances are equal, '$A >_M B$' to express a statement that A is better than B according to methodology M, and 'P(A,B)' to express a claim that A was historically preferred to B. Worrall states that we should regard every methodology as confirming that

$(*_M)\ CP \rightarrow (A >_M B \leftrightarrow P(A,B))$.

The first direct confirmation of methodology M is that if the ‘initial condition’ that $A >_M B$ is entered to the $*_M$ rule and *ceteris paribus* is presumed, then $*_M$ implies P(A,B), a claim which is confirmable by historical investigation.

$*_M$ implies that $(*'_M)\ (A >_M B \wedge \neg P(A,B) \rightarrow \neg CP$

From that arises the second confirmation for M. Initial conditions inserted to $*'_M$ are ‘$A >_M B$’ and ¬P(A,B) lead to ¬CP. This is another claim which is independently and historically testable.

If it turns out that all historical evidence refers to the absence of any disturbing facts during rivalry of A and B, then ¬¬CP should be considered historically confirmed and therefore $(*'_M)$ and $*_M$ and together with that methodology M are refuted. (Worrall, 1976, p. 167)

John Worrall has three claims

1) Adding this rule to methodology enables us to test methodology against the history of science.

Methodology should give us general criteria which would enable us to assess scientific theories, that is, which theory is better than the other, or to create a ranking list of theories. This assessment, on the other hand, has some implications to the decisions of scientists’ decisions and actions. Worrall claims that methodology determines the scientists’ acceptance of a given ranking; however, it does not mean that a scientist has to work with the theory methodology has estimated as the best, because by developing background ideas of a theory which has been recognized as less rational, a scientist may attain an excellent theory by the merits of the same methodology. (Worrall, 1976, pp. 161–163)

For the association (methodology + *) to be testable against history, that is, having descriptive implications, an additional condition is needed – one which says that every attempt that tries to save a methodology by referring to the external factors has to be done in a way that it is specific and testable against the historiography of science. An articulated conclusion has to be brought out as to why the conditions were not equal for the theories. (Worrall, 1976, p. 165)

2) Although there are no purely descriptive historical facts (or claims), it does not mean that methodology cannot be testable against history of science nor that Worrall’s rule is circular (Worrall, 1976, pp. 168–169).

3) Normative methodology can be helpful for the historiography of science.

Although the concepts historians use are provided by methodology, it does not mean that all history of science is "normatively interpreted" or "soaked in methodology", it could yet be influenced and improved by explicit application of methodology (Worrall, 1976, p. 172).

Usage of specific methodology can provide historians with proper terminology for expressing historical facts in a lucid and concise manner. For example, methodology of research programs is a further development of such theory of method that describes science solely by changing theories. It is very difficult to find one corpuscular theory or wave theory of light; instead, there are corpuscular theories and wave theories. (Worrall, 1976, p. 172)

Another way how methodology can help historiography is by widening the field of sight. Methodology provides researchers with a heuristic – not only with a set of problems but also with means to solve these questions. (Worrall 1976, p. 173)

The problems, limitations and potential applications of Worrall's rule

The first limitation in the application of Worrall's rule is the fact that it is obviously impossible to test any relativistic methodology. Why? Because relativistic methodologies cannot be testable in principle.

Barry Gower (1997) emphasizes one not very widely recognized point that if we accept the connection of method and relativism we do not have the ability to support our claim with evidence. Relativism says that if there is no right way to argue and justify the decisions made in science, then we can justify principles only by referring to local beliefs, habits and needs. Rational is what we consider rational. However, it seems to be obvious that the critique of methodology in the light of practice of science can work only if the practice is successful. But relativistic methodology does not provide us with tools to recognize the success or, to be more precise, to differentiate between actual success and apparent success. (Gower, 1997, pp. 247–248)

Secondly, the historical contexts which allow us to use Worrall's rule are limited to periods where there are at least two (in principle there could be more) clearly distinguishable rival theories between which scientists have to choose. Hence in a period of Kuhnian normal science when scientists are working with one approved theory the Worrall's rule cannot be applied. This is why it is possible to imagine that a scientist can be mistaken over a long period of time. Because of the deficiencies of ruling, theories are not evident enough to make the scientists choose between them.

The third and most important limitation for the current topic is that it is clear that the rule under question connects norm and description but does not provide a shortcut to compare adequacy of two different methodologies. We can assess methodologies one by one by placing them into historical context. This limitation, as we soon will see, plays a very important role in relation to standard empiricism and its critique.

Standard empiricism and Worrall's rule

Worrall's rule is structured in a way that with its help it is possible to falsify methodology. If the falsification fails, then the methodology is confirmed. Shortly put, this rule is a yes–no system, and (using Hume's vocabulary) a normative claim is either in correlation with a fact or not, and it is impossible to find out which methodology is more or less coherent with actual history of science compared with other methodology. It is very plausible that more than one methodology can be confirmed by this rule.

Likewise it is very much possible that standard empiricism itself will be confirmed by the Worrall's rule. The main reason why I think so is that standard empiricism is a very "indulgent" theory: it only calls for empirical adequacy. These accounts of science which have other requisites besides empirical adequacy are very likely to be more falsifiable.

An even bigger problem lies with a threat that, in my opinion, in terms of standard empiricism the circularity problem is hard to avoid. The following will explain why I think so.

As already briefly mentioned, Worrall denies that the circularity problem is something that we should be worried about when we talk about his so-called rule, although some philosophers, Lakatos and Agassi among them, have claimed that historiography is influenced by methodological considerations. This has lead to the conclusion that testing methodology against history of science is circular and therefore damaged because historical case studies which have been chosen to test methodology, probably confirm the methodology. (Worrall, 1976, pp. 168–169)

Berry Gower has expressed a similar opinion. He affirms that with inventive and perhaps impudent mind any practice can be reconciled with any principle. Take, for example, falsificationism. If one wishes to refute falsificationalism – every genuine test of a theory is a test of falsification of this theory – with the claim that it does not correspond to reality, one will find themselves in a deadlock, and has to conclude that history of science and this thesis meet very well, because first of all one has to determine which is the *genuine* test of a theory. (Gower, 1997, p. 247)

Worrall asserts that his rule can become circular for methodology only if one decides who is a scientist and who is not relying on the same methodology one wants to test. But it is also possible to decide on the basis of general opinion. Let us assume that (a) general opinion is shaped, influenced by and containing not only descriptive propositions but a mixture of descriptive and normative claims and (b) the set of persons whom general opinion considers scientists is vague. Accepting (a) affects Worrall's rule only if those normative considerations are systematically taken from the same methodology which is being tested. And according to Worrall this is not the case. As far as (b) is concerned, we can be liberal in involving the set of scientists, if we also allow external factors that could explain discrepancies between their actions and what is advised by methodology, factors like the lack of intelligence and mathematical ability. (Worrall, 1976, p. 165)

So according to Worrall the aforementioned general opinion is an escape way from the circularity problem. But is this applicable also when standard empiricism is concerned?

I think not. Because if we agree with Nicholas Maxwell's claim that standard empiricism is an officially accepted methodology of science to which the cause of the success of science is attributed, then it is more than probable that science is defined by the ideology of standard empiricism and the majority of history of science is written according to it. So it is inevitable that circularity that Worrall wants to avoid sneaks in. Standard empiricism will be tested against the history of science which defines the concepts of 'science' and 'scientist' by the rules of standard empiricism. It would be avoidable if general opinion through which history 'is given' to us actually contained material originating from very different methodological assumptions and is written during very different periods of time.

The objectivity (in the sense of avoiding circularity) would be better ensured with application of Rein Vihalemm's 'historiographical apparatus', which is, in a way, a further development of Worrall's general opinion. According to Vihalemm, only such assembled historian–methodologist–scientist's opinion can be used as historiographical apparatus that contains in itself accounts of different people who all have knowledge about science, but who have very different methodological assumptions as their history has been written during different periods of time and different development stages of science. (Vihalemm, 1981, p. 13)

Possible applications of Worrall's rule

While the mechanical testing of standard empiricism with Worrall's rule will very likely result in it being confirmed, then only way to use this rule for critique is using it in comparison with some other kind of methodology which is also confirmed by Worrall's rule. But as we previously saw, the toolbox of Worrall's rule does not contain direct comparison. So should it be concluded that Worrall's rule is completely useless as it probably does not refute standard empiricism directly (as standard empiricism is a very "indulgent" theory) and at the same time does not provide ways to compare methodologies which have been confirmed by Worrall's rule? In my opinion it is not utterly useless.

One advantage of methodologies with uttered normative component over purely descriptive is that they give another dimension to the explanation of science. They help us to understand science in the sense of success. The norms of standard empiricism do not contribute to understanding. The problem of standard empiricism is basically the same as the problem of positivism – an absolute lack of logic of discovery. Standard empiricism with its indulgency also has little to give. So if the aim is to preserve the advantages of normative methodologies, every methodology that provides some criteria for assessing empirical facts besides just collecting them should be preferable. This, of course, applies in case this other is confirmed by Worrall's rule.

John Worrall had a third argument for justifying his rule, namely a claim that methodology of science is helpful for historiography of science. If we turn our focus to this argument and emphasize that testing methodology is at the same time testing historical understanding and historiography, the statement that one methodology explains more than the other becomes an important difference. And here it is not even essential whether we talk about history of science in a sense of intrinsic rationality or history in general, because according to Worrall's rule the methodology can be confirmed by history also by referring to the external factors.

The main problem of standard empiricism is that after finding out the empirical success of a theory, a historian of science is left in a pool of loosely connected facts, with no clue about their relevance. In other words – looking at the history while armed with standard empiricism a big part of actual practice of science becomes mystical.

Conclusion

The aim of the present article was to determine which conditions are relevant for being able to criticize standard empiricism with the 'empirical argument'. How strong is the argument that standard empiricism does not correspond to the norms it states, that is there is no such ideal science as standard empiricism suggests?

I found that there are possibilities (tools) to overcome Hume's classic is–ought problem by adding a normative sentence as an assumption to the empirical description of science (in this case, to history of science). It could be, for example, an increase in the role of decisions that practicing scientists make. Or to claim that practicing scientists with their assessments of a theory give a value assessment which either confirms or refutes methodology. John Worrall provides us with precisely this kind of tool.

The second part of the article was dedicated to the question whether Worrall's rule is powerful enough to open up standard empiricism to the critique, and concluded that unfortunately its application to standard empiricism is limited. First of all, general opinion does not inevitably solve circularity problem and second, standard empiricism is so indulgent conception that it will most probably be confirmed if tested against history of science.

But this does not, however, mean that Worrall's rule is utterly useless for that task. Namely the very same property that makes standard empiricism so strong against any critique also makes it idle for understanding science. Any methodology which, similarly to standard empiricism, is confirmed by Worrall's rule, but which entails more than just a requirement of empirical adequacy, that is, which besides the process of retrospective justification also explains how the result is reached and why it is decided to take certain direction of research, should be preferable also with respect to Worrall's rule, because its wider aim (and implicit need) is to assess historiography itself, to give pointers towards adequately operating historiography. Hence the methodology allowing that is certainly better, but this is precisely the limit where the possibilities of Worrall's rule in criticizing standard empiricism end.

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Arne Naess' Meta-Philosophy: From 'Empirical Semantics' to 'Deep Ecology'

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Abstract: *After describing Arne Naess' early empirical investigations in semantics it is shown how those works fertilized his later environmental philosophy (i.e. 'deep ecology'). Based on this a criticism is formulated: namely, the neutrality of Naess' 'empirical semantics' is questioned. It is finally explained that this has also consequences for 'deep ecology'.*

Keywords: *Arne Naess, deep ecology, empirical semantics, environmental philosophy, naturalism*

Introduction

My aim is to shed some light on the inner relations of Arne Naess' (Næss) philosophical work. At a first and superficial glimpse, Naess' early investigations on 'empirical semantics' – mainly the analysis of the use of terms by interrogating persons about their understanding of terms, phrases and sentences – have nothing in common with his later and mature 'deep ecology'. Deep ecology was and is interpreted as an alternative to the established, dualistic and anthropocentric environmental philosophy.

As a consequence, Naess' deep-ecology-approach is put aside (by, e.g., analytic philosophers) with bluntly irrationalistic philosophies, which *claim* the intrinsic value of all beings and a kind of mythological connection of everything (cf. Krebs, 1999, pp. 69–77; Sylvan, 1985, pp. 11, 26ff; Mahner & Bunge, 2000, p. 170). This view might be substantiated by a long list of

Naess' contributions. At a first and perfunctory glimpse, deep ecology is really radical (cf. List, 1993): Naess sets the stage for "biospherical egalitarism", the "rejection of the man-in-environment image in favor of the relational, total-field image", the "principles of diversity and of symbiosis" to name just the subsections of his seminal paper (Naess, 1973). He also pleads for intrinsic value of "natural diversity", "plant species should be saved because of their intrinsic value"[1] and so on.

Indeed, deep ecology served as a guideline for environmentalist groups like EarthFirst! and inspired "radical" and "alternative" thinkers.[2] Thus, the conclusion seems to be obvious: Naess started as a "serious" philosopher and ended up degenerately as an adherent of irrationalism and *spiritus rector* of "radical" activism.

This conclusion is bluntly wrong. I will show in the following that Naess' *later philosophy, his deep ecology, cannot be understood properly without considering his early work*. Any interpretation of deep ecology has to take into consideration the author's early writings; otherwise its central feature cannot be grasped. To be sure, given the introductory nature of this paper, a comprehensive and in-depth overview about Naess' work is not intended. After arguing for my interpretation, I will hint at some problematic points in deep ecology.

My central hypothesis concerning his philosophy as a whole can be formulated as follows: *Naess' goal was not to formulate a generally binding philosophical system but to provide "technical" means to clarify and specify the existing philosophical beliefs. Roughly speaking, the techniques developed were 'empirical semantics'; the technique applied was the formulation of the deep-ecology platform.*

1 For a critique of Naess' inconsistent use of the concept of 'intrinsic value' see O'Neill, 2003, p. 140, note 1 and 4.

2 Those are labeled currishly by Sylvan 1985, p. 1 as 'West Coast American intellectuals'.

Empirical semantics

Semantics is the philosophical discipline which investigates meanings, that is, the relation between signifiers and objects. Naess, in his earliest works, analyzed this relation empirically with the help of questionnaires (cf. Naess, 1938; Ness [sic], 1938; Naess, 1953, p. 408ff; for an overview see Naess, 1981/2005), thus investigating how certain terms, phrases or statements in question are used.

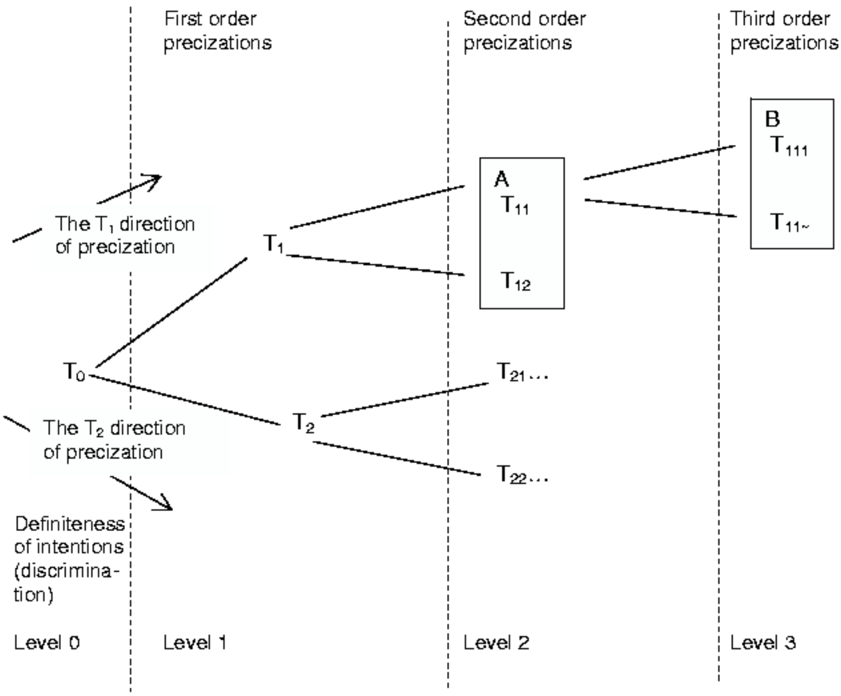
People were asked to discriminate between a set of statements. If they responded that the statements mean the same for them, they were regarded as synonymous. In a second step, statements could be ordered concerning the levels of discrimination: the result was a tree-like diagram. Gullvåg summarizes Naess' central ideas, adding the notion of the frequency of use:

> Roughly, we may say an expression [...] is *ambiguous* if and only of it has non-synonymous instances (tokens); one expression is an *interpretation* of another if and only if both are (would be) synonymous for some person in some (type of situation); one expression is a *plausible* or *standard* interpretation of another if and only if they are (would be) synonymous for *many* persons in *many* (types of) situations; hence a standard interpretation of a sentence may be said to indicate a frequent use of it. Finally, one expression is a precision of (or more precise than) if and only if the set of standard interpretations of the former is a proper subset of the set of standard interpretations of the latter. (Gullvåg, 1983, p. 34, Gullvåg's italics)

The intuitive idea behind 'empirical semantics' is the following: Given a low-level (unspecific, vague) term (phrase, or statement) T_0 the term could be rendered more precise in different directions (T_1, T_2, T_3, $T_{...}$) on the subsequent level, on the second level the same procedure might take place (T_{11}, T_{12}, T_{13}) and so on. Naess' definition of "more precise than" is the following:

> »'a' is more precise than 'b'« is equipollent to » There is no interpretation of 'a' which is not also an interpretation of 'b' whereas there is at least one interpretation of 'b' which is not an interpretation of 'a', and there is at least one interpretation of 'a'«. (Naess, 1953, p. 60; cf. Gullvåg, 1975, p. 394; cf. Naess, 1975, p. 22).

There is synonymity along the branches (T_0, T_1, T_{11}, T_{111}, ...) but not at the *same* level (cf. Naess, 1953, p. 78). Hence different people might understand the same root-term differently and/or at a different level of intention/discrimination. The following diagram (taken from Naess, 1970/2005, p. 114[3]) helps to illustrate this issue:



This helps to understand one of Naess' later key concepts: the 'depth of intention' (Naess, 1953, p. 386) Here, as already mentioned in secondary literature (Glasser, 1998), the depth metaphor occurs for the first time. One has to keep in mind that the most vague terms (sentences and phrases) are used on level 0 (T_0). Naess speaks in this context, slightly misleadingly, of 'shallow terms'. Only the more precise terms, sentences or phrases on subsequent levels have a remarkable depth of intention. Hence 'depth of intention' correlates positively with 'definiteness of terms'.[4] Those unspecified T_0-terms are those which are used among lay people; only after some "training" and learning one is able to use more specified terms.[5] Beyond that, Naess claims according to Alastair Hannay (1975, p. 417; cf. Naess, 1953, p. 151) that on the T_0-level

3 I would like to thank Michael Caley for giving me permission to reprint this diagram.

4 For a critique see Gullvåg 1983, p. 36: "We might say that 'preciseness' is a concept of socio-semantics on a macro-level, referring to social usages; whereas 'depth of intention' refers to the thinking and understanding of individuals. In view of this, the whole approach to depth of intention in Naess' semantics seems unnecessarily circuitous."

5 Naess was inspired by Otto Neurath's *Ballungen* in this (Naess, 1956/2005, p. 188; 1972, p. 134. Cf. in this context Feyerabend, 1957/1958, p. 242).

> 'instinctive *behavior*' is analogous to the utterances of an expression with the lowest level of preciseness. Accordingly, instinctive believing cannot generate the propositional content necessary for it to stand in a logical relation to a judgement.[6]

The central question is whether Naess has reached a *neutral basis*. That he does *not* becomes clear if one analyzes the analogy between 'instinctive behavior' and utterances of the lowest level terms more closely. It might be argued (as Feyerabend, Wittgenstein, Peirce and others claim) that the context (and thus the use, cf. Naess, 1953, p. 271ff) determines the utterance's meaning. Hence the utterances (as verbal behavior) and their meaning are causally dependent from the contextual setting and one can consequently scrutinize whether this (verbal) behavior is adequate or not, that the person in question shows the correct behavior. This amounts to say that the information about the context (or the speaker's environment) determines the *researcher's (interpreter's)* judgment whether the instinctive behavior is to be regarded as adequate behavior or not. (Naess is aware of this problem, cf. 1953, pp. 85, 156, 196ff, 281.)

If a certain (verbal) behavior is uttered willingly because it amounts to the formulation of a T_0-term which is the starting point for a precization[7] or is interpreted by an observer as adequate, both the attentive observer and intent speaker need appropriate information about the context in which the utterance of the T_0-term arises or how it could be rendered more precise in the intended direction. The linguistic researcher observes certain verbal behavior, documents its use, and comes to the conclusion that this utterance is instinctive *in relation to the context*.

I would suggest that if the context of an (instinctive) utterance is reconstructed, one has to assume against Naess' definition that a T_0-term stands in relation to other terms and statements – namely those which describe the context in which the T_0-term is asserted. It is not necessary to claim that the speaker is conscious about this context; it is sufficient that the researcher takes the context of the utterance into consideration. By doing so, it becomes clear that this process is a

[6] See also Naess (1971, p. 46, italics J.R.): "Confident behavior, including *verbal behavior*, is one kind of event among others. But just as verbal expressions of confidence are not necessarily expressions of statements to the effect that one is confident, so confident action in the world is not implicitly a matter of affirming that something is the case." "To assert that something is true is one thing; to give one's impression is quite another. In the former case one makes use of clear-cut distinctions and concepts [...] while the latter is no more than, as it were, letting the events speaks for themselves – a case in which the speaker functions 'angelically', as not more than a messenger of the appearances".

[7] Here and in the following I will use Naess' term 'precisation' or (as in Naess, 1953) 'precization' (*Präzisierung*) instead of the common English term 'specification'.

kind of clarification which helps to understand the speaker better and to *evaluate* his utterances in relation to their adequacy.

Naess argues that the idea of 'synonymity' is intuitively clear but he claims also that he is very indefinite on this (Naess, 1957, p. 88)[8] – that is, a quotidian understanding of synonymity is his point of departure for his painstaking elaborations. In any way it is shown by Naess that "synonymity is relative" (Chapman, 2008, p. 131; see, e. g., Naess, 1953, pp. 168, 362). If it would be a purely neutral account then this whole documentation of the usage of terms, the investigation of synonymity, would be nothing more than asserting trivialities (Feyerabend, 1957/1958, p. 239). But if, however, one has the impression that one *learns* through the term's precization a lot, then this analysis cannot be purely neutral (cf. Kraft, 1960, p. 19).

Naess explores the philosophical implications of his method. Putting the linguistic aspect of this issue aside, one might ask about the importance of low-level terms. The empirical substantiated hypothesis put forward by Naess seems to be that those terms are the core of the classical philosophical systems. Naess (1981/2005, p. 62; 1953, p. vii) uses the term 'embryonic' to describe this. It is important to understand the concept 'philosophical system' in a very broad, holistic sense; as an example, the systems of Descartes or Spinoza might be helpful. If one takes such a system, one might identify key concepts which are explored and specified in different directions and, as a result, a philosophical edifice is erected. To be sure, by doing so, some empirical hypotheses and normative axioms are added; only then a precization could be accomplished. After the process of precization one is "caught" in a philosophical system:

> [A]s soon as we start precisation and articulation of a conceptual framework, it is difficult to stop before we find ourselves standing inside the frame of presuppositions of a quite specific kind of philosophy (Naess, 1982/2005, p. 12).

Naess combines this holistic meta-philosophical approach with the claim that any critique of an existing system presupposes another system. There is no point behind or beyond a 'total view' (Naess, 1964; 1953, p. 114). This also implies that everyone has his own "private" total view.[9] Given this statement a *descriptive* interpretation, this seems true and uncontroversial: Every individual

8 I cannot go into details here but this amounts to the abandonment of a strict separation between analytic and synthetic sentences (cf. Naess, 1953, pp. 165ff and 362).

9 In order to accomplish a precisation one needs empirical and axiological hypotheses to do this. Nobody can rest on the shallow level of intention, since communication and argumentation bases on certain level of intention. "Be precise, but not too precise" might be an appropriate slogan to summarize this.

has its "own" ontology, axiology and epistemology, but only very few were and are able to "think it through". Naess' aim is *neutral* meta-philosophy, a thorough and structured reconstruction of a philosophical system, not its critique.[10]

The second use of the depth metaphor is reported by Harold Glasser and is based on 'premise-conclusion chains'. This becomes intuitively clear in Glasser's own words since it mirrors the common understanding[11] of deep thinking.

> A premise-conclusion chain, $p \subset q$ and $q \subset r$ and $r \subset s$, can be formed from a series of premise-conclusion statements, p, q, r, and s, where $x \subset y$ symbolizes, from premise x, or set of premises x, follows conclusion y. Naess characterizes an argumentation pattern starting with q as 'shallower' than one starting from p (Glasser, 1998, p. 162; cf. Naess, 1986/2008, p. 108; 1982/2005, p. 130).

This can be understood as a logical, transitive relationship and cannot be regarded as controversial. The difference between the semantic concept of depth and the premise-conclusion chain concept is that the latter is important for reasoning and action likewise. The fusion between both is given by Naess in his deep ecology approach.

Deep Ecology

The term 'deep ecology' is ambiguous. Glasser (2001, p. 4041) distinguishes between three different meanings. [1] The 'deep ecology movement', that is the name for different groups (like EarthFirst!) which are supporting actively deep ecology, [2] the 'deep ecology approach' and [3] Naess' personal ecophilosophy, his personal spelling-out of the deep ecology approach, 'Ecosophy T'[12]. I refer mainly to the deep ecology approach and partly, as a matter of illustration, to Ecosophy T. The development of the deep ecology approach by Naess and his followers will be excluded.[13]

In a concise overview Naess makes clear that his deep ecology approach is constructed as a 'platform'. That means that different individuals with very

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10 Whether Naess reached this aim of neutrality is a controversial matter. Cf. Gullvåg, 1975 with Naess, 1977/2008.

11 Cf. Sylvan, 1985, p. 21: "Ecosophy T is pretty much an old-fashioned hypothetico-deductive system [...]".

12 'T' refers to the name of Naess' remote and self-built mountain hut Tvergastein.

13 For a systematic overview see Sylvan, 1985, p. 53.

different "cultural background" share the basi c principles of deep ecology. These principles are spelled out as *vague* slogans so that every engaged individual could identify with them (Naess, 1986/2008, p. 105). In addition, Naess claims that these "slogans" – the deep ecosophical platform – can be found among supporters of the deep ecology approach (Naess, 1986/2008, p. 116): that is, those slogans can be interpreted as statements actually asserted and documented. It is not the task to argue for this platform but merely to mention that there *is* a platform.[14] It is, to use a Kantian notion, a *quaestio facti* not a *quaestio juris*.

More important is to mention that these platform-principles are themselves derived from ultimate premises. Naess says that the same class of platform-principles can be derived from different sets of ultimate premises (Naess, 1986/2008, p. 115; cf. Naess, 1981/2005, p. 74). This can also be understood as uncontroversial as long as one keeps in mind that *de facto* different persons of different cultural backgrounds engage in environmental matters. Naess claims that several ultimate premises are often incomprehensible for outsiders. This can be interpreted as an uncontroversial factual statement. Practical norms or a general policy is derived from the platform-principles.

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[14] Therefore it is not quite correct to state, as an anonymous reviewer of this paper denoted, that the concepts of deep ecology would necessarily be reached through precisation. According to Naess, vague sentences or phrases are used and could be rendered more precise in different ways. However, it is a factual problem whether and how those sentences and phrases are used. Additionally, there is not any a priori necessity that all participants of communication will agree on the same set of sentences and this inquiry also amounts to an empirical investigation which is far beyond the scope of this paper. Besides, Naess never intended to formulate a kind of generally binding philosophical system. My claim could be substantiated either by listing some examples of "environmental discourse" or by quoting Naess himself. Due to the lack of space I prefer the latter: "Some people scattered around the world seem to feel at home [with Ecosophy T, or some other ecophilosophy] in the sense of feeling what its sentences mean and more or less experience an agreement. This is important for common action in the spheres of social and political movements [...]" (Naess, 1982, p. 264). This quotation expresses his intention of formulating a 'platform'. He continues by stating: "In the exposition of Ecosophy T and formulating basic views within the deep ecological movement, I make free use of *key terms*. These words or short expressions acting more like headings or like flags, than expressions of ideas. [...] These expressions are then made more precise through definitions and elaborations" (Naess, 1982, p. 265, Naess' italics). To sum up: One *starts* with (vague) "key terms" and tries to specify and elaborate them. Recently Benjamin Howe comes to the same conclusion as I do (cf. Howe, 2010, pp. 376; 378, 380ff). The vague slogans of deep ecology do not constitute the endpoint of a philosophical procedure (like for example Kant's 'transcendental deduction'), but they are regarded as useful points of departure for an argumentation. As noted above, the endpoint of that very precisation is open.

The result of Naess' efforts is an interesting four-level scheme (cf. the diagram in Naess, 1986/2005, p. 63). It should be clear that different 'worldviews', 'ultimate premises' and 'ecosophies' can function as the logical basis for the deep ecology platform. Naess does not aim to formulate a certain closed platform, the principles on level 2 – which are not discussed here[15] – are regarded as hypotheses. Besides this it is uncontroversial that different policies (level 3) and particular decisions etc. (level 4) can be derived logically. This plurality I would like to interpret in a purely descriptive manner which can be supported empirically: There is no one and only policy, no alternative to existing actions and so on. In an explication of a *concrete action* and its *preceding argumentative decision process,* motivational, psychological aspects are excluded but those aspects may influence the formulation of the respectively higher levels: "The direction from bottom-up offers the genetic and historical derivation – including all the motivations and impulses in formulations of norms and hypotheses" (Naess, 1989, p. 196).[16]

Concluding critical remarks: Naess as "empirical" philosopher

A worldview or, to use Naess' wording, a total view is spelled out through a process of precization *and* obviously through the addition of normative and descriptive hypotheses,[17] but immediately some problems arise: The starting point is on the one hand at level 1 and there, at the very beginning lay T_0-terms, which have, according to Naess, no propositional character.

On the other hand it is stated by Naess that in the deep ecology approach the neutral, hence vague, terms can be found at level 2; and those are already deduced from an ultimate set of premises. Therefore one has to conclude that the vague terms are only allegedly neutral, that they are the outcome of a still unformulated premature philosophical position. But then it is questionable that due to precization a philosophical system is reached; a better formulation would be that due to precization a philosophical position is systematized but *not* created.

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15 For a critical discussion from a different point of view see Sylvan, 1985. However, Sylvan does not mention and discuss Naess' central notion 'depth of intention'. Nevertheless his critique is valuable because he adheres to a different ontology as Naess, namely a kind of Meinongian value-objectivism.

16 This is also a remarkable thesis which is not discussed as controversial among philosophers of science under the label 'inference to the best explanation'.

17 For a nice example see Naess, 1974/2005, pp. 48–84, 157–161.

Besides this, a further question is how the different directions of decision-making took place, if the core consists of non-propositional statements. This is arguably a question which is beyond the scope of empirical semantics but, could be, as I suggest, explained empirically. To be sure, the very problem is also logical: One has to choose the hypotheses in such a way that the whole system is consistent. The precization has to be performed in such a way that the outcome – the total view – is guaranteed. Hence one is faced with the objection that if the result is already given, then the system's erecting is superfluous, besides one aims at a more thorough formulation of the underlying intuitions (cf. Naess, 1953, p. 386).

I think it is possible to inerpret Naess as a "naturalistic" philosopher. This holds for both his empirical semantics and his later deep ecology approach. It becomes clear that the latter is not only a description of environmentalist's attitudes from all over the world, it is not only proposed as a means to prevent the destruction of our planet, but it also witnessed Naess' deep conviction as a political human. Consider as a last example of the preceding the sketch of his own total view his Ecosophy T (Naess, 1989, p. 196ff): 'Self-realization!' as its basic norm must already be seen as precization of the very vague T_0-term 'self-realization' (Naess, 1989, p. 84). One cannot argue for this most basic norm, so Naess can only show with the help of examples how to make sense out of it.[18] And therefore his examples (e.g., his autobiographical sketch [Naess, 1983]) are of utmost importance. The skeptical reader might get the impression that Naess is correct in his description of his basic insights. But here an interesting complication arises. Naess claims correctly that his Ecosophy T and deep ecology are *incompatible* with other *ganzheitlich* totalitarian ideologies, like fascism (Naess, 1982/2005, p. 4).[19] This is obviously true as fascism is not compatible with 'self-realization!'. So, one faces the following situation: Either Naess discovers, finds the basic insight in 'self-realization!' by his *friluftsliv* (Drengson, 2008, p. 22) or some form of hidden (unconscious) vindication took place and 'self-realization!' found its place in Naess' mind not only by living and contemplation but by a kind of searching for it. In my opinion this is a more

18 Naess (1989, p. 172) gives a list of examples but then mentions that identification with nature does not dissolve the individual: "The above seems to point in the direction of philosophical mysticism but the fourth term, 'self-realisation' (identification, oneness, wholeness are the other terms, J.R.) breaks in and reinstates the central position of the individual [...] The widening and deepening of the individual selves somehow never makes them into one 'mass'. [...] How to work out this in a fairly precise way I do not know."

19 The point in question made by Naess seems misleading: Although Naess rightly claims that any fascist ideology lacks consistency; this lack of consistency does not prevent individuals killing others in the name of inconsistent views.

probable version of how the things might have happened – and one that could be substantiated by Naess' own autobiographical remarks. An analogous point makes the intended neutrality of empirical semantics dubious.

As already mentioned, Naess gives a lot of examples in his deep-ecological writings. That is no coincidence. As the most basic T_0-assertions are the logical premises of the subsequent conclusions, it is impossible to deduce them from other premises. Hence the philosopher has to "show" them; they must be intuitive for those who are in need of a justification. This process is understood psychologically by Naess – he rejects a phenomenological approach (Naess, 1954; but see Rothenberg, 1993, p. 155). This kind of reasoning has the form of an inference to the best explanation. Naess seems to subscribe this because he mentions several examples of thinkers (or groups of individuals) who developed a monistic worldview. The problem in question, which awaits justification, is to make another way of living plausible. To *show* that the way of living is practiced (and not only considered theoretically) is not an explanation at all but a kind of education; explanation would consist in formulating some abstract principles from which subsequent conclusions might be derived. I cannot see how a person alien to such ways of life might be convinced solely through a descriptive reconstruction. For those who already share the philosophical system in question it might be a help for maturing their position by analyzing their own arguments and those of his or her fellows. Those examples provided, might nevertheless be a help for those who are wavering or even in strict opposition. Empirical semantics provides for Naess a useful tool to formulate a "neutral" deep-ecological platform. During the process of precization (and by adding normative and descriptive hypotheses as premises) a philosophical system is erected. So long as this process is described no problems arise.

Is this descriptive, "empirical" philosophy? I think so. Naess does not argue *for* a certain kind of worldview but shows that it can be spelled out in a concise manner. He explicitly does *not* assert that his Ecosophy T is the *only possible* formulation (precization) of ecophilosophical insights. There are many others possible. He explicates his own assumptions and their logical relations, analyzes empirically the use and interpretation of expressions, gives (admittedly sketchy) examples. His partly extreme vagueness is owed to his empirical semantics. The linchpin is the alleged neutrality of T_0-terms. His preference for environmental matters reflects his own value preference but this is uncontroversial since the choice of a proper topic of investigation always reflects a scientist's preferences and interests. The "neutrality" Naess is looking for is, in my eyes, neither possible nor necessary.

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Carl Friedrich Gauss' Correspondents in the Baltics

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Abstract: *During his whole lifetime, Carl Friedrich Gauss had a close relationship with the Baltics. In 1809 he was offered a professorship at the University of Tartu (Dorpat) but he did not accept the offer. Most of his correspondents, as those of Georg Friedrich Parrot, Friedrich Parrot, Wilhelm Struve, Johann Heinrich Mädler and Thomas Clausen, were connected with the University of Tartu. In 1821, Gauss' old school friend, Martin Bartels, moved from the Kazan University to Tartu. But we must also mention the brothers Carl Heinrich Kupffer and Adolph Theodor Kupffer. Gauss was further in correspondence with scientists working in Latvia, as for example with Magnus Georg Paucker in Mitau (Jelgava). Of course, he had friends at the Observatory of Vilnius (Wilna). In fact, the first mathematical journal was published in the Russian language in Tallinn.*

Keywords: *Carl Friedrich Gauss, history of science*

This discussion, which is sketched here only shortly, is part of our soon-to-be published book *Gauß und Russland. Gauß' Briefwechsel mit in Russland wirkenden Wissenschaftlern*. The book will be published in 2011 by the Göttingen Academy of Sciences.

Carl Friedrich Gauss (1777–1855)

Gauss was born on April 30, 1777, in Brunswick. When still a schoolboy, his mathematical abilities were recognized. These early abilities were so impressive that he received, as a young boy, financial support from the Duke of Brunswick-

Wolfenbüttel, Carl Wilhelm Ferdinand (1735–1806). Gauss was now in the position to attend the Collegium Carolinum in Brunswick (from 1792 to 1795) and to study mathematics at the University of Göttingen (from 1795 to 1798). In 1799, Gauss' thesis was published in which he had developed the fundamental theorem of algebra. In 1801, his main work on number theory, the famous *Disquisitiones arithmeticae* was published.

Gauss was also interested in the astronomical application of mathematics and he calculated the motion of the newly discovered asteroid Ceres. It had been discovered first in February 1801, but was lost track of shortly afterwards. However, using the method of Gauss, astronomers were able to find Ceres again. With this success Gauss became an internationally famous and recognized scientist not only among mathematicians but also among astronomers. Meanwhile, the duke still provided Gauss with the necessary financial support and paid him a salary as a private scientist. This lasted until the duke died on November 10, 1806, shortly after he was wounded during the battle in Jena and Auerstedt. Since 1807, Gauss was professor of astronomy in Göttingen and director of the observatory.

Russian Emperors Alexander I (r. 1801–1825) and Nicholas I (r. 1825–1855)

During the largest part of Gauss' lifetime the whole of the Baltics belonged to the Russian Empire. In 1801, the same year when Gauss became famous all over the world, the new emperor, Alexander I (1777–1825), took over the reign in Russia. Until then Russia had had only one university – the University of Moscow, founded in 1755. Alexander I founded six new universities in:

1802 Dorpat (Tartu),[1]
1803 Wilna (Vilnius),[2]
1804 Kazan,
1804 Kharkov,
1816 Warsaw, and
1819 St Petersburg.

[1] The first university in Dorpat was founded under the Swedish King Gustav II Adolf in 1632, but this university moved to Pernau and was closed in 1710. In the 17th century Dorpat was the second university in the Swedish Empire, next to the University of Uppsala (Donnert, 2007, pp. 17–35).

[2] In Wilna the Alma Academia et Universitas Vilnensis Societatis Iesu was founded in 1578; the Jesuit order was dissolved in 1773. In 1795, Lithuania became a part of Russia, so the university was refounded in 1803.

After the death of Alexander I in 1825, his youngest brother Nicholas succeeded him to the throne. Under the reign of Nicholas I (1796–1855), the universities of Warsaw and Wilna were closed in 1832 because of the Polish revolt, but in spite of this the University of Kiev, the University of Saint Vladimir, was founded in 1834. Also the foundation of the University of Helsingfors in 1828 should be mentioned,[3] because since 1809 Finland had also belonged to Russia; it was given a special kind of autonomy. In 1817, the later Emperor Nicholas I was married to Charlotte,[4] daughter of the Prussian King Friedrich Wilhelm III (1770–1840); as a result the relations between Russia and Prussia were very close. Nicholas I died in 1855, the same year as Gauss.

As mentioned earlier, two new universities were founded in the Baltics: in Dorpat and in Wilna. The more important one was the University of Dorpat, where the physicist Georg Friedrich Parrot became the first professor of theoretical and experimental physics, even before the university was founded, in 1800. In 1802/1803 he became the first rector, and in 1803 dean of the Faculty of Philosophy.

Georg Friedrich Parrot (1767–1852)

Parrot, born in Mömpelgard (Montbéliard), was a citizen of Württemberg, therefore he was educated in the Hohe Karlsschule (during the years 1782–1786), located in the capital, Stuttgart. This school had a status between that of a gymnasium and a university. The most famous students of this school were the biologist Georges Cuvier (1769–1832), the mathematician Johann Friedrich Pfaff (1765–1825) and, last but not least, the German poet Friedrich Schiller (1759–1805). Afterwards Parrot became a private teacher in Normandy and in Karlsruhe as well as in Offenbach, close to France, where the French Revolution broke out in 1789.

Since 1795, Parrot lived in the Baltics, at first in Riga and since April 1802 in Dorpat. He was promoted by the University of Königsberg in 1801, and his thesis was titled *Ueber den Einfluß der Physik und Chemie auf die Arzneykunde nebst physik[alischer] Theorie des Fiebers und der Schwindsucht. Dissertation zur Erlangung der Würde eines Professors der Physik an der Dorpatschen Universität.* This kind of addition is very unusual: Parrot was

3 Since 1640 there had been an academy in Åbo, which was moved to Helsingfors after a disastrous fire in 1828. The new university got the name Imperial Alexander University.

4 Charlotte of Prussia (1798–1860) is known in Russia under the name Aleksandra Fedorovna.

promoted in Königsberg in order to become professor in Dorpat! In 1802, Parrot met the Russian Emperor Alexander I for the first time, and a close relationship between the two men developed. This special relationship was the reason why the University of Dorpat received privileges that other Russian universities did not; the new university had more freedom, very liberal statutes, and received a larger financial support than usual (Bienemann, 1902). It should be mentioned that German was the common language at the University of Dorpat.

Since 1804, Johann Wilhelm Andreas Pfaff (1774–1835), the younger brother of the mathematician Johann Friedrich Pfaff (1765–1825), was professor of Mathematics and Astronomy in Dorpat. During Pfaff's time, an observatory was planned and built, but it was ready only in 1810. Pfaff, however, left Dorpat in 1809 and became professor in Nürnberg and later in Erlangen.

Georg Friedrich Parrot was one of Gauss' correspondents. There exists a letter from Gauss to Parrot dating from 1809 and two letters from Parrot to Gauss from 1826.

After the astronomer Pfaff had left Dorpat, Parrot tried to persuade Carl Friedrich Gauss to become Pfaff's successor (Müürsepp, 1978). Gauss did not agree because at that time mathematics and astronomy were the field of only one professor at the University of Dorpat. So it would have been necessary for him to give mostly lectures to beginners, not only in astronomy but also in mathematics. Also, the financial support for children and widows was worse in Dorpat than in Göttingen. At that time, Gauss had a family.[5] So, Johann Sigismund Gottfried Huth (1763–1818), who previously had been professor of mathematics in Kharkov, followed Pfaff.

The two later letters of Parrot,[6] dating from 1826, concern Parrot's mathematical theory of the tides. These letters of Parrot are the only source we have: Gauss was quite familiar with a detailed mathematical theory of the tides. The letters show that Gauss was able to convince Parrot that his own gravitational theory was superior and the theory of Parrot was partly wrong. Parrot accepted this and hoped that Gauss would publish his theory, but unfortunately this never happened. In the same year of 1826, Georg Friedrich Parrot moved from Dorpat to St Petersburg, where he became a member of the famous Academy of Sciences, founded in 1724/1725.

[5] This letter from Gauss dating from August 20, 1809 was published several times; the most recent edition is given in Depman 1956, pp. 242–244.

[6] SUB (Staats- und Universitätsbibliothek) Göttingen, Gauss-Nachlass. The letters mentioned in the following text are all located in Göttingen in the Gauss-Nachlass, if nothing else is said.

Wilhelm Struve (1793–1864)

Wilhelm Struve was born in 1793 in Altona (near Hamburg), which at that time belonged to the Kingdom of Denmark. Struve had studied in Dorpat since 1808 and finished his thesis in 1813; Huth was his supervisor. The title of Struve's thesis was *De geographica positione speculae astronomicae Dorpatensis*; it was published in 1813 in Mitau (Jelgava) (Struve, 1813). A copy exists in the Gauss Library in Göttingen[7] – this suggests that there were contacts between Gauss and Struve even at this time. The Gauss Library still exists: it is no longer complete, but the larger part of it is preserved within the library of Göttingen. In 1813, Struve became extraordinary professor of mathematics and astronomy at the University of Dorpat; in 1820 he became ordinary professor of astronomy. It should be mentioned that his chair was for astronomy only, because at this time the subject of Mathematics became separated from Astronomy.

Struve was the one who transformed the Observatory of Dorpat into one of the very best in Europe; he founded the journal *Observationes astronomicae institutae in specula Universitatis caesareae Dorpatensis*, published in Latin. He himself published 8 volumes: the first one for the years 1814/1815 was published in 1817, the last one for the years 1831–1838 in the year 1839.

Struve had a large influence and could afford to buy very expensive instruments, among others, in 1824, the famous refractor telescope of Joseph von Fraunhofer (1787–1826), who worked in Munich.

It was especially with this instrument that Struve made his most successful observations, the results of which were published in catalogues of double stars (Struve 1822; 1827; 1837), and the measurement of the parallax of α Lyrae (Struve, 1840). Some of Struve's observations of the parallax were even earlier than of Bessel's of 61 Cygni (Ławrynowicz, 1995, pp. 191–214), but Struve's publication came later. The reason for that was the building of the new Main Observatory in Pulkovo near St Petersburg, which was inaugurated in August 1839.

Since 1816, Struve was in charge of surveying the Baltics. It is known that Struve was able to understand and speak Estonian and Latvian. Gauss himself began surveying the Kingdom of Hanover in 1820. Gauss and Struve met during the measurement of the basis in Braak, near Hamburg.[8] This measurement was

7 Gauss Library 1370, with a personal dedication from Struve: "*Dem Herrn Professor Gauß hochachtungsvoll, der Verfasser*".

8 Letter from Struve to Gauss from November 11 (October 30), 1821.

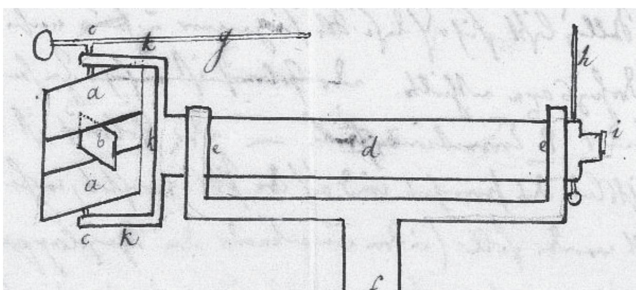
directed by Heinrich Christian Schumacher (1780–1850), who was a Danish citizen and lived in Altona. The Danish King Frederik VI (1768–1839) paid for this very expensive operation. This basis was used by both, Gauss and Schumacher, for the triangulation of Denmark as well as for the triangulation of the Kingdom of Hanover.

Struve's most famous triangulation was the so-called Struve Meridian Arc which started in Norway and ended at the Black Sea, at the mouth of the Danube. Dorpat is located directly on this meridian ([Fuss], 1853). The measurement was finished only in 1855. This Struve Arc now belongs among the UNESCO World Heritage sites.

Struve and Gauss exchanged many letters: 22 of these, written between 1815 and 1847, still exist. In their correspondence Gauss and Struve exchanged mostly their results in surveying and astronomical data.

In one of his letters, written on December 21, 1821, Gauss explained Struve his newly invented astronomical instrument, the heliotrope. With this instrument Gauss was able to survey distances larger than 100 kilometres; such large distances could not be measured by means of ordinary instruments.

Figure 1. Gauss' heliotrope, letter from Gauss to Struve, December 21, 1821



Source: SUB Göttingen, Gauss-Nachlass

As Struve's answer from September 15/27, 1822 shows, he was fascinated by the heliotrope and immediately tried to supply his own surveying group with several of such instruments.

Further, many of Struve's publications can still be found in the Gauss Library. In 1835, Struve became member of the Göttingen Academy of Sciences, supported by Carl Friedrich Gauss.

In 1839, Struve left Dorpat for the new observatory in Pulkovo, near St Petersburg, where he became its first director.

Johann Heinrich Mädler (1794–1874)

Struve's successor in Dorpat was Johann Heinrich Mädler (Eelsalu & Herrmann, 1985). He had become famous when collaborating with Wilhelm Beer (1797–1850) in Berlin. Their maps of the Moon were admired by astronomers; Gauss himself was impressed by their accuracy. Mädler got Gauss' special support when the chair of Struve became vacant. There is no doubt that Struve had favoured the young Estonian scientist Karl Eduard Senff (1810–1849), but Gauss decided in favour of Mädler. Not surprisingly, it was Gauss' favourite Mädler, who was given the chair in 1840. Mädler continued Struve's work: The publishing of *Observationes astronomicae* was continued, though not in Latin but in German under the title *Beobachtungen der Kaiserlichen Universitäts-Sternwarte Dorpat*. Under Mädler volumes IX (1842), X (1843), XI (1845), XII (1850), XIII (1856). XIV (1856), XV (1859, 1863) and XVI (1866) were published.

As far as the correspondence between Gauss and Mädler is concerned, eight letters are known, of which two, dating from 1842 and 1843, were written in Dorpat. Mädler mentioned that the observatory in Dorpat was very well equipped and how happy he was living in Dorpat. Gauss got information of Mädler's most recent observations and Mädler sent him his new publications; also the volumes IX, X and XII of the *Beobachtungen* are in the Gauss Library (Gauss Library 761).

However, Mädler's fame in Dorpat was not comparable to Struve's. In 1866, Mädler retired and returned to Germany. Thomas Clausen succeeded him.

Thomas Clausen (1801–1885)

Gauss had supported Clausen throughout his whole life. He began his career as an assistant of Heinrich Christian Schumacher at the observatory in Altona, then Denmark. Unfortunately, Clausen fell in love with Schumacher's niece and therefore was forced to leave Altona. Gauss helped him as far as possible. In 1842, Clausen became observer in Dorpat and in 1854 he became corresponding member of the Göttingen Academy. Of course, this honour was due to Gauss' support (Biermann, 1964).

There exists only one letter from Clausen to Gauss, which dates from January 1, 1855: Clausen reported about his achievements in surveying, in astronomy and even in mathematics. For example, Clausen showed that the Fermat number $2^{64} + 1$ did not have a prime number as result as expected – it was the product of two prime numbers, one of them had 14 digits and that was considered the largest prime number at that time. Fermat numbers are defined as $F_m := 2^n + 1$, $n = 2^m$. In the case of m=1, 2, 3, 4 the results are prime; in the case of m=5 Euler had shown that the result was not prime and in the case of m=6 Clausen had shown that the result was not prime.

When Mädler retired, Clausen was 65 years old. However, he succeeded Mädler and retired in 1872. Clausen stayed in Dorpat where he died in 1885, and his grave still exists. Unfortunately, however, Clausen did not continue the publication of *Observationes*, initiated by Struve, or the *Beobachtungen*, continued by Mädler.

Magnus Georg Paucker (1787–1855)

Paucker was born in the small Estonian village of Simuna (St Simonis). In 1805, he began his studies in astronomy and physics at the University of Dorpat, with Georg Friedrich Parrot and Johann Wilhelm Andreas Pfaff as his most important professors. In 1808, Paucker took part in the surveying of the Emajõgi (Embach) river and in 1809 he contributed to the construction of the first optical telegraph in Russia in Tsarskoe Selo near St Petersburg. In 1811, Paucker took over the tasks of an observer at the University of Dorpat, after the astronomer Ernst Christoph Friedrich Knorre (1759–1810) had died in 1810. In 1813, the year when Wilhelm Struve finished his thesis in Dorpat, Paucker also finished his thesis which had the title *De nova explicatione phaenomeni elasticitatis corporum rigidorum*; although this was a dissertation in physics, his supervisor had been the mathematician Huth.[9] A copy of this work can also be found in the Gauss Library (Gauss Library 1278). Because it was Struve who became assistant and later professor in Dorpat, Paucker left Dorpat in 1813 and became professor of mathematics at the Gymnasium Illustre in Mitau (Jelgava); he stayed there for the rest of his life. This gymnasium was founded in 1775 by Peter von Biron (1724–1800), Duke of Courland, and was at first called Academia Petrina but in 1806 it had been named Gymnasium Illustre. The gymnasium owned a very large library and there was also a small observatory.

In 1815 in Mitau the Kurländische Gesellschaft für Literatur und Kunst was

[9] Huth had also been the supervisor of Struve's thesis.

founded. Paucker became its perpetual secretary and in 1819 Gauss became an honorary member of this society. The diploma, dating from June 1, 1819 still exists, it is signed by Paucker and it is preserved in Brunswick.[10] Shortly afterwards Paucker published his work *Ueber die Anwendung der Methode der kleinsten Quadratsumme auf physikalische Beobachtungen*, where he quoted in detail Gauss' and Legendre's contributions to this subject; a copy of Paucker's work can be found in the Gauss Library (Paucker, 1819).

Paucker was familiar with Gauss' work, especially with his mathematical output. In 1822, he published his contribution *Geometrische Verzeichnung des regelmäßigen Siebzehn-Ecks und Zweyhundersiebenundfünfzig-Ecks in den Kreis* (Paucker, 1822). Quoting Gauss' *Disquisitiones arithmeticae* Paucker treated the theory and the construction of the regular polygons with 17 and 257 sides. Generally, Friedrich Julius Richelot (1808–1875), a student of Carl Gustav Jacob Jacobi (1804–1851), is mentioned as being the first who had achieved the theory and the construction of the polygon with 257 sides (Richelot, 1832), but Paucker was much earlier. Within this contribution Paucker published a letter from Gauss, dating from January 2, 1820. In this letter Gauss expresses his thanks for Paucker's publication and tells Paucker details about the achievement of his own results.

Gauss also mentioned that there was nobody in Germany who was able to present further developments in number theory. So Gauss was very happy to have found a new friend:

> *Ich freue mich daher um so mehr, wenn ich sehe, daß diese herrliche Wissenschaft [= die höhere Arithmetik] einen neuen Freund gewinnt, da die Anzahl solcher, die sich damit vertraut gemacht haben, äußerst klein ist. In der That kenne ich bisher in Deutschland keinen einzigen. (Paucker, 1822, pp. 217–219)*

Paucker was not only interested in number theory but also in geometry. In 1823, his *Plane Geometry* was published, and dedicated to Gauss: "Dem Archimedes der Deutschen Dr. Carl Friedrich Gauß, ordentlichem Professor der Astronomie in Göttingen, Königl. Großbritannischem Hofrath, Ritter des Guelphen= und Dannebrog=Ordens etc. etc. in Ehrerbietung und Hochachtung gewidmet vom Verfasser"(Paucker, 1823).

Paucker wrote many articles and textbooks; very often he quoted Gauss, so Paucker was really an expert as far as Gauss' work is concerned.

[10] Stadtarchiv Braunschweig, shelfmark G IX 21: 44 Nr. 7.

Since 1823, Paucker had been interested in Russian meteorology: he published several articles concerning the Russian system of measurements. Finally he wrote a huge *Handbuch der Metrologie Rußlands und seiner deutschen Provinzen*. For this work Paucker received the Demidov Prize. This award was the highest scientific honour in Russia at this time; the originator of this award was Pavel Nikolaevich Demidov (1798–1840), who was a philanthropist and belonged to the very rich Demidov family. In 1832, Paucker received the first Demidov award and also the full prize, though his voluminous contribution was written in German and not, as expected, in Russian (Mezenin, 1987).

Martin Bartels (1769–1836)

When Wilhelm Struve became ordinary professor of astronomy in 1820, it was Martin Bartels (Lumiste, 1997), who in 1821 obtained the Chair of Mathematics; Mathematics and Astronomy were from then on split at the University of Dorpat.

Gauss and Bartels had been friends since Gauss went to the primary school in Brunswick, and they remained friends during Bartels' lifetime. Bartels is the only one among the correspondents mentioned here who was older than Gauss. Bartels had been professor of mathematics at the Kazan University from 1808 to 1821.

There exist five letters from Bartels to Gauss: one was written in Kazan and the two last ones in Dorpat (Biermann, 1973). Bartels' daughter Johanna became Wilhelm Struve's second wife.

In 1822, Bartels published his textbook *Disquisitiones quatuor*, and sent a copy with a personal dedication to Gauss: "Seinem verehrten Freunde Herrn Prof. und Ritter Hofrath Gauß in Göttingen zum freundschaftlichen Andenken der Verfasser den 12./24. Nov. 1822. Dorpat" (Bartels, 1822). Bartels was an excellent teacher: in Dorpat he had many students who became quite famous later. We should mention at first Karl Julius Senff (1804–1832) and Karl Eduard Senff. Karl Eduard Senff's thesis contained the famous Frenet-Serret formulas (Senff, 1831) – as Ülo Lumiste (1963) has stated, important formulas in differential geometry. Karl Eduard Senff sent his thesis also to Gauss, and it still exists in the Gauss Library. The thesis is decorated with a handwritten dedication: "Herrn Hofrath und Ritter Profeßor Gauß" (Senff, 1831). Senff was decorated with a golden medal for his mathematical achievements. Also, Petr Ivanovich Kotel'nikov (1809–1879) und Vasilii Ivanovich Lapshin (1809–

1888), two Russian students of Bartels, have to be mentioned. Both became university professors later: Kotel'nikov in Kazan and Lapshin in Kharkov and Novorossiisk.

Friedrich Parrot (1791–1841)

The Physics Chair in Dorpat was for some time in the hands of the Parrot family. When Georg Friedrich Parrot left Dorpat in 1826, he was succeeded by his son Friedrich Parrot. He participated in five major expeditions:

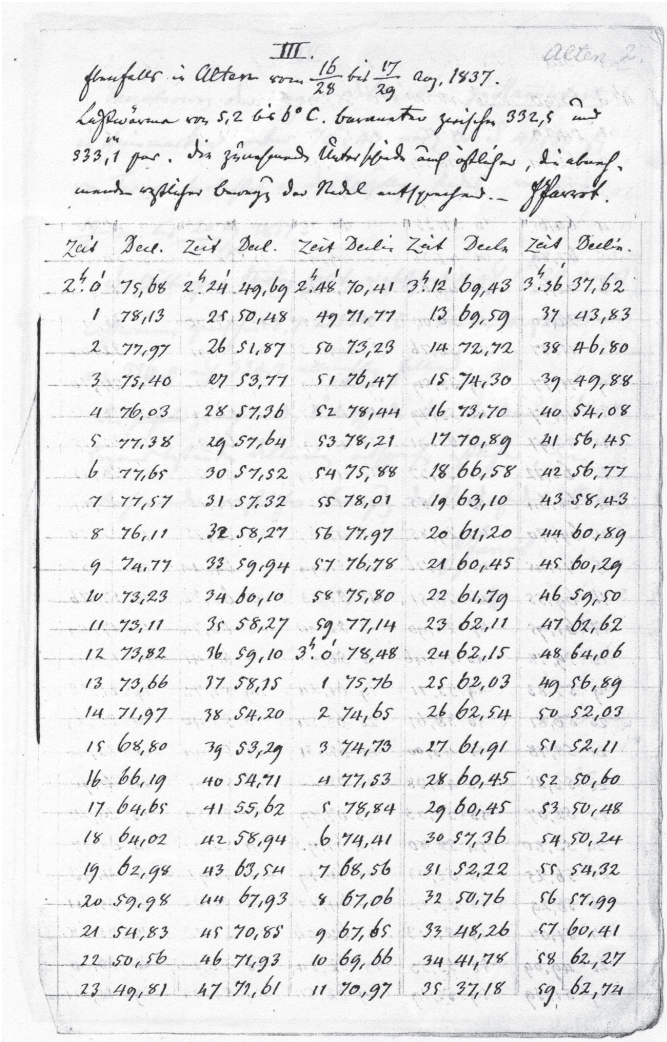
1) 1811–1812: Friedrich Parrot's and Moritz von Engelhardt's destination was the Caucasus. They investigated animals, plants, minerals, geology, and they also made physical measurements, especially measurements of levelling (the so-called *nivellements*). These researches remind us of those made by Alexander von Humboldt (1769–1859) and Aimé de Bonpland (1773–1858) on their expedition to South and Middle America during the years 1799–1804, when they also climbed the highest known mountain, the Chimborazo in Ecuador. Parrot's and von Engelhardt's highest mountain was Mount Kazbek (5,047 m) in the Caucasus.
2) 1814–1816, Parrot was mountain-climbing in the Alps; there still exists the Parrotspitze.
3) 1817, Parrot undertook an expedition to southern France and was also mountain-climbing in the Pyrenees.
4) 1829, Parrot climbed Mount Ararat (5,165 m); geomagnetic observations played the main role.
5) 1837, Parrot visited the North Cape and made several geomagnetic observations.

Gauss read a review of Parrot's expedition to Mount Ararat, this is how he became acquainted with Friedrich Parrot ([von Hoff], 1835). Later Parrot sent to Gauss and Weber in Göttingen his geomagnetic data which he had made near the North Cape; the main results were published in *Resultate aus den Beobachtungen des magnetischen Vereins*[11], the journal which was founded by Gauss and Wilhelm Weber in 1836.

There exist two letters from Friedrich Parrot to Gauss, both dating from the year 1839, accompanying the geomagnetic results from the North Cape.

[11] *Resultate aus den Beobachtungen des Magnetischen Vereins im Jahre 1838*, Leipzig 1839, in the part without pagination.

Figure 2. Friedrich Parrot's observation notes



III.

Zeit	Decl.	Zeit	Decl.	Zeit	Declin.	Zeit	Declin.	Zeit	Declin.
2h 0'	75,68	2h 24'	49,69	2h 48'	70,41	3h 12'	69,43	3h 36'	37,62
1	78,13	25	50,48	49	71,77	13	69,59	37	43,83
2	77,97	26	51,87	50	73,23	14	72,72	38	46,80
3	75,40	27	53,77	51	76,47	15	74,30	39	49,88
4	76,03	28	57,36	52	78,44	16	73,70	40	54,08
5	77,38	29	57,64	53	78,21	17	70,89	41	56,45
6	77,65	30	57,52	54	75,88	18	66,58	42	56,77
7	77,57	31	57,32	55	78,01	19	63,10	43	58,43
8	76,11	32	58,27	56	77,97	20	61,20	44	60,89
9	74,77	33	59,94	57	76,78	21	60,45	45	60,29
10	73,23	34	60,10	58	75,80	22	61,79	46	59,50
11	73,11	35	58,27	59	77,14	23	62,11	47	62,62
12	73,82	36	59,10	3h 0'	78,48	24	62,15	48	64,06
13	73,66	37	58,15	1	75,76	25	62,03	49	56,89
14	71,97	38	54,20	2	74,65	26	62,54	50	52,03
15	68,80	39	53,29	3	74,73	27	61,91	51	52,11
16	66,19	40	54,71	4	77,53	28	60,45	52	50,60
17	64,65	41	55,62	5	78,84	29	60,45	53	50,48
18	64,02	42	58,94	6	74,41	30	57,36	54	50,24
19	62,98	43	63,54	7	68,56	31	52,22	55	54,32
20	59,98	44	67,93	8	67,06	32	50,76	56	57,99
21	54,83	45	70,85	9	67,65	33	48,26	57	60,41
22	50,56	46	71,93	10	69,66	34	41,78	58	62,27
23	49,81	47	71,61	11	70,97	35	37,18	59	62,74

Source: SUB Göttingen, Cod. Ms. Magn. Verein 3: 1837 (Juli bis November).

Further relationships

The following two scientists – Friedrich Theodor Schubert (1758–1825) and Adolph Theodor Kupffer (1799–1865) – did not work in the Baltics, but they lived there for some time. Both had a close relationship with Carl Friedrich Gauss and they exchanged many letters.

Schubert was born in Helmstedt and therefore was a fellow countryman of Gauss. During the years 1783–1785 Schubert was a private teacher or house teacher and a surveyor in Reval (now Tallinn). Since 1785 he had made his career in St Petersburg, where he was at first the so-called adjunct and afterwards ordinary member of the Academy of Sciences. His fields of research were astronomy, surveying, and geomagnetism. Gauss and Schubert exchanged five letters during the years 1802/1803 and 1823.

Kupffer was born in Mitau. He attended there the Gymnasium Illustre where Magnus Georg Paucker had been his teacher. He began his studies at the University of Dorpat, continued in Berlin, and finished in Göttingen. There he also listened to lectures by Gauss. From 1822 to 1826 he was professor in Kazan; then moved to St Petersburg, to the Academy of Sciences. In 1849, Kupffer founded the Main Physical Observatory in St Petersburg, where he was the first director. Kupffer and Gauss worked together on elasticity theory, metrology and especially on geomagnetism. They exchanged 27 letters between 1823 and 1849; Kupffer was one of the most important correspondents of Gauss. It was Gauss who saw to that Kupffer became member of the Academy of Sciences in Göttingen in 1842 and that he was decorated with a special award from the Göttingen Academy of Sciences in 1855.

Adolph Theodor Kupffer's elder brother, Carl Heinrich (1789–1838), was also born in Mitau. He had studied mathematics at the University of Dorpat, but did not become professor there as he had hoped. There still exist three letters from Carl Heinrich Kupffer to Gauss that document this. Instead, Carl Heinrich Kupffer worked as scientific teacher at the main gymnasium in Reval. In 1835, however, Carl Heinrich became professor of mathematics at the Bezborodko Lyceum in Nizhyn. He died before he could have become professor at the newly founded the University of St Vladimir in Kiev.

Carl Heinrich Kupffer was the founder of the first special journal devoted to mathematics, *Uchebnyi matematicheskii zhurnal* (the journal for teaching mathematics), published in the Russian language in Tallinn. This was the first purely mathematical journal in Russia. Unfortunately it existed only in the years 1833 and 1834, because Kupffer left Dorpat. Copies of this journal are not available in Germany, but are to be found in the university libraries of Tallinn and Tartu.[12]

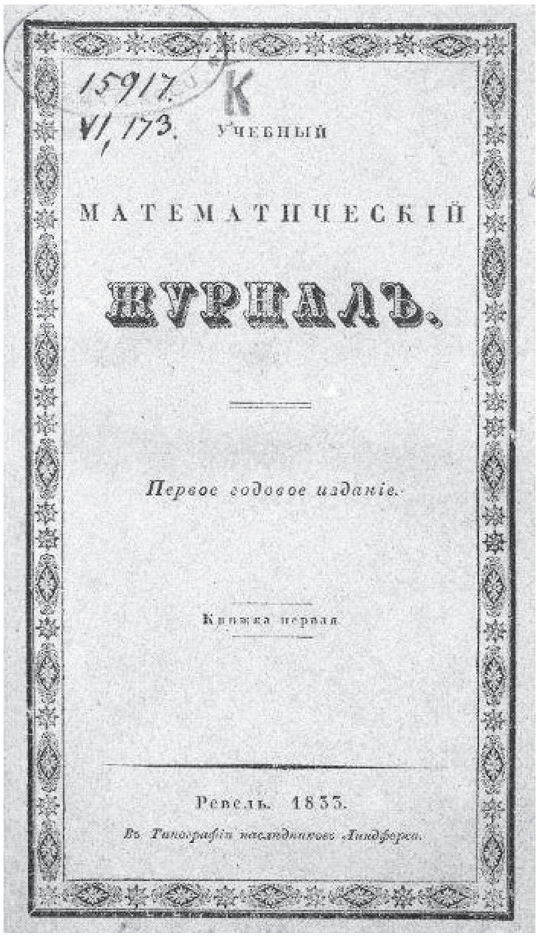
Furthermore, it should be mentioned that Paul Schilling von Canstadt (1786–1837) was born in Reval; he had developed a telegraphic apparatus and

[12] We want to thank Mrs. Dr. Katrin Kaugver and Mrs. Malle Ermel for their help in making for us copies of this journal.

worked mostly as a diplomat and was an Orientalist. He too was one of Gauss' correspondents.

The observatory of Wilna was founded in 1753; it was not affected, when the University of Wilna was closed. Gauss was familiar with the achievements of the observatory and was in contact with its directors Jan Sniadecki (1756–1830), Georg Fuss (1806–1854) and Georg Sabler (1810–1865). Gauss appreciated their scientific contributions, although there is no correspondence.

Figure 3. Title page of volume 1 of the journal for teaching Mathematics, Reval 1833.


УЧЕБНЫЙ
МАТЕМАТИЧЕСКІЙ
ЖУРНАЛЪ.
Первое годовое изданіе.
Книжка первая
Ревель. 1833.
Въ Типографіи наслѣдниковъ Линдфорса.

Source: Academic Library of Tallinn University.

Final remarks

As mentioned previously, the Baltics were a part of Russia during the time considered here. The Baltic scientists were appreciated in Russia, and most of the professors in Dorpat were members of the Academy of Sciences in St Petersburg. These were, in alphabetical order: Martin Bartels, Thomas Clausen, Ludwig Kämtz,[13] Karl Friedrich Knorre,[14] Ferdinand Minding[15], Georg Friedrich Parrot, Friedrich Parrot, and Wilhelm Struve (Modzalevskii, 1908). Kämtz, Knorre and Minding did not correspond with Gauss. The only scientist who was mentioned among the correspondents and was not member of the academy in St Petersburg is Johann Heinrich Mädler. The reasons for that are not known.

Very soon the young Gauss came in close contact with the scientists in Russia, especially in St Petersburg. The name Gauss has been mentioned in the records of the Academy of Sciences since 1799; he sent abstracts of his thesis, his *Disquisitiones arithmeticae* and the construction of the regular polygon with 17 sides in St Petersburg in 1800/1801. In 1802, he became Member of the Academy and was offered a position as astronomer, which he did not accept. Summing up, he exchanged letters with the following 17 scientists:

Martin Bartels (Kazan, Dorpat), Thomas Clausen (Dorpat), Nikolaus Fuss (St Petersburg), Paul Heinrich Fuss (St Petersburg), Carl Jaenisch (St Petersburg), Carl Heinrich Kupffer (Dorpat, Reval, Nizhyn), Adolph Theodor Kupffer (Kazan, St Petersburg), Joseph Johann Littrow (Kazan), Nikolai Ivanovich Lobachevskii (Kazan), Johann Heinrich Mädler (Dorpat), Georg Friedrich Parrot (Dorpat, St Petersburg), Friedrich Parrot (Dorpat), Magnus Georg Paucker (Dorpat, Mitau), Paul Schilling von Canstadt (frequently in St Petersburg), Ivan Mikhailovich Simonov (Kazan), and Wilhelm Struve (Dorpat, St Petersburg).

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[13] Ludwig Kämtz (1801–1867) studied at and graduated the University of Halle. In 1827, he became extraordinary and in 1834 ordinary professor there. In 1842, he got the Chair for Theoretical and Practical Physics at the University of Dorpat. In 1865, he became the second director of the Main Physical Observatory in St Petersburg.

[14] Karl Friedrich (Karl Khristoforovich) Knorre (1801–1883) was the son of the astronomer Ernst Christoph Knorre (1759–1810), who was extraordinary professor of mathematics at the University of Dorpat and observer at the observatory in Dorpat. Karl Friedrich Knorre had studied astronomy under Wilhelm Struve. In 1821 he became director of the observatory in Nikolaev, in 1828 he became corresponding member of the Academy of science in St. Petersburg.

[15] Ferdinand Minding (1806–1885) had studied at the universities of Halle and Berlin; he graduated in Halle. In 1830 he became professor in Berlin; in 1843 he got the Chair of Mathematics at the University of Dorpat.

There are still 120 extant letters that will be published in the forthcoming book *Gauss and Russia. Gauss' correspondence with scientists working in Russia*. (Reich & Roussanova, in print). The list makes it clear that Dorpat, Kazan and St Petersburg played an important role for Gauss. It can be said that there was no country where Gauss' work was better recognized than in Russia, and especially the Baltics.

Acknowledgment

Arthur Stinner (University of Manitoba, Winnipeg) corrected our English; we wish to thank him very, very much.

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Development of Geological Studies in Lithuania: New Records on Roman Symonowicz's 1803 Mineralogical Travel

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Abstract: *At the start of the 19th century, geological research in Lithuania tended to encourage prospecting for useful minerals as the sources of salt, coal, gypsum, and iron ore deposits. Mineralogy – a popular discipline at that time – was introduced at the Vilnius Imperial University in 1803. Roman Symonowicz (1763–1813), Doctor of Philosophy and Medicine, but greatly interested in mineralogy, was invited to give lectures on mineralogy. Symonowicz was one of A. G. Werner's students at the Freiberg Mining Academy in 1804/1805; he was a diligent person and a thorough mineralogist. In 1806, Symonowicz published the first mineralogy handbook (in Polish), and wrought up the first classification of minerals. Symonowicz earned fame for his 'mineralogical' trip to Transylvania, Hungary, and Poland, carried out in 1803. This article presents new documents covering so far unknown events from more than two hundred years ago that were, for the first time, discovered in the Krakow (Poland), Vienna (Austria) and Banská Štiavnica (Slovakia) archives.*

Keywords: *geology, history of science, Lithuania, mineralogical travels, mineralogy, Roman Symonowicz, Vilnius University*

Introduction

After the Mineralogy course had been introduced at the Vilnius University[1] in 1803, it was Symonowicz who was the lecturer for the first-year students. In 1804,

[1] According to the Low Lithuanian language, the spelling *Vilnius* will be used henceforth (Engl. Vilna, Pol. Wilno, Rus. Вильно).

a special Mineralogy Cabinet was founded (Grigelis, 2003a, b, c). Already at the end of the 18th century, there was a small collection of minerals and rocks in the Nature History Cabinet of the Principal School, in the Grand Duchy of Lithuania, which had been used by the first lecturers Josephus Gerardus Sartorius, Jean Emanuel Gilibert, Johann Georg Adam Forster, Ferdinand Spitznagel, Stanisław Bonifacy Jundziłł.[2] The collections were accessioned not only by departmental purchases but also by private collections, including highly valuable items donated by rich patrons. Having become a mineralogy lecturer, Symonowicz took care about the enlargement and keeping of the collection; in 1803, he was sent by his university to collect and/or purchase minerals and rocks to Transylvania, Hungary, Saxony; however, "he had to see that the items collected were not too small or damaged" (Grigelis, 2005). The result was that, finally, the University Mineralogy Cabinet contained the richest in Europe collection of minerals, rocks, palaeontology samples and meteorites (Grigelis, 2007a, b). The collection was used for research; and only a small part of it survived in archives (Žalūdienė, 2008).

To increase his practical knowledge, Symonowicz visited the Banská Štiavnica and Banská Bystrica ore deposits, the Kremnitz and Hronitz mints, and the Wieliczka salt mines. Back in Vilnius, Symonowicz reported about his trip to the University Council, first published in Lithuanian (Grigelis, 2005). The report seems to be an eminently valuable document written over two hundred years ago. It is evidencing author's broad sophistication and scientific intelligence. Moreover, it reports on specific features of metal deposits and rock-salt exploration in the Central European deposits, demonstrating scientific circumstances and the state-of-the-art teaching mineralogy and mineralogical researches.

For several years the authors studied the archives of the Vilnius University (VU), Wroblewski Library of Academy of Sciences (MAB), the Princes Czartoryski Library in Kraków (B_Cz), and the Court Chamber for Mining and Minting (*Hofkammer in Münz- und Bergwesen)* in Vienna in order to enlarge knowledge about the activities of the Vilnius University at the start of the 19th century and the academic relations, as well as the phenomenon of the extraordinary popularity of mineralogy among the public (Garbowska, 1993). In 2007, these studies lead us to Slovak Republic, the State Central Mining Archives of Ministry

2 Jean Emanuel Gilibert (1741–1814), taught natural history and mineralogy at the Principal Lithuanian School in Vilnius in 1781–1783, later became Mayor of Lyon in France; Johann Georg Adam Forster (1754–1794), lecturer of Mineralogy, Botany and Zoology (1784–1787), naturalist, traveller, publicist, participant of James Cook's second voyage around the World (1772–1775); Stanisław Bonifacy Jundziłł (1761–1847), botanist, lecturer of Natural History (1797–1803), Botany and Zoology, chair of Botany Department.

of the Interior, located in Banská Štiavnica (Fig. 1) (Pol. *Szczawnica,* Germ. *Schemnitz*, Hung. *Selmecbánya*), one of the main mining centres of the League of Seven Mining Towns (*Septem Civitatis; Ziemia Siedmiogrodzka*). Some new documents about Roman Symonowicz's mineralogy trip were found there.

Figure 1. Slovak Republic, situation map (Slovakia website).

Roman Symonowicz

Roman Symonowicz, Doctor of Philosophy and Medicine, graduated from the Vilnius Teachers' Seminary. From 1792, he lectured on law and history at the Vilnius Gymnasium, and from 1797 he was the vice-professor of Anatomy at the Main School of the Grand Duchy of Lithuania. In 1801, Symonowicz went to Vienna to improve his knowledge in medicine under Johan Peter Frank. However, at the same time he went in for mineralogy. So, in June of 1803, the Vilnius University sent him on a mineralogical trip to Hungary and Transylvania to get acquainted with ore and salt mining and to purchase minerals and rocks for the university collection. Rector of the university, Hieronim Strzemień Stroynowski[3], supported this trip in every possible way.

After coming back Symonowicz presented a comprehensive report to the University Council (*Roman Symonowicz's Report to the Vilnius Imperial University Council*, 1803, pp. 1–5, 10). This is one of the first sources about the geology of Lithuania given by a professional and well-educated geologist (Grigelis, 2005). Later, in 1804–1805, Symonowicz studied mineralogy further at the Freiberg Mining Academy under the distinguished geologist Abraham Gottlob Werner (Skuodienė, 2003; Wójcik, 1972).

[3] Hieronim Strzemień Stroynowski (1752–1815), university rector (1799–1806), priest, economist, lawyer, famous physiocrat; in 1804 Stroynowski sent a letter inviting Abraham Gottlob Werner as Mineralogy Professor at the Vilnius University.

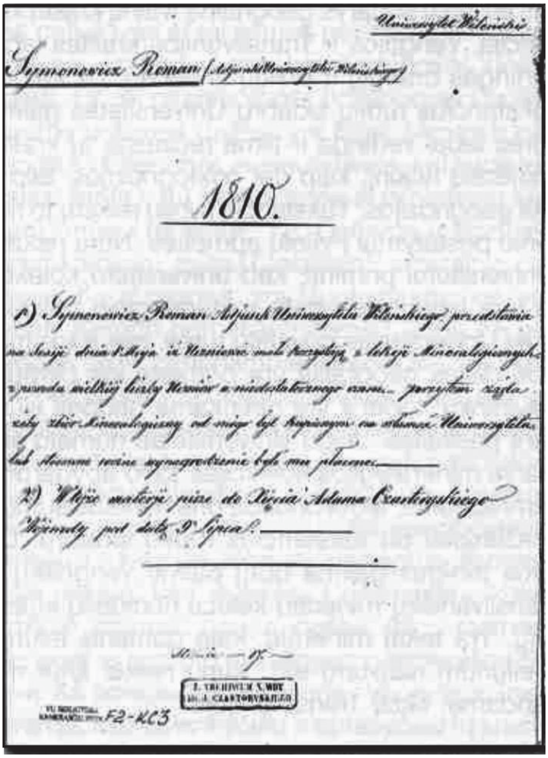


Figure 2. Facsimile of Vilnius University Yearbook for 1810 (VUB RS, F 2 KC3).

Being just an adjunct (assistant professor – *author's note*) with 300 silver roubles as annual salary, Symonowicz was a scientist of merit for his time. In 1806, he published his mineralogy manual and pretended to become a mineralogy professor (Symonowicz, 1806). He was backed by the then Rector Hieronim Stroynowski, but the University Council had not elected him. Symonowicz was single and perhaps not financially well funded. On May 18, 1810, the curator Duke Adam Jerzy Czartoryski[4] wrote to the Rector Jan Śniadecki[5] in order that Symonowicz *"could be promoted as mineralogy professor"* (*Letter from Duke Czartoryski*..., 1810). However, being already a 47-year-old man, Symonowicz wrote directly to the university curator Duke Czartoryski on July 9, 1810 (*Vilnius University Yearbook*, 1810, pp. 255, 275; Fig. 2), linking two likely favourable circumstances: a chance to obtain professorship and a proposal to give over his collection to the university [translated from Polish]:

> *1. I supplicate His Grace W*[ojewóda] *Duke a favour that I was paid for the mineralogy collection I was using at public lectures.*
>
> *2. If I am elected ordinary professor with a salary* [annual] *of 15 000 roubles in silver, I shall give over my mineralogy collection to the University for twenty four thousand roubles in silver. This sum might*

[4] Adam Jerzy Czartoryski (1770–1861), who was Curator of Vilnius University in 1803–1824.

[5] Jan Śniadecki (1756–1830), Rector (1807–1815), astronomer, mathematician, philosopher, highly supported science and education; corresponding member of the St Petersburg Academy of Sciences.

be paid off outright or a half outright and the rest by the end of the next year of 1811.

3. If I remain at the University in present situation: the price of my mineralogy collection is twenty five thousand eight hundred roubles in silver. This sum [should] *be paid off me outright or by the end of 1810 at the latest. In this case I shall not take any care about the collection as soon as it lapses being my property.*

4. If the University does not acquire my mineralogy collection: I shall use it during my public lectures when I am elected ordinary professor with a salary of 15 000 roubles in silver and when the University pays for the use of the collection 500 roubles in silver per year. Such a 500 rouble pay shall not be any reason for the University to claim for my collection that will always be my property. In winter, I shall properly heat the rooms where my collection is kept at the expense of the University.

R. Symonowicz
9 July 1810.

The curator Czartoryski regarded this with favour. However, it was probably too late – the expectations of Symonowicz did not come true. He died on January 29, 1813, in Vilnius after his semi-centennial. His burial site is unknown (possibly, the Bernardine Cemetery).

Symonowicz's deserts to the university are outstanding: his mineralogy collection contained over 20,000 specimens; he created his (and the first Polish) classification of minerals; he owned a rich geological library that was later donated to the university. Few scholars who later became well-known scientists such as Makar Bogatko, Norbert Kumelski had learned mineralogy under Symonowicz (Grigelis, 2007a, b).

Symonowicz wrote that 12,643 mineral and rock specimens in the university's collection belonged to him; and this was the fourth collection in Europe after those of Werner in Freiberg, de Drèe in Paris, and van der Nulle in Vienna (Grigelis, 2005)[6]. After Symonowicz died, the university bought the collection from his brother Jacob for only 10,250 roubles in silver.

6 Abraham Gottlob Werner (1749–1817), German geologist, professor at Freiberg Mining Academy, Saxony, leader of his time Neptunism school; Étienne Gilbert, Marquis de Drèe (1760–1848), French nobleman; Jacob Friedrich von der Null (Van der Nulle; d. 1826?), Austrian banker in Vienna.

Mineralogy travel

Having returned from Hungary and Transylvania, Symonowicz presented the above-mentioned report to the Council of the Vilnius Imperial University (Grigelis, 2005). The dates and events of this travel, according to the archive documents, are as follows:

- *At the end of June* [25] *he departed from Vilnius* [with a coachman]*;*
- *At the beginning of August he arrived to Vienna, where he got the permission* [August 10]*;*
- *At the end of August he departed for Hungary;*
- *On September 11 he got permission from the Banská Szczawnica* [Schemnitz] *administration;*
- *On September 14 the mountains were covered in early snow;*
- *In Banská Szczawnica he visited four ore mines: Pacherstollner, Zygmunt's, Stephen's, Maximilian's mine;*
- *He went to Kremnitz* [coin mint; Mennica Kremnicka]*;*
- *Maria Hilf ore mine;*
- *Banská Bystrzyca* [Neusohl; where 300 centners of copper coins used to be minted per day]*;*
- *Panska Dolina* [Herngrund] [4 hours' way from Bystrzyca]*;*
- *Tajow* [2 hours' way from Bystrzyca]*;*
- *Hronitz* [12 hours' way northwards from Bystrzyca].

In his report Symonowicz presents a detailed description of his travel. Its full translation from Polish is published in Lithuanian and in English (Grigelis, 2005; 2007a). An excerpt from it about the visit by Symonowicz to the Bansk*á* Štiavnica region rich in ore is given below:

> ***(i) Roman Symonowicz's Report to the Vilnius Imperial University Council About His Foreign Travel in 1803*[7]**
>
> *I, the undersigned, was sent by the University to make the mineralogy trip to Hungary and Transylvania*[8]*, and now I present the report about the localities I had visited. I departed from Vilnius at the end of June, according to our calendar, and due to slender means – eight hundred roubles – given me by the University, I couldn't post but* [travelled] *with a coachman. In early August I reached Vienna, and*

[7] *Roman Symonowicz's Report to the Vilnius Imperial University Council*, 1803, pp. 1–5, 10. Translation from Polish.

[8] Orig. *Ziemi Siedmiogrodzkiej*.

till I was given the necessary passports, three weeks had passed. In late August I departed for Hungary, however, the last winter that had come too early to the mountains, covered them on September 14, therefore it was difficult to reach the mountains to do geognostic observations. In spite of all this I was in Szczawnica[9]*, where I visited four mines: Pacherstollner mine with its vein formed mainly of Zinopel*[10]*, Zygmunt's mine, Stephen's mine and Maximilian's mine with its vein formed of quartz, field spar, and white clay, but earlier – cinnabar.*

I looked over the shop, where various silver and gold ores[11] *are grinded, washed and processed into schlich* [heavy concentrate]*, where gold by means of washing is separated from lead schlich, and metallurgy furnaces, i.e., the furnaces where the ores are melted. In Kremnitz I looked over all metallurgy furnaces, smelting furnaces, furnaces and apparatuses, where nitric acid is obtained by distillation, where quartering, granulation and separation of the residual gold from silver takes place; I looked over the shop of silver and gold ore ragging, washing and processing into schlich, all mint shops and equipment and came around the Maria Hilf mine, where beside silver and gold ores, grey antimonite crystallised into prisms and long needles is found. I was in Bystrzyca*[12]*, where I looked over metallurgy furnaces and smelting furnaces. I was in Panska Dolina*[13]*, four hours by road from Bystrzyca, where I looked over the copper ore mine, notable for groundwater cementing by copper salt and cobalt salt, and most famous by its immeasurable length under the land surface. In Tajow, two hours by road from Bystrzyca, I looked over the liquation furnaces, i.e., furnaces where silver is separated from copper by means of lead, and smelting furnaces. No wonder that so many metallurgy and smelting furnaces are located near the Hungarian silver and gold mines, because soon after the death of Born*[14]*, his method of silver and gold separation from the ore by means of amalgamation was applied there. Bosses of the furnaces told me that, using amalgamation, much gold is lost, but this is hard to swallow this. During my visit to Bystrzyca, I looked over the mint, where 300 hundredweights of copper coins are minted per day,*

[9] Orig. *Schemnitz* (Pol. Bańska Szczawnica), now Banská Štiavnica, Slovakia.
[10] Orig. *Zinopel* – most probably 'cinnabar', mercury ore.
[11] Orig. *minery* – ores.
[12] Orig. *Nesohl* [Neusohl], now Banská Bystrica, Slovakia.
[13] Orig. *Herngrund*, now Špania Dolina, Slovakia.
[14] Ignaz Edler von Born (1742–1791) – Austrian mineralogist.

> *and where after the final marking they are sent to the Kremnitz mint*[15]*; I was in Hronitz*[16]*, a locality 12 hours by road north of Bystrzyca towards the Carpathians, notable for furnaces and iron smithies belonging to royal treasure and very perfected. Two of these furnaces are 28 feet high, where mineras or iron ores, i.e., clayey common iron ore, ragged brown iron ore, brown hematite iron ore, common magnesium iron and spar iron ore, are melted. The raw material that is produced in the smithies in the same way as the material from four other mineras is processed into band iron. All iron machinery, used for various purposes in Schemnitz, Kremnitz and Bystrzyca mines, and all equipment in Kremnitz and Vienna mints are made in Hronitz smithies.* […]

Symonowicz made interesting remarks about the style of his trip, circumstances of visiting ore mines, as well as proposals to the university about the circumstances of acquiring a mineralogical collection. He wrote:

> […] *Being short of money and, hence, due to the short duration of my mineralogical trip, I could not fully fulfil the instruction sent me by the Curator of HG Duke and by the University*[17]*. It's not so difficult to describe which ores compose an ore field, and such a description wouldn't be very useful, but the description of mountains, rocks and ore veins constituting them with all geognostic circumstances, to learn whether these thick veins in Schemnitz up to 14 or 18 fathoms in some places are real veins, whether they are also ore beds, as Mr. Werner thinks, to describe peculiarities of melting of each ore, is not so simple a thing. Such observations and descriptions are very revealing and, in addition to mineralogy, geognosy and chemistry knowledge, they are much time- and labour consuming/*
>
> […] *More than a hundred students who attended my lectures on mineralogy, including twenty ones who passed the exams, persuade the University that the mineralogy knowledge in our country, in a short time, will become more popular than it was up to now. Many of them will study rock strata on the banks and valleys of our rivers, in order to satisfy various economic needs. In my lectures, I have finished the first class of oryctognosis, in all cases integrating the geognostic, geographical and economic knowledge about each mineral; major part of my students have copied my sextern down; the opinion about*

[15] Orig. *Mennica Kremnicka*, now Kremnica, Slovakia.
[16] Orig. *Hronice*, now Hronec, Slovakia.
[17] *Instrukcja dla JP. Symonowicza*. CVIA, F 721, 1803, cited in Garbowska, 1993, p. 82.

their progress was expressed to the University by Highly Esteemed Rev. Dean of Physics Faculty[18] *and professors who took part in the examinations. Recurring to the trip that I wanted to carry on, I have the honour to inform the University that Hungarian, Transylvanian and Tatras mines are far away from each other, thus, visiting them caused expenses greater than I was given last year. In the mountains, where there is no post and rare* [inhabitants] *keep horses, to drive a mile or several miles, one should pay a local gold coin (zloty rynski) per mile, moreover to fodder a horse at one's own charge. Last year, all my trips made up 443 miles, except for distance covered by foot – then the total should be doubled; one has to take a guide everywhere, an office servant (officialist) who accompanies you to the mine, who shows you the furnaces and various machinery; the miners carrying lamps in the mine also should get at least their daily money; one can take an attendant not for good but for protection from various incidents.*

[…] *Visiting of all the above-mentioned localities and their mines will take me for more than a year. I ask the Council of the Vilnius Imperial University to allot two thousand five hundred roubles in silver for my trip useful in all respects. The instructions of HG Duke Mr Curator*[19] *prescribe me to buy "a collection of ore minerals produced from veins and mountains in the Hungarian and Transylvanian mines, supervising that the samples selected were not too small or damaged".*[…] *In the localities with the mines it is possible to buy at popular prices very rare and excellent minerals, which, in my own experience, would cost much more when buying from the traders. Moreover, minerals bought at the site are much more valuable, because their geography is known; thus the University seems, in time, to form a geographical collection from various regions. The region of Hungary and Transylvania is very rich in precious and excellent minerals. For a thousand roubles in silver, the University would be able to purchase a very valuable and the rarest collection of minerals of those countries, both in oryctognosis and in geognosis. One thousand roubles would be necessary to pay the transport of this collection to Vilnius* […].

Signed Roman Symonowicz
Adjunct of Imperial University
S. Malewski Prof. Sekret.
1804. 30 April

18 Józef Mickiewicz, uncle of the poet Adam Mickiewicz.
19 Adam Jerzy Czartoryski, University Curator in 1803–1824.

Septem Civitatis

As mentioned above, in 1803 Roman Symonowicz visited the Banská Štiavnica ore mine region called *Septem Civitatis* (*Siebenbürgen, Ziemia Siedmiogrodzka*). The State Mining Archives (*Štátny ústredný banský archív,* ŠÚBA) in Banská Štiavnica was found to have manuscript documents related to the visits by Symonowicz to the copper and silver mine area. By the way, since 1780, the publications about the history of the League of Seven Mining Towns have been known (von Fichtel, 1780). The area was already a well-known site exploiting copper and trading with a matter in European countries since the 16th century (Fig. 3).

Figure 3. Copper trade routes from the Hungarian mining area in 16th- to 17th-century Europe (Slovakia website).

Banská Štiavnica (with a population of 10,000) lies in the area of the Štiavnica Mountains, Central Slovakia, on the slopes of a picturesque volcanic caldera between the hills of Glanzenberg and Paradayz; from the south it is blocked by the hill of Calvary (Scharffenberg). This well-conserved medieval town with Baroque churches, monuments and Renaissance houses is placed on the UNESCO heritage list. There are two universities *(Banícka a lesnícka akadémii v Banskej Štiavnici)* in the town. The site of Krahule about 10 kilometres from Banská Štiavnica is notable for the geographical centre of Europe, marked by a stone monument on the hilltop.

The development of the town is closely related to the working of rich silver ores. The settlement is known from the Neolithic, and the first silver mine had been established by the Celts in the 3rd century B.C. The Slavonic tribes moved here in the 10th–11th centuries. From the early Middle Ages there was the main gold and silver production centre (*terra banensium,* 1156) in the Kingdom of Hungary. In

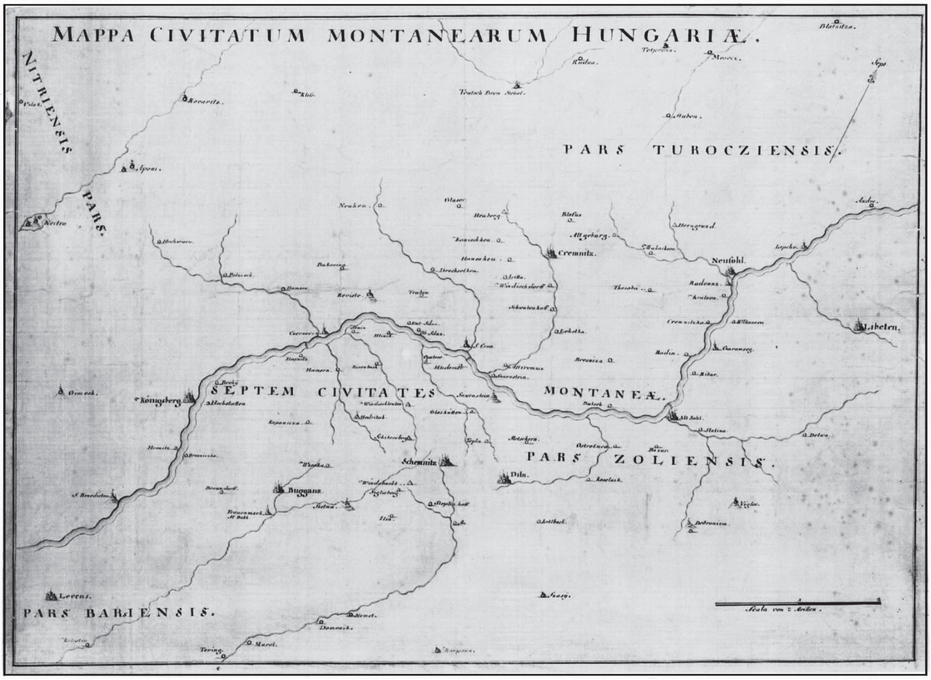


Figure 4. Map of Lower Hungary (present-day Central Slovakia) Mining Towns (ŠÚBA, HKG VI, Inv. No. 247).

the 13th century, the Germans, representing a higher level of culture, came here. In 1238, the town was given the royal status. During battles against Ottomans in the 16th century, a defence system had been built with its two elements – the Old Castle and the New Castle – still standing. During the Reformation period, the town was within the League of Seven Mining Towns together with Banská Belá, Banská Bystrica, Kremnica, Ľubietová, Nová Baňa and Pukanec (Fig. 4).

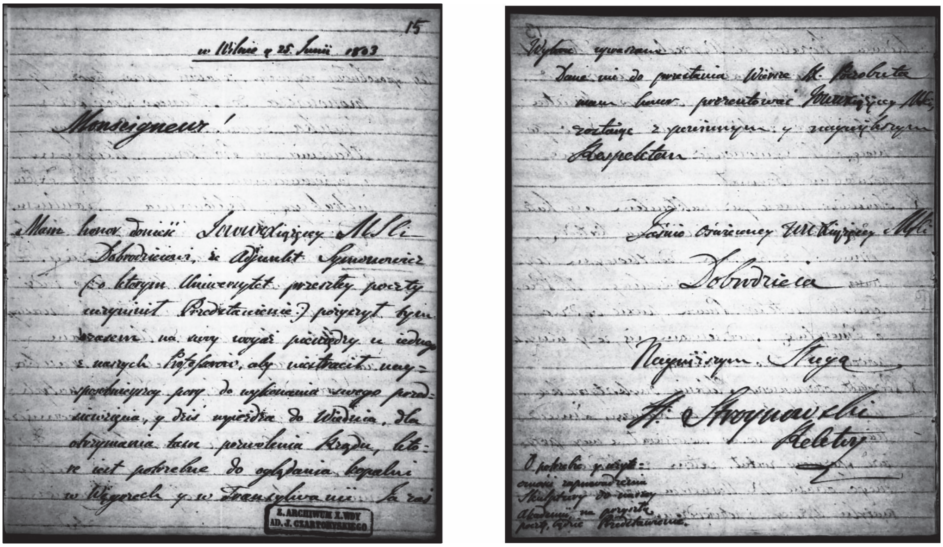
The town was an important mining industry centre. In 1627, for the first time in the world, smokeless gun powder was used in the ore mines. In the 18th century, the water storage and canal system, the so-called *tajchy*, had been constructed to drain the mine water. In 1735, for the first time in the Kingdom of Hungary, Samuel Mikoviny established the mining school which later, in 1762–1770, favoured by the Empress Maria Theresa, had been reformed into the Mining Academy, the first technological university in the world (Novák & Herčko, 1992). In 1782, Banská Štiavnica's population was over 23,000; and it became the third largest town in the Kingdom of Hungary after Bratislava and Debrecen. In the second half of the 19th century, the scale of ore mining sharply decreased, and the best part of the mines was closed. Nowadays one mine, Hodruše Hamré, is still working in the vicinity of Banská Štiavnica.

Now Banská Štiavnica is an attractive recreation and tourist centre notable for its Slovakian Mining Museum. Here one can visit the two-kilometre-long seventeenth-century mines and galleries; by the way, the galleries of Pacherstollner mine extend under the very centre of the town.

Archive trouvaille

A large part of the Vilnius University curatorship archive is kept in Krakow's Princes Czartoryski Library Manuscript Unit of old printed and cartographic matter. In the 1803 files, we have found several documents in which the trips made by Symonowicz are mentioned. The document dated to 25 June 1803 [old style] is written to the curator Czartoryski by the Rector of the Vilnius University, M. Stroynowski (Fig. 5; in Polish):

> *Mam honor donieść* [illegible] *Dobrodzieiowi, że Adjunkt Symonowicz (o ktorym Uniwersytet przeszłey poczty uczynił Przedstawienie) pożyczył bym czasem na swoy woyaż pieniędzy u iednego z naszych Profesorow, aby niestracił naysposobnieyszey pory do wykonania swego przedsięwzięcia, y dzis wyieżdża do Wiednia, dla otrzymania tam pozwolenia Rządu, ktore iest potrzebne do oglądania kopalni w Węgrzach y w Transilwanii.* [...] *Woyaż Adjunkta Symonowicza do kopalni w Węgrzach y w Transilwanii iednomyslnie od wszystkich iest uznany za potrzebny y użyteczny: bo tenże Symonowicz ma wielką passyą, y zdatność do Mineralogii, y dał tego dowody.* [...] *H. Stroynowski Rektor.*
>
> *[English translation: I have the honour to inform* [illegible] *the Benefactor that the Adjunct Symonowicz (the University had introduced him earlier by mail) has now borrowed money for his trip from one of our professors in order to avoid losing the best time for his undertaking and now departs for Vienna to obtain there the permission of the Government necessary for the survey of ore mines in Hungary and Transylvania.* [...] *The trip by the Adjunct Symonowicz to the ore mines of Hungary and Transylvania has been unanimously recognised as necessary and useful since Symonowicz has a strong partiality and gift for mineralogy and has presented proof of it.* [...] *H. Stroynowski Rector].*


w Wilnie d. 25 Junii 1803

Monseigneur!

Figure 5. H. Stroynowski's letter to A. J. Czartoryski dated 25 June 1803 (RKPS_B Cz, No. 6395. T. 2, 15–17).

When Symonowicz arrived in Vienna, he applied for accreditation at the Court Chamber for Mining and Minting to obtain a license to visit Hungarian ore mines. As stated in the archive document (*Decision of State Vice-Chancellor Count Cobenzl to grant license...*, 1803)[20] an application was presented by a State Vice-Chancellor to Chamber meeting on 10 August, 1803 (full original extract is given in German):

1397/8863	*Statim*
d.d. 6ten praes. 8t August 1803 Graf d Cobenzl Staatsvicekanzler ersuchet, den russisch kaiserlichen Unterthanen Simonovicz, Doktor der Arzneykunde, die Bereisung der Hungarischen Bergwerke zu gestatten, und die Ausfertigung, der erforderlichen Anweisungen, und Credite zu veranlassen.	*Exped. d. 9t August*
Offenes Creditiv	*Zur Raths Sitzung den 10n August 1803*

pr Creditiv

In diesem Gewähr wird das anverlangte Creditiv an das k.k. Haupt–Oberstkammer–Grafenamt und die übrigen Haupt- und

[20] The document presented by Professor Marianne Klemun, Department of History, University of Austria, on 7 July, 2009.

*Oberbergämter und die Siebenbürgische k. Landes Thesauriat ausgefertigt haben. * Da man auf Ansinnen der k.k. geheimen Hof und Justizkanzellei den Rusisch kaiserlichen Unterthan, Doctor der Arzneykunde und Mitglied der Lithauer Universität zu Wilna Herrn Simonovicz erlaubt hat, die Hung.- und Siebenbürgischen Bergbezirke bereisen, und die Berg und Hüttenwerke einsehen zu dürfen, so hat das k. Oberstkammergrafenamt, und die übrigen k. Bergoberämter; so wie das k. Siebenbürgische Landes Thesauriat diesen wißbegierigen Reisenden mit aller Willfährigkeit die Befahrung der Gruben und Besehung sämtlicher Manipulationen Werker zu gestatten.*

An die k.k. Geheime Hof– und Staatskanzellei

Die k.k. geheime Hof und Staatskanzellei aber wird mit Note erwidert. Mit danknehmiger Rückstellung als mit Note von 6ten dieses anhero gefällig mitgetheilten Ansinnens als Russich kaiserlichen Gesandschafts,– Trägers hat man die Ehre auch das zur Bereisung der Hungarisch und Siebenbürgischen Berg und Hüttenwerke, für den Russisch kaiserlichen Unterthan und Doctor der Arzneikunde Herr Simonovicz anverlange Creditiv in Freundschaft beyzüfugen.

S. Anton Ruprecht[21]

Mittels beiliegender Note verwendet sich der russisch-kaiserliche Geschäftsträger v. Anstett, womit dem russisch kaiserlichen Unterthan Hernn Simonovicz, Doktor der Arzneykunde, und Mitglied der Universität zu Vilna in Lithauen gestattet werden möge, zur Erweiterung seiner chemisch und mineralogischen Kenntnisse die Bergwerke in Ungarn zu besichtigen. Wenn dennoch kein Anstand dagegen abwaltet; so würde der unterzeichnete Hof- und Staatsvizekanzler Seiner des k.k Vizepräsidenten in Münz und Bergwesen Hernn Grafen von Wrbna Excellenz für die gefällige Ausfertigung und Anherosendung der für den Herrn Simonovicz benöthigten Credideten sehr verbunden seyn.

Anbey hat Unterzeichneter auch die Ehre, sich die beliebige Zurück-Stellung des ballegierten Communikats Dienstfreundschaft zu erbitten.

Wien den 6. Aug. 1803.
Ludwig Cobenzl[22]
An Seine des k.k Präsidenten in
Münz und Bergwesen Hernn Grafen
v. Wrbna Excellenz!

---

21 Anton Ruprecht (1748–1814), mining advisor, the Court Chamber for Mining and Minting.

22 Johann Ludwig Joseph Graf von Cobenzl (1753–1809), Austrian politician, the Court Chamber for Mining and Minting in Vienna.

Two documents about the permissions given to Symonowicz to visit the *Septem Civitatis* ore mines have been found in the Slovak State Central Mining Archive in Banská Štiavnica (ŠÚBA) in the Fund of the Great Duke Chamber Board (HKG). The first one (ŠÚBA, 1803a) is given in Vienna on 10 August 1803 by von Leüthner, Vice-President of the Emperor's Royal Court Chamber for Mining and Minting (Fig. 6):

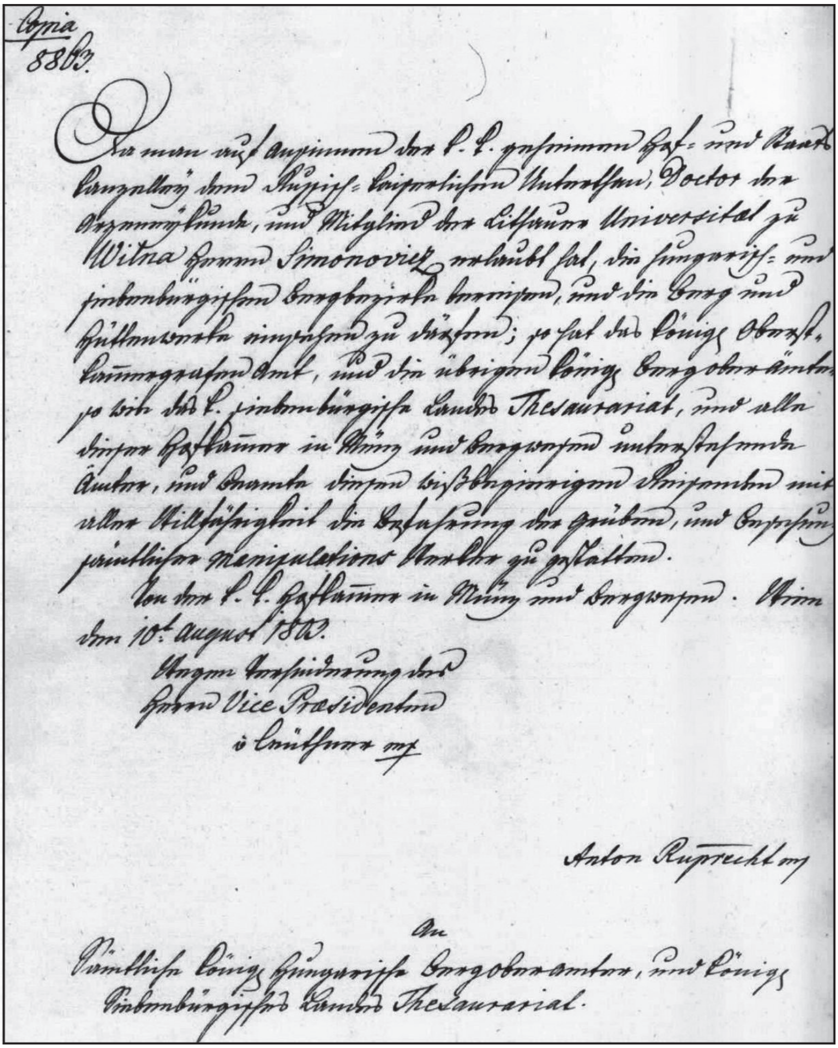


Figure 6. Permission to visit the mines of Hungary (present Central Slovakia) and Seven Mining Towns (Siebenbürgen; former Transylvania) given to R. Symonowicz by the Emperor's Royal Court Mint and Mining Chamber in Vienna, 10 August 1803 (ŠÚBA–HKG, No. 4002/1803).

Da man auf Ansinnen der. k. (kaiserlichen) k. (königlichen) geheimen Hof- und Staatskanzeley dem Russisch-kaiserlichen Unterthan, Doctor der Arzeneykunde, und Mitglied der Lithauer Universitaet zu Wilna Herrn Simonovicz erlaubt hat, die hungarisch- und siebenbürgischen Bergbezirke bereisen, und die Berg und Hüttenwerke einsehen zu därfen; so hat das königl. Oberstkammergrafen Amt, und die übrigen königl. Bergoberämter, so wie das k. siebenbürgische Landes Thesaurariat, und alle dieser Hofkammer in Münz und Bergwesen unterstehende Ämter, und Beamte diesem wissbegierigen Reisenden mit aller Willführigkeit die Befahrung der Gruben, und Besehung sämtlicher Manipulations Werker zu gestatten.

Von der k. k. Hofkammer in Münz und Bergwesen. Wien den 10. August 1803.
Wegen Verhinderung des Herrn Vice Praesidenten von Leüthner mp (manu propria = vlastnou rukou) Anton Ruprecht mp.
An Sämtliche königl. hungarische Bergoberamter, und königl. Siebenbürgisches Landes Thesaurariat.

[English translation: The subordinate of Russia's Emperor, Doctor of Pharmacy and Member of the Lithuanian University in Vilnius Mr. Symonowicz made a request to the Royal Secret Court and State Chancellery of the Emperor to allow him to visit the mining regions of Hungary and Septem Civitatis, as well as to see the ore mines and mining factories; the Chief Royal Director of the Duke's Chamber and the rest royal chief mining directors and the Thesaurariat of Septem Civitatis land, as well as all the directors mints and mining factories belonging to the Court Chamber, and officials can allow with all the attentions this hungry in knowledge traveller to visit the ore mines and see all [ore] treatment factories.

From the Emperor's Royal Court of Mint and Mining Chamber. Vienna, August 10, 1803.
Due to business of the vice-president Mr. von Leüthner mp
*Anton Ruprecht mp [*mp – manu propria]*
To all chief royal Hungarian directors and the Royal Septem Civitatis Thesaurariat.]

Symonowicz waited for this permission for three weeks in Vienna. Having got it, he went to Banská Štiavnica where he received the second document, issued on September 11, 1803 by the Great Duke Chamber Board (HGK) in Banská Štiavnica and signed on September 14, 1803 by the HGK mining advisor Prof. Patzier[23] (ŠÚBA, 1803b; Fig. 7):

[23] Michael Ignatz Patzier (1748–1811), metallurgy professor at Banska Štiavnica in 1792–1811.

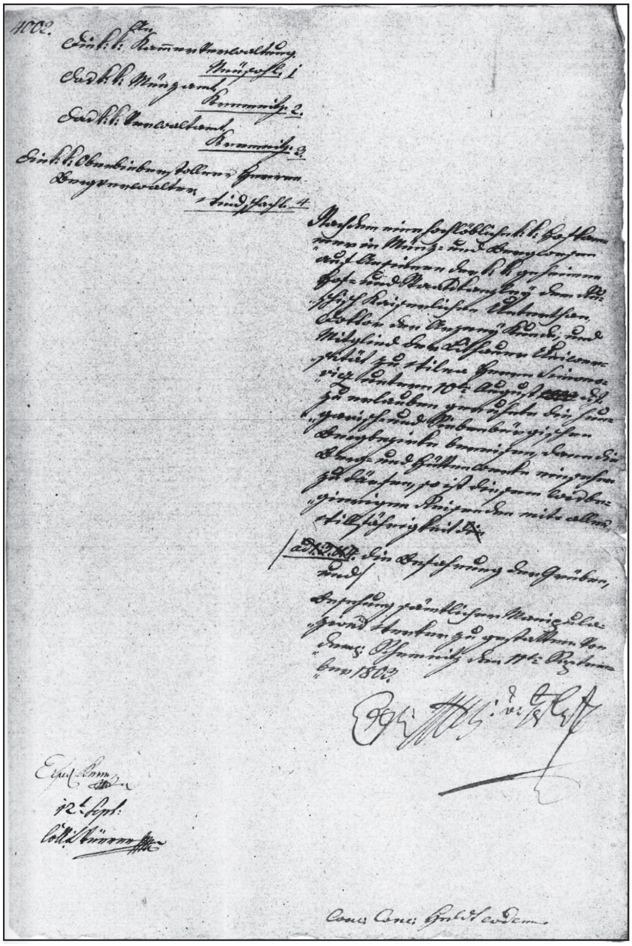


Figure 7. Permission to visit mines and ore-dressing factories given to R. Symonowicz by Great Duke Chamber Board in Schemnitz (present Banská Štiavnica), 11 September 1803 (ŠÚBA–HKG, No. 4002/1803).

An
die k.k. KammerVerwaltung Neüsohl. 1.
das k. k. Münzamt Kremnitz. 2.
das k.k. Verwaltamt Kremnitz. 3.
die k.k. Oberbieberstollner Herren Bergverwalter Windschacht. 4.

Nachdem eine hochlöbliche k.k. Hofkammer in Münz- und Bergwesen auf Ansinnen der k.k. geheimen Hof- und Staatskanzlei dem Ruschisch kaiserlichen Unterthan, doktor der Arznei Kunde, und Mitglied der Lithauer Uniwersität zu Wilna herrn Simonovicz untern 10. August d. J. zu erlauben geruhete die Hungarisch- und Siebenbürgischen

Bergbezirke bereisen, dann die Berg- und Hüttenwerke einsehen zu därfen, so ist diesem Wissbegierigen Reisenden mit eller Willfährigkeit /~~ad 1.3.und 4.~~ die Befahrung der Grüben, und/ Besehung sämtlicher Manipulazions Werker zu gestatten. Von dem: Schemnitz (Banská Štiavnica) den 11. September 1803.

[Vlastnoručná poznámka banského radcu HKG a profesora akadémie Patziera:]
Hiernach sind die unterstehenden Ämter das gehörigen angewiesen worden.
Schemnitz 14. Sept. 1803.

[English translation: To:
the Emperor's Royal Neusohl Chamber Board. 1.
the director of the Emperor's Royal Kremnitz mint. 2.
the director of the Emperor's Royal Kremnitz Board. 3.
the director of the Emperor's Royal Ober Bieber Mines Mr. chief manager of the Wind Pit. 4.

The highly honourable Emperor's Royal Court Mint and Mining Chamber, under the request made on August 10 by the Russia's Emperor's subordinate Doctor of Pharmacy and Member of the Lithuanian University in Vilnius Mr. Symonowicz to the Emperor's Royal Secret Court and State Chancellery, granted him the permission to visit the mining regions of Hungary and Septem Civitatis, as well as to see the ore mines and mining factories; thus, this hungry for knowledge traveller is allowed to visit the ore mines and see all [ore] treatment factories. Schemnitz [Banská Štiavnica], September 11, 1803.

[HGK mining advisor and [Mining] Academy Prof. Patzier mp.]
Therewith the subordinate officials shall fulfil in due order.
Schemnitz, September 14, 1803.]

Mines visited by Symonowicz

From Symonowicz's report follows that he arrived at Bansk*á* Štiavnica at the beginning of September 1803. That year the mountains were covered in an early snow. Nevertheless, Symonowicz went to see the ore mines in the vicinity of Banská Szczawnica: Pacherstollner, Zygmunt's, Stephen's; Maximilian's in Panska Dolina [Herngrund]; Maria Hilf ore mine; he ran also in Kremnitz [Mennica

Kremnicka], Banská Bystrzyca [Neusohl], Tajow, and Hronitz. Some exciting remains of the former ore mines, such as Maria Hilf, still exist on the slope of Štiavnica mountains (Fig. 8).

Figure 8. Entrance to the former Maria Hilf ore mine, slopes of Štiavnica Mountains (Slovakia website).

One of the biggest was 'Maximiliani Schacht' located in Špania [Panska] Dolina (Fig. 9). The mine section plan shows seven underground levels (Lauf, Germ.) crossed by numerous vertical shafts sliding along ore body. Galleries of the Maximilian mine remind of a spider-web stretching for kilometres underground. The mine operated for many centuries, from 1567 to the 1820s. The rubble dump of this mine forms a steep artificial hillside, containing ca. 405,510 m^3 of debris which is called 'anthropogenic landscape element'. The Ferdinand mine close-by in

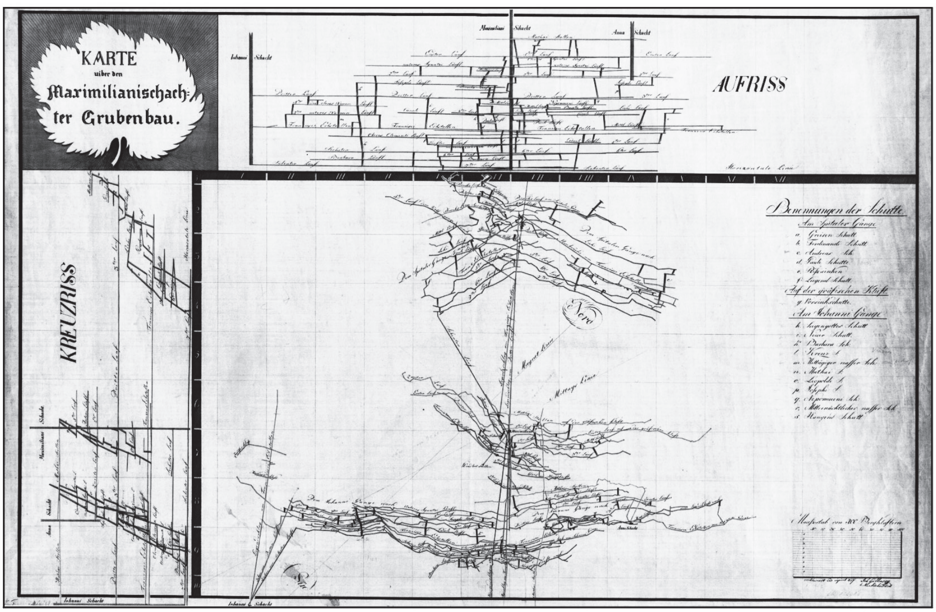


Figure 9. The 1827 plan of Maximilian's ore mine in Špania Dolina, Slovakia (ŠÚBA–HKG, Inv. No. 13646).

Figure 10. Special signals desk of shaft lifting from Maximilian's shaft. Photo by A. Grigelis, 2007.

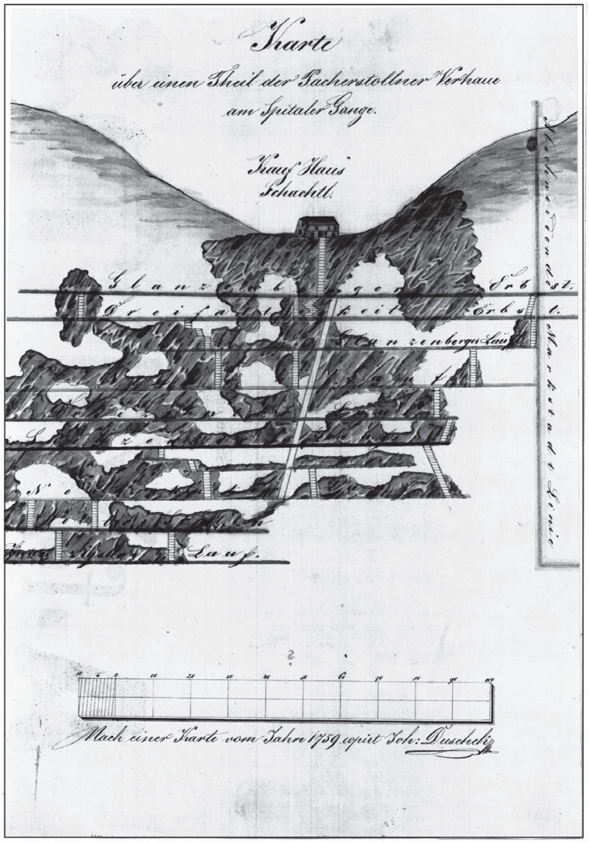


Figure 11. Section of Pacherstollner ore mine in Banská Štiavnica, after the map of 1759 (ŠÚBA–HKG, Inv. No. 13960).

Špania Dolina had been exploited since 1400; it reached 295 m in depth, and its galleries were 4,050 m in length. Every miner was obliged to know the special signals that were used for shaft lifting or in case of emergency (Fig. 10).

The Pacherstollner and Zygmunt's mines were situated in the entire Banska Štiavnica city. The *Pacherstollnie Hause* was located at the so-called 'Hospital Down'. In 1759, this mine had twenty underground levels (Fig. 11). The Zygmunt's mine was rather modern and had three vertical tubes for ore mining (Fig. 12). Notably, the plans of the mines referred to above have been made in a very precise technique.

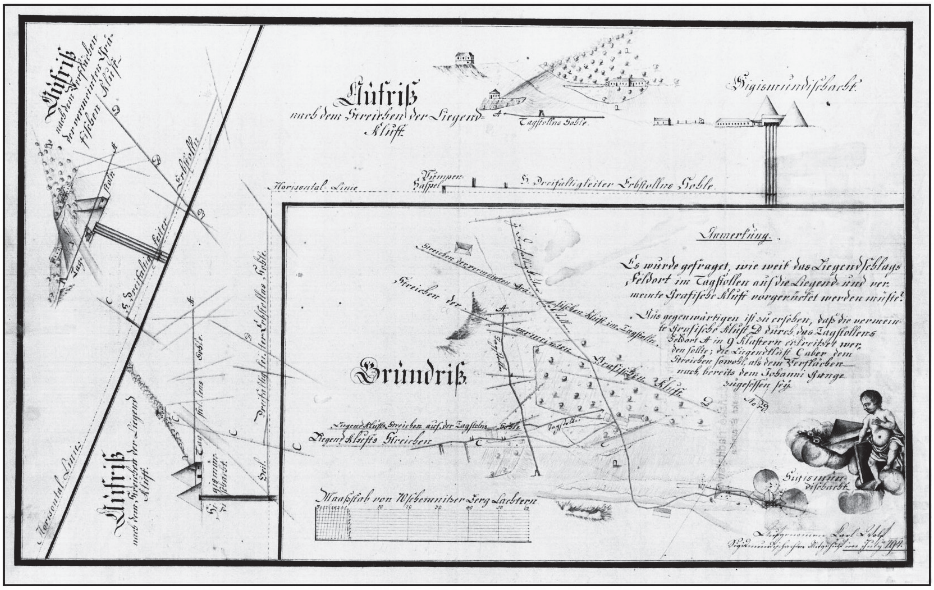


Figure 12. The 1794 plan of Zygmunt's ore mine in Banská Štiavnica (ŠÚBA–HKG, Inv. No. 6753).

Some conclusions

An assumption is made that in 1801, during his stay in Vienna to improve his medical skills, Roman Symonowicz obtained useful knowledge in mineralogy; a favourable circumstance was that "the Emperor's Royal Court Mint and Mining Chamber" was in Vienna, the capital city of the Empire. We can see that the important sphere of ore mining belonged to the Royal Court was centralised and well organised. The ore region of *Septem Civitatis* was "very rich in precious and nice minerals". The ore mines were operating, metal extraction and melt technologies were improving. The Banská Bystrica mint used to produce up to 300 centners of copper coins per day for the empire's coffers.

This mining branch needed highly skilled specialists, especially ore experts (mineralogists), mine-surveyors, and constructors of mine machinery. The Mining School, established in 1735 in Banská Štiavnica, was reformed in 1762 as part of the Mining Academy which was the first of its kind in the world and older than the famous Freiberg *Bergakademie*. The ore mining plans drawn by the then mine-surveyors in Banská Štiavnica delight us even now.

Symonowicz turned towards mineralogy, since he had a "strong partiality and gift" for this science. He became the first mineralogy lecturer at the Vilnius University. All students of Physics and Medicine faculties were liable for the mineralogy courses. "More than a hundred students who attended my mineralogy lectures and those twenty of them which passed the exams convince the University that in a short time the mineralogy knowledge will become more general than up to now", Symonowicz wrote in his report. However, good teaching without a good collection is impossible. In 1803, Symonowicz was implementing his "passion", even borrowed money for his trip and departed for Hungarian and Transylvanian ore mines. He was said to acquire a collection of ore minerals for the university, while "the specimens should not be too small or damaged".

Roman Symonowicz, "this hungry for knowledge traveller", formed such a collection. Of course, a part of the collection already existed before. He had bought very many specimens of minerals and rocks for the university with his own resources or used to get them directly from miners. He noted himself that of the 20,800 collection samples, more than 12,600 were his own property! Undoubtedly, he collected the rock and mineral samples in different areas. He mentioned that, except for the Hungarian and Transylvanian ore mines, he made three visits to the well-known salt mine of Wieliczka, surveyed the sulphur mine in Swoszowyce; he wrote about gypsum rocks occurring in Upytė Powiat, Kursh and Podole; he knew about Čiobiškis sandstone, as well as about cold sulphurous springs at the gypsum outcrops where natural sulphur should be present as well.

As one ore specimen weighed, in average, about 100 g, it would make 1200 kg of ores and rocks. Symonowicz could have struck it rich from this collection that was "the fourth in Europe". In 1810, he asked "his Grace W[ojewóda] Duke for his favour that I was paid for the mineralogy collection I was using in public lectures by now". However, he had not managed to sell the collection to the university during his life.

Thus, Roman Symonowicz was an excellent mineralogist dedicated fully to the science, a well-known expert who used to be invited to noblemen to put in order their collections in such a manner as "the nature did". Further archive studies will disclose new aspects of his life and, at the same time, of mineralogy and geology at the beginning of the 19^{th} century in the panorama of Lithuanian science development.

Acknowledgments

Authors are sincerely thankful to the Department of Manuscripts of the Vilnius University Library, the Slovakian State Central Mining Archive in Banská Štiavnica, the Department of Old Publications and Cartography of the Princes Czartoryski Library in Krakow, Dr. Jan Kozák (Prague), Ms. Elena Košiarova (Banská Štiavnica), Prof. Wojciech Narębski (Krakow), and Prof. Marianne Klemun (Vienna). Prof. Juozas Algimantas Krikštopaitis (Vilnius) is acknowledged for useful remarks.

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The Fame of Scientists: Does It Reflect Their Real Contribution to Science?

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Abstract: *Analysis of the factors that influenced the degree of popularity of Tadas Ivanauskas and Pranciškus Baltrus Šivickis, two famous Lithuanian biologists of the 20th century, was carried out. For the broader Lithuanian society, Ivanauskas is much better known, while biologists know that the scientific achievements of Šivickis are much greater. They both were very active organizers of educational processes in Lithuania, but the fields of activity of Ivanauskas were more visible and interesting for the broader public. Ivanauskas wrote much more items of popular scientific literature than Šivickis, which was another reason that made him remarkably popular. The most important factor was a political one: Šivickis resisted the ideologization of science, whereas Ivanauskas adjusted quite well to the new social system. Therefore, the mass media propagated his achievements and he was extremely popular during the whole Soviet period. Nearly fifty years of promoting Ivanauskas left marked prints in human memory: even today he is much better known than Šivickis by the general Lithuanian society. Our analysis showed that Ivanauskas was a great organizer, a great educationalist, but not a great scientist; his scientific achievements were exaggerated during the Soviet period. The life histories of the two famous biologists point to another common rule characteristic of all historical periods: fundamental researches are very often bound to remain unpopular as it takes a long time until they become understandable for the major part of society.*

Keywords: *history of biology, ideologization of science, popularity of scientists, Pranciškus Baltrus Šivickis, Soviet period, Tadas Ivanauskas*

Introduction

Does the popularity of scientists always reflect their real contribution to science? Very probably most people would answer: No, not always. We know very well the impact of television and other means of mass media on the formation of public opinion; our age is very often called the Age of Advertising. Maybe things were somewhat different in earlier days? Unfortunately, the same principles seem to have existed in the past, although many processes seem invisible and make lead to the wrong illusion that the most popular persons are also the most important scientists.

If you randomly ask a Lithuanian to name the most famous Lithuanian biologist of the 20th century, the majority would answer: Tadas Ivanauskas. However, most biologists would name Pranciškus Baltrus Šivickis. Petrauskienė (2006) made a prediction of this answer, which was confirmed in a nation-wide poll in 2009. That year Lithuania celebrated the 1000th anniversary of the first mentioning of Lithuania in written sources. On this occasion, 100 most famous Lithuanian persons of all times were selected by citizens. Ivanauskas was included in the list, while Šivickis was not.

Why are some persons well known while others remain little known in the society, in spite of the fact that their scientific achievements are remarkably higher? Let us try to answer this question by analyzing the life stories and scientific activities of two famous Lithuanian biologists of the 20th century – Pranciškus Baltrus Šivickis and Tadas Ivanauskas. The personal, historical and scientific reasons for the different fame of these biologists will be discussed below.

Short biographies of Ivanauskas and Šivickis

The detailed biographical data are collected in several books and articles devoted to Ivanauskas (Budrys & Prūsaitė, 1976; Zajančkauskas, 2002; Zajančkauskas & Vaitonis, 2007) and Šivickis (Petrauskas, 1980; Arnastauskienė & Jakimavičius, 1997; Jakimavičius, 2004). Here we will mention only the main facts of their lives. They both were born in 1882; they both died approximately at the same age: Šivickis in 1968, Ivanauskas in 1970.

Ivanauskas (Fig. 1) was the son of a landlord, and his way to education was straight and easy; he had no financial problems in pursuing his studies. His

Figure 1. Tadas Ivanauskas.

father was a well-educated man with a special interest in biology. The family had a rich collection of ornithological and entomological materials and many biological books in their private library. Ivanauskas studied biology at the universities of St Petersburg and Sorbonne in 1903–1910. He was one of the founders of the University of Lithuania in 1922, and in 1922–1940 professor at this university in Kaunas. When the University of Lithuania was reconstituted in Vilnius, he worked as professor at the University of Vilnius until 1964. In 1941, he was nominated Academician of the Lithuanian Academy of Sciences; in 1945–50 director of the Institute of Biology; in 1949–70 professor at the Academy of Agriculture and the Medical Institute; in 1959 he won the Lithuanian Science Award.

Šivickis (Fig. 2) was a farmer's son. He was forced to emigrate to America in 1906. His education was three classes of primary school (at that time Ivanauskas was already a student at the University of St Petersburg). Šivickis purposefully, with great efforts, sought education and accomplished a lot. He attended the evening classes at Pullman School and later studied at seven American universities: Valparaiso (B.Sc. degree, Biology), Illinois, Purdue (Agricultural Sciences), Missouri (B. A. degree, Medicine), Iowa (Medicine), Columbia (Chemistry), Chicago (Ph.D. degree, Zoology). He graduated from three of the seven universities he had studied at. Šivickis was very choosy: he was interested in fundamental sciences, which is why he studied at various universities, looking for the field that was interesting to him. The last university from which he graduated and where

Figure 2. Pranciškus Baltrus Šivickis.

he defended his thesis on the regeneration of tissues and earned his Ph.D. degree was the University of Chicago – the most prestigious university in the U.S.A., founded by the millionaire John D. Rockefeller, who invited to the university the most famous scientists of the time. After he got his Ph.D. degree in 1922, Šivickis wished to return to Lithuania and handed in an application for the University of Lithuania. Strange as it may seem (because at that time this university had no specialist with an academic degree in Biology), the answer came too late, and Šivickis had already signed a contract with the University of Manila in the Philippines. He handed in his application for the second time in 1925; again the answer came too late, so Šivickis prolonged the term of his contract with the University of Manila. Such purposive lateness shows that some persons at the university were not interested in having such a well-educated biologist as a rival. The same opinion was expressed by Šivickis in one of his articles a few years later (Šivickis, 1935b). He returned to Lithuania in 1928, being an already hi ghly-educated experienced professor and a scientist well known in the world. In recognition of his merit, foreign scientists had named after him two animal species (*Carybdea sivickisi* and *Pleionogaster sivickisi*). Šivickis arrived in Lithuania with the only desire to honestly serve his native country:

> *While coming home from abroad I left a good post there, comfortable and beautifully established laboratories and not bad lecture rooms, the well-trained staff, a significantly higher salary and better life conditions in order that I might work in my country, and I shall work as long as I can* (Šivickis, 1935b).

In 1928–1948, he worked as professor at the universities of Kaunas and Vilnius. In 1941 he became Academician of the Lithuanian Academy of Sciences. In 1948 he was expelled from the Academy of Sciences and from the university. In 1948–1952 he worked as senior researcher at the Institute of Agriculture in Baisogala (a small town in central Lithuania). In 1952–1956 he was the head of Laboratory of Parasitology at the Institute of Animal Husbandry and Veterinary. In 1956, Academician of the Lithuanian Academy of Sciences. In 1956–1959, Šivickis was the head of the Laboratory of Zoology at the Institute of Biology. In 1959, he was awarded the Lithuanian Science Award. In 1959–1960, he was the director of the Institute of Zoology and Parasitology and in 1960–1968 the head of the Laboratory of Invertebrate Zoology at the Institute of Zoology and Parasitology.

We wish to describe in more detail only one period in the lives of Šivickis and Ivanauskas which proved fatal to their further scientific career, their future popularity, and to the whole Lithuanian science. This period is shortly mentioned in a book about Šivickis (Jakimavičius, 2004), published after the Soviet empire disintegrated; however, the after-effects of this period have been analyzed in only two papers so far (Petrauskienė, 2006; 2008).

A special session of the Academy of Sciences of Lithuania together with the Ministry of Higher Education of the Soviet Union was held in Vilnius in 1948. The aim of this session was to reform Lithuanian science according to "the most advanced" Soviet science. In fact, this session was the final stage of the ideologization of science, orchestrated by the Communist Party of the Soviet Union. Before the session, many biologists were made to publicly condemn genetics and their pioneers Gregor Mendel, Thomas Morgan and August Weismann, and to propagate the ideas of the "great" Russian biologists Ivan Michurin and Trofim Lysenko. They were forced to publish the new "progressive" scientific view in press. Most people agreed to behave according to the new rules because they knew that disagreement would result in a loss of job or even deportation to Siberia. However, Šivickis refused to condemn genetics and had the courage to tell the officials from Moscow (in 1948, the undersecretary and other officials of the Ministry of Higher Education of the Soviet Union came to Lithuania to organize the special session) that Mendel's, Morgan's and Weismann's contribution to science was noteworthy, and we should still wait to see what the achievements of Michurin and Lysenko would be (LMAA, 1948). After this session, Šivickis lost his job and was expelled from the Lithuanian Academy of Sciences. Ivanauskas, on the other hand, was the main local accuser in this special session. He delivered a long speech condemning the propagators of genetics and especially Šivickis. The speech was published in *Tiesa*, the major newspaper of the Lithuanian Communist Party (*Kūrybingasis tarybinis darvinizmas…*, 1948). Besides, Ivanauskas published several articles that exalted Stalin and Michurin (Ivanauskas, 1950a & b; 1951). After this "contribution" to the Soviet power, Ivanauskas was very popular during the whole Soviet period: he was often invited to various meetings and events, mass media propagated his achievements, and he was featured in a long documentary film. As mentioned above, Šivickis returned to the Academy of Sciences several years later and became the director of the Institute of Zoology and Parasitology, organized new laboratories, wrote several fundamental books, and received the Lithuanian Science Award. However, the mass media did not propagate his achievements because the Soviet authorities regarded Šivickis as disloyal.

Educationalists

The contribution of both biologists to education processes in Lithuania is solid and epoch-making. As mentioned above, Ivanauskas was one of the organizers of the University of Lithuania in 1922. Later he was the main founder of the Museum of Zoology (now named after him, and a sculpture of Ivanauskas stands in front of the museum) and one of the organizers of the Zoological Garden. He accomplished a lot in the field of nature protection: established various societies (of naturalists, fishers, hunters, etc.), and was an initiator of various journals and nature reservations. He was the organizer of the Bird Day – a festive day in spring when pupils, students and various communities gathered together, with songs and music, and went to parks and forests to put up nest boxes (Fig. 3).

In a book about Ivanauskas it is written that he was an initiator of the Arbor Day as well (Zajančkauskas & Vaitonis, 2007). The Arbor Day was also a festive day in spring when people planted trees together. However, it is known that the initiator of the first Arbor Day in 1921 was Ivanauskas' wife, Honorata Ivanauskienė, who was a highly-educated and self-starter woman (Vailionytė, 2002). Only later, in 1923, Ivanauskas became the president of the organizing committee of the Arbor Day. Ivanauskas organized many zoological expeditions in Lithuania and in twelve foreign countries (even to such exotic places as Brazil) to collect exhibits for the museum. All these

Figure 3. The Bird Day organized by Ivanauskas. Ivanauskas stands in the middle of the crowd (with a dark-coloured hat). 1922, Kaunas, Freda.

Figure 4. International malacological expedition organized by P. Šivickis in Lithuania. From the left: J. Maniukas, assistant from Kaunas University, Dr. C. Krausp from Tartu University, Dr. H. Schlesch from Copenhagen, Prof. P. Šivickis. 1937, Molėtai region.

expeditions were very well advertised in the Lithuanian press and described in several books. Ivanauskas had a gift of writing, so his activities were very well known to Lithuanian society.

Šivickis resided in the Philippines when the University of Lithuania was established. He donated a large sum of money (1,385 French francs) to purchase books for the university (Petrauskas, 1980). Šivickis also sent very valuable collections of sea animals, birds and other tropic animals from the Philippines to the newly-opened Zoological Museum of the University (everything was sent at his personal cost). After his death, a great collection of mollusks (23,462 shells) gathered by Šivickis throughout his life was also presented to the Museum of Zoology (Gurskas, 2002). It is evident that the contribution of Šivickis to the Museum of Zoology is quite great; however, all merit is ascribed to Ivanauskas. Šivickis organized a number of scientific expeditions together with his students to investigate the fauna of Lithuania; many investigations were performed for the first time and were thus very important for the Lithuanian science and for students' training (Fig. 4). These expeditions, however, were not as interesting for the broad public as the exotic impressions from Brazil.

Being aware of the highly limited possibilities of the University of Lithuania, Šivickis bought a little island in Lake Grabuostas, where he established a base for the practical studies of his students (at his personal expense). So, Šivickis was very altruistic, his educational activities were highly necessary for the Lithuanian science and for the students' education, but they were not as demonstrative as the activities of Ivanauskas. On the other hand, the main investigation objects of Šivickis were water invertebrates, while those of Ivanauskas were birds and vertebrates. It is quite understandable that the numerous stories written by Ivanauskas about birds and other animals were much more interesting for the general public than stories about invertebrates or about such complicated things as tissue regeneration.

Another very important event for education and scientific investigations was the establishment of the Experimental Biological Laboratory, the first one at the University of Lithuania. Šivickis prepared very thoroughly for establishing this laboratory: he visited many scientific institutions, museums and libraries in Western Europe (also at his own expense) to get the knowhow for setting up a very modern laboratory. Moreover, he engaged a laboratory assistant at his own expense. He carried out, by himself, scientific investigations on the regeneration of tissues and involved his students in these experiments. Šivickis encouraged employing experiments in zoology; this was very new and unusual for zoologists and for biologists in general at the University of Lithuania (as descriptive approach had been more common in zoology). He was a pioneer of experimental zoology in Lithuania.

Šivickis, as mentioned above, studied at the best universities of America. He saw many drawbacks in the teaching methods and scientific work at the University of Lithuania and was anxious about the future of the university. In 1935, he wrote the polemic article 'Mūsų universitetas' (Our University). In this article, he presented an analysis and comparison of studies at the universities of small countries and proposed methods to improve teaching methods (Šivickis, 1935a). He wrote only a few sentences subjecting some professors to criticism. Although he did not mention any names, many professors immediately recognized themselves and a whispering campaign and machinations were started against Šivickis (*Neįvykęs garbės teismas*, 1935; *Kas teis prof. Šivickį*, 1935; *Prof. Šivickis Universiteto teisman nestosiąs ir išvažiuosiąs?*, 1935; Y-kas, 1935; Čėsnys, 1936). The honorable professors failed to see the future guidelines for the university in the article, and only saw the few lines devoted to their persons. Šivickis was head and shoulders above the rest of the academic world who could never forgive and forget him.

Scientific activities

Some aspects of the scientific activities of both biologists are described in the chapter above (scientific expeditions, new laboratories) because educational and scientific activities are closely connected. The two biologists were interested in many fields of biology. They were initiators of many investigations that were launched for the first time in Lithuania. Their fields of investigations are listed in Table 1; the list is made according to the data found in the biographies of Ivanauskas (Budrys & Prūsaitė, 1976) and to Šivickis (Petrauskas, 1980).

Table 1. Ivanauskas' and Šivickis' fields of investigation according to their biographies (Budrys & Prūsaitė, 1976; Petrauskas, 1980).

IVANAUSKAS	ŠIVICKIS
Ornithology	Morphogenesis
Theriology	Hydrobiology
Herpetology	Malacology
Entomology	Parasitology
Hydrobiology	Pedobiology
Dendrology	Entomology
Pomology	General biology, physiology, morphology
Horticulture	

The number of published articles (the total number and number of articles according to the fields of investigations) is presented in Table 2.

Table 2 shows that the total number of scientific articles by both researchers does not differ greatly: Šivickis published only two more than Ivanauskas. However, the total number of articles published in foreign journals or proceedings differs markedly: Šivickis published 16, while Ivanauskas only 5 articles in foreign publications. From this it is possible to conclude that in the scientific world Šivickis was much better known and more appreciated than Ivanauskas. Furthermore, Ivanauskas had his articles published only in two neighboring countries (Germany and Estonia), while those of Šivickis have been published in various countries (U.S.A., Great Britain, Italy, Spain, Hungary, the Philippines). Šivickis published some articles even in *Nature* and *Science*, the most prestigious science journals in the world. In general, Ivanauskas had fewer publications in scientific journals than Šivickis (29 and 37, respectively). We think that the latter figures (the number of articles in journals) are a more informative index than the total number of articles because many of Ivanauskas' articles were published in the proceedings that were edited by him.

Table 2. The number of scientific articles by Ivanauskas and Šivickis in various fields of research. The number of articles published abroad in parentheses (Petrauskienė, 2006).

IVANAUSKAS	ŠIVICKIS
Total no. of scientific articles published in proceedings and scientific journals	
36 (5)	38 (16)
No. of articles published in scientific journals	
29 (4)	37 (16)
No. of scientific articles according to the fields of research	
23 (5) ornithology	12 (7) morphogenesis
4 faunistics	9 (5) hydrobiology
2 hydrobiology	6 parasitology
3 fur farming	4 (1) malacology
2 pomology	2 (1) pedobiology
2 ecology	5 (2) general biology, physiology, morphology

The analysis of publications according to the field of investigations showed that Ivanauskas as a scientist was known abroad only in the field of ornithology; all his other scientific articles were published in Lithuania. Moreover, a comparison of the fields of research of Ivanauskas that are mentioned in his biography (Table 1) and the publications presented in Table 2 shows that in several fields (herpetology, horticulture, entomology, dendrology) he had no scientific publications at all. So, the scientific merit of Ivanauskas was exaggerated in the Soviet period, and still is. The interests of Ivanauskas that were only his personal hobby have been described as his marked contribution to the Lithuanian science (Budrys & Prūsaitė, 1976; Zajančkauskas, 2002).

Comparing data about Šivickis, presented in Tables 1 and 2, reveals that he had no publications only in the field of entomology, but it does not necessarily mean that Šivickis had no merit in the field. In fact his doctoral students had publications in this field (Arnastauskienė & Jakimavičius, 2005), and Šivickis did not always add his name to his doctoral students' papers. Table 2 shows that in every field (except for parasitology) he had publications in Lithuanian and in foreign journals. Strange as it might seem, it is for his parasitological research that Šivickis received the highest Lithuanian scientific award in 1959. To those who know the life history of Šivickis this is not strange. In 1948, after he was forced to leave his job and the Academy of Sciences, being already 66 years old, he began investigations in a new field of biology – parasitology – and achieved a lot: he founded a parasitological laboratory and wrote the fundamental book *Parazitų apibūdinimas* (Definition of Parasites; Šivickis, 1956). It is quite understandable that after the events of 1948 he was no longer allowed to publish his articles in foreign journals. Thus, in every field he worked, Šivickis left indelible marks on Lithuanian, and not only Lithuanian science.

Interestingly, while considering the merits of Ivanauskas in Lithuanian science, some of the achievements of Šivickis are ascribed to Ivanauskas. For example, in his biography (Budrys & Prūsaitė, 1976) it is written that Ivanauskas was the first scientist in Lithuania who in 1949 emphasized the necessity of investigating the Baltic Sea fauna and of establishing the Baltic Sea Biological Station, whereas Šivickis had introduced the problem twenty years before that (in 1929). Moreover, Šivickis organized the first scientific expedition to investigate the Baltic Sea fauna in 1934 and another expedition in 1935 (Petrauskas, 1980).

Šivickis was a leader in training the new generation of scientists. He was the founder of the first biological scientific school in Lithuania. The school was called 'Ecological and faunistic studies of invertebrates'. Under his supervision, 28 candidate and 7 doctoral theses (in present terms, 28 doctoral and 7 habil. doctoral theses) were defended. One generation of Šivickis' disciples and two generations of their successors can be distinguished (Arnastauskienė & Jakimavičius, 2005). A scientific school is an extraordinary phenomenon in the scientific world: while there are many leaders heading laboratories, only a few are capable of forming and leaving behind their own scientific school. Scientists know how much time, effort, knowledge and capability are needed to found a scientific school. However, the non-scientific public does not find it very interesting; such a great scholarly achievement does not contribute to a scientist's popularity, especially if it is not propagated by the mass media. We already know why the mass media did not propagate Šivickis' achievements.

Ivanauskas did not found his scientific school. He was the supervisor of 11 candidate theses in different fields of biology (Petrauskienė & Valentienė, 1971). In some of them he was a supervisor by name only, i.e. he was asked to be a supervisor when dissertations had already been written.

Šivickis prepared and defended a thesis on the regeneration of tissues of Triclads in 1922 (in those days, experimental zoology was a very new field of biology) at the University of Chicago. Ivanauskas did neither prepare nor defend any dissertation. He received the doctor's degree for publications in the field of bird migration in 1940, just after the onset of Soviet occupation, and was nominated Academician of the Lithuanian Academy of Sciences by the Soviet People's Commissar. This means that the Soviet authorities knew of Ivanauskas' loyalty to the Soviet power. However, these facts are known only to those who have thoroughly studied the biography of Ivanauskas; they are usually concealed in many biographical publications about him.

Šivickis was elected (not appointed) Academician at the Academy of Science of Lithuania.

Popularization of sciences

Ivanauskas was a gifted writer: he published many stories, articles, booklets and books about animals and about expeditions to exotic places. He wrote many practical recommendations for farmers, hunters, and fishermen.

Šivickis also very actively popularized scientific news and tried to explain the mechanisms of various phenomena. The popularization of sciences by Ivanauskas was of descriptive character, while Šivickis went deeper: he tried to explain the background of various things. Šivickis used to deliver popular-scientific lectures over the radio during the first independence period of Lithuania (before 1940); therefore, before the Second World War he was a very well-known person in Lithuania. However, after the events of 1948, his activities in popularizing science virtually stopped.

In general, the significance of Ivanauskas as a science popularizer is greater than that of Šivickis. The total number of publications (scientific and popular scientific) by Ivanauskas is 610, while that by Šivickis is 280 (Budrys & Prūsaitė, 1976; Petrauskas, 1980). The popularization of science made Ivanauskas a very well-known person in Lithuania.

The aspect of character traits

Ivanauskas was very communicative and easy-going; he was welcome in many circles where he used to tell interesting stories about his hunting or traveling adventures. He was an active atheist; this was a fashionable credo during the Soviet period. He was very well adapted to the new social and ideological system. As mentioned above, he wrote several articles extolling Stalin and Michurin, agreed to be the accuser during the 1948 session, and agreed to condemn genetics and the many scientists in Lithuania who seemed to be less enthusiastic about the "great" achievements of Lysenko and Michurin. This does not mean that he really adored the Soviet regime. According to the reminiscences of his friends about him and the ideas in his autobiography (Ivanauskas, 1996), which was published after his death and after the Soviet power collapsed in Lithuania, it is evident that he hated the Soviet power. His beloved native estate in Lebiodka (now Belarus) was ravaged; the remains of his parents were removed from the graves and strewn, some of his relatives died on their way to Siberia. Nevertheless, he adapted to the new social system very well. As a reward, he was appointed to high professional positions and his activities were constantly propagated by the mass media which made him a very popular scientist in Lithuania.

Šivickis was a very hard-working, reserved, modest man, and did not like to waste time in non-academic circles. He was religious and lived according to the Ten Commandments; he dared to reprove those professors who set a bad example to students, therefore some people disliked him. Šivickis was a high-principled man not only in his personal life: the above-described events during the 1948 session showed him to be a very brave and unwavering person. He had a family of five children and dared to resist the Soviet ideology, knowing what the consequences might be. His adherence to principles exacted a heavy price: the loss of job, the loss of popularity.

Conclusions

The difference in the popularity of the two famous twentieth-century Lithuanian biologists, Tadas Ivanauskas and Pranciškus Baltrus Šivickis, depended on many factors: personal, historical and scientific. They both were very active organizers of educational processes in Lithuania, but the fields of activity of

Ivanauskas were much more visible and more interesting for the broad public. Ivanauskas wrote more items of the popular science literature than Šivickis, and this is another reason for his popularity in Lithuania. The most important factor was a political (and a historical) one: while Šivickis resisted the ideologization of science, Ivanauskas adjusted very well to the new social system. Therefore, the mass media propagated the achievements of Ivanauskas, who was extremely popular during the whole Soviet period, while the activities of Šivickis remained unnoticed. Almost fifty years of constant promoting of Ivanauskas has left a deep mark in collective memory; even today he is much better known to the general Lithuanian society than Šivickis. However, the scientific achievements of Šivickis are much more important than those of Ivanauskas. Ivanauskas was a great organizer, a great educationalist, but not a great scientist; his scientific achievements were exaggerated during the Soviet period. The analysis of the life histories of both famous biologists revealed another common rule characteristic of all historical periods: fundamental researches are very often bound to remain unpopular, for it takes a long time until such studies become understandable (*popularis*) for the major part of society.

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Public Science as a Network: The Congresses of Russian Naturalists and Physicians in the 1860s–1910s

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Abstract: *The paper examines a changing audience present at the major academic conventions in the Russian Empire in the second half of the 19th century – the congresses of Russian naturalists and physicians. Like similar national academic congresses in other European countries of the same age, the congresses of Russian naturalists and physicians served as important sites of academic socialisation, exchange and public dissemination of knowledge. The paper provides a detailed analysis of the dynamics of gender, regional and professional background, and institutional affiliation of registered participants. In this way it is able to demonstrate social and geographic expansion of public science in the late imperial Russia, and the role of the imperial universities, as the principal organisers of the conventions, in the process. In particular the paper focuses on the geography of science in the Russian empire, by tracing and analysing the involvement of different regions of the country, with their varied ethno-cultural background and traditions of scholarship, in the events.*

Keywords: *academic congresses, geography of knowledge, Russian empire, public science*

In the 19th century, academic congresses became important institutional means facilitating the traffic of knowledge and the making of academic communities. National academic congresses, which emerged in Western Europe after the Napoleonic Wars, were a part of a broader trend towards the making of national institutions for science. The congresses were a form of representation and advancement of science at a national level: they were instrumental for expanding its audience, enhancing prestige of scholars, and linking the 'centre' and 'periphery' of science – provincial societies and major universities, amateur enthusiasts and established academics. Most often the congresses were deliberately conceived as itinerant events, taking place at different cities and towns of a nation-state. Therefore their geography can provide some insights into their role in the making of an 'imagined community' of a nation. (On academic congresses in the 19th century Europe see Fox, 1980; Ausejo, 1994; Casalena, 2006; 2007; Withers, Higgitt & Finnegan, 2008). This paper examines the congresses of Russian naturalists and physicians – a major academic forum for natural sciences that was established in the Russian empire in the late 1860s and convened periodically till the outbreak of the First World War. It focuses on changing the composition of the congress audience. My aims here are twofold. Firstly, I am about to explore the relations between the universities, as the leading centres of scholarship in that era, and a broader public. Secondly, I am going to consider the involvement of different regions of the multi-ethnic and multi-cultural Russian Empire in the academic events, which positioned themselves as a showcase for Russian (national) science.

The congresses of Russian naturalists and physicians: their history and institutional infrastructure

Like many other academic institutions, national (or rather empire-wide) congresses were introduced in the Russian Empire with some delay, when compared to the leading countries of science and scholarship in the 19th century, such as Britain, France, Germany, Switzerland or Italy. In Russia they were a product of the 'Great Reforms era' of the 1860s – the decade of major political, social and economic reforms, epitomised by the abolition of serfdom in 1861. The idea to set up periodic conventions of naturalists was first conceived by Professor Karl Kessler (1815–1881) in the late 1850s. In the 1860s, he emerged as one of the principle advocates and lobbyists of the congresses. The Ministry of Education eventually succumbed to his and his colleagues' entreaties and authorised the first congress of Russian naturalists to be convened in the late December 1867 – early January 1868 in St Petersburg. The St Petersburg University, where Kessler served as Professor of Zoology, hosted the event (Pogozhev, 1887; Tikhonovich, 1953; Savchuk, 1994).

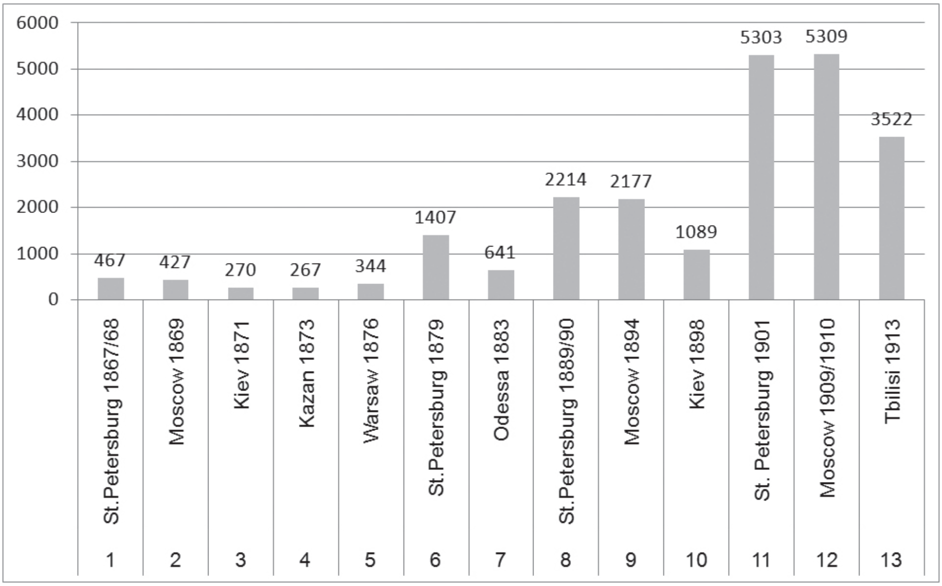
Obviously, the idea itself was borrowed from Western Europe. Russian naturalists were quite familiar with German and Swiss congresses; however it was the British

Association for Advancement of Science with its annual meetings that provided the greatest inspiration – precisely because its congresses were run by a permanent public body (Liubimov, 1869). In Russia, Kessler and some of his colleagues at the St Petersburg and Moscow universities strongly advocated the idea of establishing a national (in practice, an imperial) association; yet this part of their vision never materialised, even if proposals for an association were repeatedly discussed at the congresses (*Vtoroi s´´ezd*, 1869, pp. 1–4 [2nd pagination], 1–4 [5th pag]; *VIII s´´ezd*, 1890, pp. xlix–xlx, 69; *Dnevnik XII s´´ezda*, no. 2, 1909, pp. 5–9). The failure to establish the Russian Association at the early stage, in the late 1860s–1870s, could be accounted for not only by a very cautious policy pursued by the Ministry of Education towards any public initiative but also by a rather reluctant stance taken by the universities themselves. The first congress of Russian naturalists petitioned the government for the setting up of naturalists' societies, which would be affiliated with the universities. The emperor consented and in 1868–1869 the naturalists' societies were founded at the St Petersburg, Kazan, Kharkov, St Vladimir (Kiev) and Odessa universities, i.e. at all the universities of the empire where naturalists' societies were not already functioning (*Obshchestva estestvoispytatelei*, 1990). Subsequent attempts undertaken by a few prominent St Petersburg scientists, notably by a botanist Andrei Famintsyn (1835–1918), to coordinate their activities and to make societies publish their *Transactions* jointly, met a muted but effective resistance (*Vtoroi s´´ezd*, 1869, pp. 1–4 [5th pag]).

Therefore until the very end of the tsarist period, the congresses of Russian naturalists were run by the universities with financial support provided principally by the Ministry of Education. The Ministry encouraged the university and other higher education school faculty members, as well as secondary school teachers, to attend the congresses by authorising paid leaves for those employees who wished to take part in the event. However the congresses were open to much broader audience: anyone 'interested in natural sciences', who paid a small conference fee, could sign up as a registered participant (*Trudy pervogo s´´ezda*, 1868, p. v; *Trudy tret´ego s´´ezda*, 1873, pp. 1–2). Indeed, from their early days the congresses attracted a substantial number of people who had no university affiliation. Already the first two congresses, which took place in St Petersburg and Moscow in the late 1860s, drew several hundred registered participants. In the next decade, as the congresses moved away from the two capitals of the empire to Kiev (1871), Kazan (1873) and Warsaw (1876), the number of attendants perceptibly declined; however the return of the 6th congress to St Petersburg in 1879 was marked by a dramatic increase of its audience. The growth continued in the 1880s–1910s, although each time when a congress was held outside of the two capitals – in Odessa (1883), Kiev (1898) or Tiflis (Tbilisi, 1913) – the numbers dropped again.

By the early years of the 20th century the congress audience reached mammoth proportions, exceeding five thousands participants.

Figure 1. Number of registered participants at the congresses of Russian naturalists



Sources: Trudy pervogo s´´ezda, 1868, pp. xv–xxxiv; Vtoroi s´´ezd, 1869, pp. 1–21; Trudy tret´ego s´´ezda, 1873, pp. 11–23; Spisok chlenov IV s´´ezda, 1873; Trudy V s´´ezda, 1877, pp. 4–16; Rechi i protokoly VI s´´ezda, 1880, pp. 1–33; VIII s´´ezd, 1890, pp. iv–xxx; Dnevnik IX s´´ezda, 1894, no. 1, pp. 22–55, no. 3, pp. 15–24, no. 5, pp. 23—32, no. 10, pp. 52–62; Vysochaishe utverzhdennyi X s´´ezd, 1898; Tikhonovich, 1953.

Reconstructing congress audiences: a note on sources

My reconstruction of the congress audiences is based on lists of registered participants that were published either in the *Diaries* or in the *Proceedings* of the congresses. These lists contained not only the names of congress attendees but also their institutional and/or professional affiliation, their place of residence, and a section or a discipline they were interested in. Of course, some people provided more details about themselves than others; institutional/professional affiliation is the category for which the data are missing in a quite substantial number of cases. Sometimes I was able to verify the data or fill in the gaps using external data, but that was usually the case when prominent scholars or university faculty were involved. The place of residence is a less ambiguous category with a far smaller proportion of missing data. However the results are likely to be skewed in favour of those cities which hosted a particular congress, since it is often hard to establish whether people gave their permanent or temporary address they used while staying in this city. At the early congresses participants indicated only one section they opted to register, while later on it was apparently possible to sign in for several sections. So far I have failed to find the lists of participants for the 7th, 11th, 12th and 13th congresses.

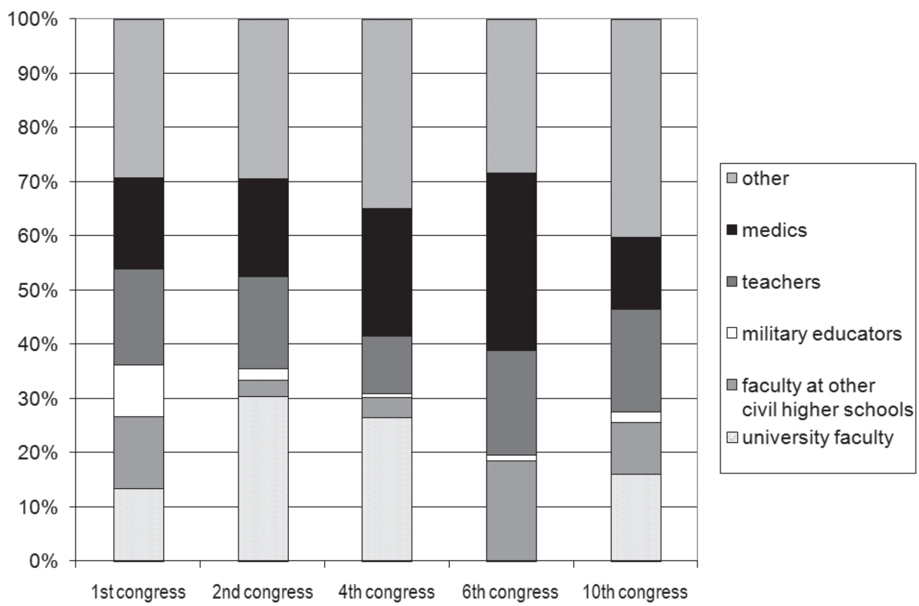
Institutional affiliation, professional background and gender

No doubt, for the vast majority of these people their participation at a congress was a singular event: about 2,580 persons attended the first six conventions (1867–1879). Among them only about 420 (or 16%) returned to visit another congress. Later the ratio remained essentially unchanged: by 1898 no less than 7,400 people attended the congresses of Russian naturalists (the actual figure must have been even bigger, as no data exist on the participants of the 7th congress), yet only about 1,260 members (or 17%) visited more than one convention.

In the course of time the congresses of Russian naturalists lost their even pace: the rhythm was first broken in the 1880s, when the gap between the 7th and the 8th congresses exceeded six years (instead of two or three years in the late 1860s–1870s). But it was in the early decades of the 20th century that the failure to convene at regular intervals became graphic: it took about ten years to organise the 12th congress in Moscow (December 1909 – January 1910) after the 11th congress in St Petersburg in 1901. The reasons for the delays are not yet quite clear. A long interval in the 1880s could possibly be accounted for by a hostile political climate in the country. However it would be more difficult to explain the slackening rhythm in the 1900s—the period of a rapid expansion in education and research, and the institutionalisation of new applied disciplines. Perhaps, it was the very growth of the congress audience that jeopardised these events: obviously they became difficult to manage, while their openness to general public must have compromised their academic objectives. The institutional formation of new fields of knowledge undoubtedly played its role as well: the early decades of the 20th century were also the time when much smaller conventions, focused on a particular discipline such as meteorology, entomology or applied geology, were established (see *Trudy Vserossiiskogo s´´ezda deiatelei po prakticheskoi geologii,* 1908; *Protokoly zasedanii II meteorologicheskogo s´´ezda*, 1910). Therefore it is difficult to judge at the moment whether the congresses of Russian naturalists had a potential for future, or with the outbreak of the First World War they were about to dissolve and be replaced by specialised conventions of mathematicians, physicists, geographers, and others, as it would indeed happen in the Soviet Russia in the 1920s.

The data available on professional or institutional background of registered participants are not quite satisfactory; however, there are some indicators suggesting that the university and higher school faculty composed about one quarter of the audience at the early congresses and their share remained relatively stable in the course of time, experiencing perhaps some decline at the 6th congress in 1879 but recovering by the last years of the 19th century. Another relatively stable group was formed by professional educators who composed about 15–20% of all registered participants. Finally, already in the late 1860s–1870s a substantial part of the audience consisted of the members of medical professions (physicians, dentists, pharmacists and veterinary specialists). These people became particularly visible at the 6th congress, when their share exceeded 30%. Indeed, we may assume that the first upsurge in the number of registered participants that took place at the same congress was at least partially accounted for by a growing interest in the congress expressed by medics.

Figure 2. Congress participants by occupation or institutional affiliation



Sources: see Fig. 1. The data for the 6th congress do not allow us to differentiate between the university faculty proper and the faculty employed by other non-military higher schools. Therefore on the graph these people are lumped together under the category 'Faculty at other civil higher schools'.

The audience of the first two congresses was exclusively male: it was only at the 3rd congress (Kiev, 1871) when the very first (and the only) woman showed up at the convention. Anna Volkova opened the way for other women: a few more attended the next congress in Kazan in 1873. Yet at the Warsaw congress (1876) their number dropped down again to just two ladies. It was only at the 6th congress at St Petersburg in 1879 when they began to form a sizable group (61 female participants on the list), even if proportionally their increase did not match the enlargement of the congress audience in general. A real growth occurred later, at the 8th congress (St Petersburg, 1889–1890): the number of female participants increased more than threefold, while their share among the participants grew up from 4.3 to 9.6%. The next congress in Moscow (1894) confirmed their increasing visibility, yet the move to Kiev, where the 10th congress took place in 1898, apparently discouraged women more than men from taking part in the event.

Quite predictably, the women who attended the congresses of Russian naturalists gravitated towards ‘softer’ subjects, such as geography and anthropology, while they were underrepresented at the sections on physics, mathematics and chemistry. Like in some other countries their role initially was rather passive: the very first woman, who did not only attend the conference but presented her paper and chaired a session at the 6th congress, was Sofia Pereiaslavtseva (1851–1903), a graduate of Zurich University who would later earn an international reputation in marine zoology (On her see Mitrofanova, 1905). At the 9th congress one more woman ventured to address the meeting as a speaker: this time she was Maria Pavlova (1854–1938), a graduate of Sorbonne, the wife of the leading Russian geologist Aleksei Pavlov, and a future prominent Russian palaeontologist on her own right (further on her see Borisiak & Menner, 1939). Yet even fifteen years later, at the 12th congress in Moscow (1909–1910) there were just ten women among the 478 speakers (*Dnevniki XII s´´ezda*, 1910).

The opening of the Russian naturalists’ congresses for female speakers and audience could be seen as rather belated and slow, yet it was quite comparable with the advances in other areas of public scholarship in Russia. Indeed, one way to assess the changing composition of the congress audience is to compare it to the public, who attended similar conventions for the humanities—the Russian archaeological congresses. These meetings were instituted in the same period (the first archaeological congress took place in Moscow in 1869) and met even more regularly than the naturalists’ congresses till 1911. For the very first time women appeared at the 5th archaeological congress (Tiflis, 1881), and with the course of time their visibility at the archaeological congresses (measured by their share of the audience as a whole) remained quite comparable with the situation at the naturalists' conventions (*Trudy V arkheologicheskogo s´´ezda*, 1887, vol. 1, pp. xi–xii; *Trudy VI arkheologicheskogo s´´ezda*, 1886, vol. 1, p. liii–lxii; *Trudy XIV arkheologicheskogo s´´ezda*, 1911, vol. 3, pp. 32–42 [2nd pag]).

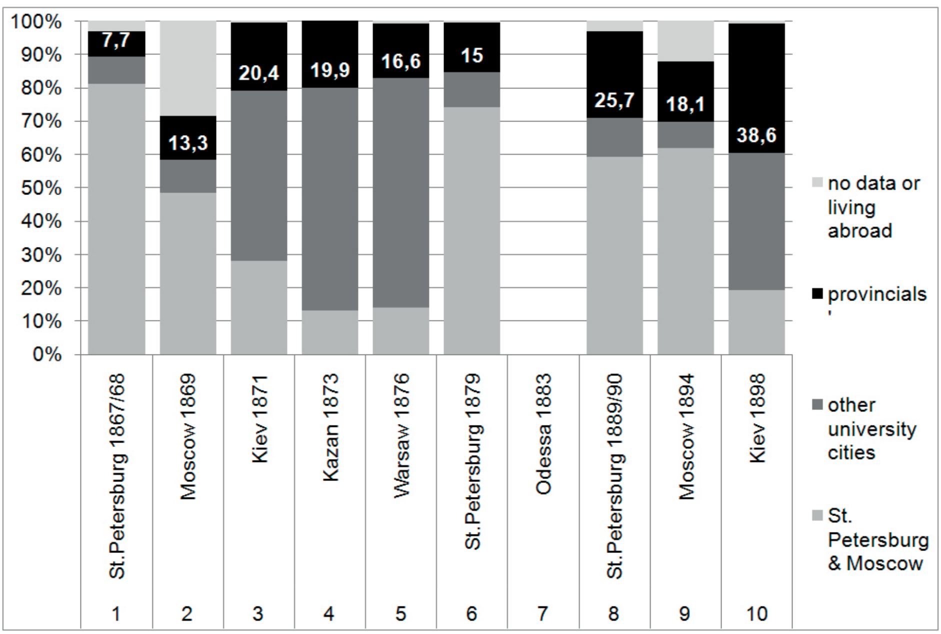
Geography of congresses and its impact

The fact that the naturalists' congresses were organised by the universities determined the choice of their venue: except the very last meeting (Tiflis in 1913) all previous assemblies took place in the university centres of the empire. Predictably, St Petersburg, as the capital, hosted the largest number of conventions (1867–1868, 1879, 1889–1890, 1901), it was followed by Moscow (1869, 1894, 1909–1910); twice the congresses met in Kiev (1871 and 1898), once in Kazan (1873), Warsaw (1876) and Odessa (1883). In this respect the naturalists' conventions differed from the Russian archaeological congresses. The archaeological congresses also originated in the two capitals of the empire: the first one convened in Moscow (1869), the second one in St Petersburg (1871), then followed the meetings in Kiev (1874), and Kazan (1877). Later on, the archaeological congresses occasionally returned to the university seats (Odessa in 1884, Moscow in 1890, Kiev in 1899, Kharkov in 1902). However from the 1880s, their geography rapidly expanded to encompass Tiflis (1881), Yaroslavl (1887), Wilna (Vilnius, 1893), Riga (1898), Yekaterinoslav (now Dnepropetrovsk, 1905), Chernigov (1908) and Novgorod (1911) (Lebedev, 1992, pp. 100–101).

Much wider geography of the archaeologists' conventions can be accounted for by the fact that they were much smaller events (even in the 1910s the number of their participants did not exceed three hundred people) run by the Moscow Archaeological Society – an independent public association, very loosely tied to the university milieu. Another factor might have been at play as well: at least from the 1890s the choice of location for archaeological congresses was very much determined by the advancement of field research in a particular region. Venues were chosen because of the interest, which a particular town or city could generate with its archaeological monuments and excavation sites (Lebedev, 1992, pp. 100–101). As for the congresses of Russian naturalists, apparently, their organisers were keen to show not the field sites but laboratories, museums and research libraries. Characteristically, when participants had to vote for the location of the next naturalists' convention, the sections on chemistry or mathematics tended to favour St Petersburg, while botanists and zoologists were more inclined to support the idea of changing the location (*Trudy V s´´ezda*, 1877, pp. 66–68; *Rechi i protokoly VI s´´ezda*, 1880, pp. 281 [1st pag], 26, 74, 123–124, 169, 238 [2nd pag]).

The choice of the city, which would host the convention, had serious implications for the composition of the congress audience. For obvious reasons, the biggest share of congress participants always came from the very city, which served as the congress venue. Since all the congresses of Russian naturalists and physicians, with a sole exception of the very last 1913 congress in Tiflis, always convened in the university centres, it could only mean that these events reinforced the university domination not only in academic research and education but in the sphere of public science as well. Nevertheless, there was always a sizable group among the audience who resided in the provinces. Evidently, the congresses always functioned as a powerful magnet for a much broader region outside the city, which hosted a convention. For reasons, which are not yet clear, Kiev as the congress venue proved to be particularly conducive to expanding the congress membership by attracting people from near-by towns and provinces: the proportion of provincials was markedly higher at the two Kiev congresses (1871 and 1898) as compared to the conventions held elsewhere.

Figure 3. Congress participants by place of residence



Sources: see Fig. 1.

Overall, there are some indicators that by the late 1890s the share of provincials among the public was on the increase. Perhaps even of greater importance was a steady albeit uneven expansion of interest in the congresses expressed by professionals and members of general public from a geographical perspective. Compare, for example, the two congresses, which took place in Kiev with the time gap of almost thirty years in between them. Of the participants of the 3rd congress less than thirty people lived outside of the capitals, university cities and provincial administrative centres (i.e. the centres of *guberniia*), while the list of geographical names referring to their places of residence consisted of fifty entries. At the 10th congress, the same list contained 224 entries; a substantial number of people came from small towns and even villages and hamlets.

Science and empire: naturalists from Finland and the Baltic provinces at the congresses

However the congresses' outreach into the 'deeper provinces', was remarkably uneven: some of the regions were much more involved in these events than others, and the 'mobilisation of the periphery' only exacerbated this trend. Two universities of the Russian Empire that were located on its north-western fringe, in the Baltic provinces and Finland, that is the University of Dorpat and the University of Helsingfors, exhibited much weaker links with the congresses from the early days. A few people from both universities showed up at the 1st congress in St Petersburg but abstained already from the 2nd one. In the next decade, before the 6th congress at St Petersburg (1879), no faculty member from Helsingfors ever attended these conventions, while it was only Professor Konstantin (Caspar) Grewingk from the University of Dorpat who showed up at the 5th congress in Warsaw (1876). On the contrary, the faculty members from other imperial universities, including the one in Warsaw, never failed to come to these events, even if the universities at Warsaw and Odessa were not particularly strongly represented. The 1879 convention in St Petersburg, like the very first congress, which had also been held in the capital of the empire, in a relative proximity to both Helsingfors and Dorpat, did attract quite a number of scholars from these two institutions. For the next, 7th congress the exact data on the participants are missing, but the last three 19th-century conventions leave an impression that till the 1890s none or very few scholars from Helsingfors took any interest in the congresses of Russian naturalists and physicians. However the attitude of the Dorpat faculty members perceptibly changed in the 1890s, as the university outlook was profoundly transformed by the intervention of the Russian imperial administration.

Figure 4. Congress participants from Finland and the Baltic provinces

Congresses:	1st	2nd	3rd	4th	5th	6th	8th	9th	10th
Helsingfors	5					8	7	1	
Dorpat	4		1		1	15	3	3	11
Riga			1		1	2	16		5
Reval						2	11	1	2
Other places in the Baltic provinces		1					1	6	3

Sources: see Fig. 1.

In the late 1880s, the Ministry of Education committed itself to converting the University of Dorpat from a German-speaking institution catering for the young generation of local Baltic nobility to a regular Russian university. From 1889 Russian was gradually introduced as the principal language of instruction while a number of new professorships and assistantships were created. These measures resulted in a substantial turnover in the university faculty: many German subjects left the school, while Russian professors and junior faculty members came over to take up vacant and newly established positions (Petukhov, 1906). In 1893, the city and the university itself were renamed to Yuriev. The transformation had an immediate impact upon the contacts between the university and the congresses of Russian naturalists and physicians: two recently appointed professors of Russian cultural background, Leonid Lakhtin (1863–1927) and Franz Levinson-Lessing (1861–1939) showed up at the 9th congress in Moscow (1894), while the 10th congress in Kiev attracted at least six faculty members from the School of Physics and Mathematics at the Yuriev University. No similar change occurred in Helsingfors: its faculty members, in rather few numbers, attended the conventions only when these meetings took place in St Petersburg.

Perhaps the difference between the three Baltic provinces and the Great Duchy of Finland, on one hand, and the rest of the European part of the empire, on the other, was even more pronounced when a broader audience of the congresses, beyond the university faculty, is examined. Till the 6th congress in St. Petersburg (1879) just three residents from Riga and Pernau (Pärnu) came to the congress, while all those congress members who lived in Helsingfors belonged to the university faculty. However from the late 1880s–1890s the pattern slightly changed: this time Helsingfors' residents were not the university professors but local doctors and secondary school teachers (mostly of ethnic Russian background). At the same time two other cities of the region emerged, where the local public expressed some interest in the congresses of Russian naturalists – Riga and Reval (Tallinn). Both places were major Baltic ports with a rapidly growing population and increasingly assertive Russian educational and cultural establishments. Still the congresses of Russian naturalists were attended by very few people who resided in other towns of the Baltic provinces, while none ever came to the congresses from Finnish cities and towns, apart from Helsingfors.

Contrasting pattern: the Polish, north-western and Ukrainian provinces

It would be wrong to project the same lack of interest onto other regions on the western fringes of the Russian Empire, even if these regions also had their own distinctive traditions of education and scholarship, stretching back to the times when these territories were a part of the Polish-Lithuanian Commonwealth. No doubt, a brutal suppression of the two Polish uprisings in 1830–1831 and 1863–1864 followed by the policy of Russification pursued by the Russian government could partially account for a far greater integration of these regions into imperial network of scientific congresses. Indeed, the closure of the Warsaw Main School after the outbreak of the Polish uprising in 1863, and the subsequent establishment of a Russian-speaking Imperial University of Warsaw in 1869 epitomised the nature of the academic policies applied by the Ministry of Education at St Petersburg towards Russian Poland. The Warsaw University and the Agricultural Institute established in New Alexandria (Pulawy) in the Lublin Province in 1869 were the two principle centres in Russian Poland that maintained steady links to the congresses of Russian naturalists. It was particularly true for the early conventions, when almost all congress participants from Poland were affiliated with the Main School—the Warsaw University. However the 5th congress, which took place in Warsaw in 1876, altered the situation dramatically by attracting not only the residents of Warsaw but also naturalists and physicians from other places in Russian Poland. Certainly, quite a number of them were Russians, but if we can use personal and family names as an indicator of ethnicity, we may presume that quite a number of Poles did not abstain from the event. When the next, 6th congress returned to St Petersburg in 1879 the number of participants from Poland had dropped. Nevertheless this time the Polish provinces were much better represented than it had been the case before the convention in Warsaw. Ten years later, in 1889–1890, at the 8th congress in St Petersburg the Polish provinces were even better represented: their increasing visibility evidently matched a broader trend towards the expansion of the congress audience. Indeed, only one half of Polish participants came from Warsaw – the rest were from other cities and towns, while those from Warsaw were evenly divided between the university and other affiliations. In other words, the 5th congress in Warsaw had a profound impact upon naturalists of the region who for the first time entered this informal network in substantial numbers, and its effect apparently did not vanish afterwards.

Figure 5. Congress participants from Russian Poland

	1st	2nd	3rd	4th	5th	6th	8th	9th	10th
Warsaw	3	2	6	5	192	32	41	23	30
New Alexandria				2	10	2	6	8	14
Other	1		1		23	8	35	2	6

Sources: see Fig. 1.

As for the south-western (the Ukrainian) and the north-western (the Lithuanian and Belarusian) provinces of the empire, naturalists from these areas were very visible at the congresses from the beginning. The two congresses held at Kiev, undoubtedly, were particularly important for attracting participants from the nearby provinces. The case of the north-western region is more intriguing: there was no university or a proper higher school there, and the population density was much lower than in the south. However people from this region were quite conspicuous at the early congresses, as there were very few provincials who attended these events.

Figure 6. Congress participants from the north-western (Lithuanian and Belarusian) provinces

	1st	2nd	3rd	4th	5th	6th	8th	9th	10th
Wilna	2	5	2	1	2	10	14	1	3
Mogilev	1	4	4			3	5	1	1
Minsk		1	1		1	3	10	1	1
Bialystok	2	2			2		5		1
Dunaburg	3	3	2		1	2	1		
Other places	2	7	2		2	7	36	5	16

Sources: see Fig. 1.

Figure 7. Congress participants from the South-Western (six Ukrainian) provinces

	1st	2nd	3rd	4th	5th	6th	8th	9th	10th
Kiev	8	6	98		16	24	58	33	303
Kharkov	7	11	21	10	10	38	81	37	36
Poltava			1			1	4	16	17
Other places in the Ukrainian provinces	2	4	15	2	2	18	51	28	88

Sources: see Fig. 1.

Most of them were secondary school teachers, and this fact suggests that in order to account for a quite unusual visibility of the north-western provinces on the map of the congress audience we should look into the history of schooling in this area. Indeed, there are reasons to believe that in the late 1860s and 1870s natural history was much better taught in the secondary schools of the Wilna educational circuit than elsewhere, since almost all secondary schools in the Russian Empire that had been focused on sciences (as distinguished from the classical curriculum) in the 1860s, were located within the circuit (Loskoutova, 2003).

Conclusions

Certainly, further research is needed to understand behind-the-stage mechanists, which determined the inclusion and exclusion of certain figures, institutions, social groups or geographical regions. We need to know more about formal and informal ways, in which both speakers and their audiences were recruited. At the moment it is clear, however, that the congress audience, particularly at the early stage, was rather uniform in terms of the social outlook and institutional affiliation of the participants. The university faculty played the dominant role by providing the key speakers and organising the events, while the most visible groups among the public were secondary school teachers and doctors. In the course of time, as the audience expanded dramatically and new disciplines were introduced onto the program, the conventions of Russian naturalists and physicians began to attract a very different social stratum of professional people, experts in applied disciplines, such as agronomy, veterinary, forestry, and statistics, who often lived and worked outside of the major university seats.

At the same time, different regions of the Russian empire were very unevenly involved in the academic networks established by the naturalists' congresses. While the Lithuanian, Belarusian, Ukrainian and even Polish provinces were to a larger or lesser degree integrated into the congress network, the Baltic provinces and Finland in particular remained very loosely connected to these events, at least till the turn of the 19^{th} century. Of course, the inclusion of the Warsaw and Dorpat/Yuriev University faculty was achieved due to the policy of Russification pursued by the Ministry of Education that in practice meant the coming over of Russian professors and junior faculty members to staff these institutions. These people had been already well-integrated into the Russian university community by the time they moved to Warsaw or Dorpat, and no wonder they were eager to maintain their contacts by attending the congresses. Nevertheless, the links I have been able to trace between these fringe areas and the naturalists' conventions cannot be neglected when the making of academic communities on a regional, national, imperial or international level in Eastern Europe is discussed.

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Collectors of Estonian Folk Botanical Knowledge

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Abstract: *This article discusses the approaches to collecting plant lore in the territory of Estonia since the beginning of the 18th century. The authors have divided the collection activities into two periods according to the collectors' ethnic background. Baltic Germans, such as Anton Thor Helle, Johann Willem Ludwig von Luce, and Johann Heinrich Rosenplänter, dominated the early period. Their collections were constrained primarily by linguistic and botanical concern. Native Estonians such as Jakob Hurt, Mihkel Ostrov, Gustav Vilbaste, and Richard Viidalepp, who strived to preserve rich folk heritage, dominated the later period. Although only two of the collections discussed in the article are reliable from an ethnobotanical point of view, the importance of such plant knowledge cannot be overestimated.*

Keywords: *archival data, data collection methods, Estonian plant lore, historical ethnobotany*

Introduction

Research into local plant knowledge has attracted growing international interest for many centuries, although the discipline—ethnobotany—was formulated relatively recently. The term 'ethnobotany' was introduced by the American botanist John William Harshberger in 1895 to designate the use of plants by indigenous people. Ethnobotanical research in the modern sense was introduced in Europe by a few local scholars even earlier.[1] Up to the present time, most

1 For a review on the history of European ethnobiology see Svanberg *et al.*, 2011.

researches in the field of ethnobotany are conducted in Americas (Waldstein & Adams, 2006) and preferably among indigenous people (Logan & Dixon, 1994). Old cultures, including those in Europe, have been left aside as unpromising in terms of new medicines because of their long literary tradition and the possible influence of the latter on popular plant use (Heinrich, Pieroni & Bremner, 2005); moreover, they may rely, to a great extent, on old herbals (Leonti *et al.*, 2010) or recipe books and scholarly medical tradition. On the other hand, studies about the influence of ethnobotanical or ethnopharmacological research on the medicinal use of plants have not introduced any drug to Northern pharmacopoeias during the past half a century (Reyes-Garcia, 2010). So ethnobotanical research in which anthropological methods are applied should focus on understanding the cultural importance of plants (Vandebroek, 2010; Tardío & Pardo-de-Santayana, 2008) or on the healing practices of a given society (Reyes-Garcia, 2010). In this respect the novelty of plant use loses its importance and the plant lore of the Old World will become an important source for research.

Still, the outcome of the research depends on the methods selected. Linguistics has been the 'official' channel for ethnobotany in Russia and other post-communist countries (Svanberg *et al.*, 2011). After all, it was language that "enabled people to share and pass on experiences of plant properties and their effects against disease" (Waldstein & Adams, 2006). For the rest of the world, medical ethnobotany is a discipline that lies at the intersection of botany, pharmacology and anthropology, and specialized literature in this field has followed the structure of scientific papers, based on large amounts of quantitative data. Nowadays, ethnobotanical research is carried out in accordance with agreed international standards, employing detailed interviews, observations, specimen collection and identification, statistical methods of data analysis, etc. This does not apply to research into historical data on local plant lore, which is often collected applying uneven methodology, across different periods of time and for different purposes. Large collections of plant lore are held in many European folklore archives, but their contents have been very little studied (Tillhagen, 1963; Babulka, 1993; Łuczaj & Szymanski, 2007; Łuczaj, 2010a; Sõukand & Kalle, 2010a, b; De Natale, 2009). The historical data on the use of medicinal plants is often too important to be rejected because of insufficient documentation or lack of details; thus several methods for its analysis have already been proposed (Łuczaj, 2010b; Sõukand & Kalle, 2011).

Estonian archives hold a large body of erratically analyzed traditional knowledge, collected since 1888, when the wide-scale activity for collecting folklore materials began. Some of the data was collected even earlier. This material includes a quantity of data on the traditional medicinal use of plants. Moreover, the few booklets with popular remedies that were published before 1920 and are clearly distinguishable from oral folklore, make the early collections a particularly valuable source, even for the discovery of a new plant use. As serfs bound to an estate and using parish-specific plant names, Estonian-speaking peasants followed the advice on plant use that was printed in pamphlets very randomly, because the plant names given in these differed from what they used.

Some historical insights into the collection of this data have already been published (Sõukand & Raal, 2005; Sõukand, 2010). These studies, however, cover only the main collection stored in the Estonian Folklore Archives at the Estonian Literary Museum and leave out collectors prior to 1888.

The aim of this article is to give a compact overview of the most important collectors known to the authors to date, including a brief insight into the works of collectors who have already been discussed in the authors' previous works with a special emphasis on analyzing their methods of collection and the relevance of their results to fulfilling the tasks of present-day ethnobotany.

The early period: Baltic Germans

The history of collecting materials of Estonian medical ethnobotany goes back as far as the beginning of the 18th century when local Baltic German Estophiles started to take interest in Estonian culture.[2] The following chapter will give an overview of the most important collectors of medical ethnobotanical data of the early period, which lasted until the middle of the 19th century, when the large-scale collecting of Estonian folklore was started.

Anton Thor Helle

The first collector of Estonian plant and medical terminology was Anton Thor Helle (1683?–1748), pastor of the then Jüri parish, North Estonia. He studied theology at the University of Kiel and learned there the basics of medicine and

2 The term Estophile refers to people not of Estonian descent who were sympathetic to or interested in Estonian language, Estonian literature or Estonian culture, history of Estonia and Estonia in general. Their activities relate to the Estophile Movement of the late 18th to the early 19th century, when Baltic German scholars began documenting and promoting Estonian culture and language. This movement played a crucial role triggering the Estonian Age of Awakening almost 100 years later that eventually led to the Estonian Declaration of Independence in 1918, the Estonian War of Independence and the foundation of the Republic of Estonia (Wikipedia: 'Estophilia' at http://en.wikipedia.org/wiki/Estophilia [Accessed April 2011]).

the use of medicinal plants. As a spiritual leader of his church community, he often had to treat physical conditions as well. This gave him a chance to observe and document folk medical terminology and plant use among peasants. Helle's most important medical ethnobotanical works (a bilingual medicinal lexicon in Estonian and German, and a trilingual medicinal plant lexicon in Estonian, German and Latin) were published in 1732 in *Kurzgefasste Anweisung zur ehstnischen Sprache* (Short introduction into Estonian language), a collection of articles dedicated to the study of North-Estonian dialect. Although his main goal was to develop and provide the local Germans with tools for learning Estonian language, the result was the first attempt to develop medical terminology.

The medical lexicon listed and described folk disease categories using Latin terminology as an aid to German near equivalents. The list of medicinal plants, later used by almost all upcoming generations of botanists in Estonia (Kutsar, 2000), included also the names of some spices and flowers, altogether 200 names. Gustav Vilbaste, the first near-modern Estonian ethnobotanist, indicated that in addition to the data Helle collected personally, he may have used collaborators from other parts of Estonia to document plant names (most of the plant names in the list have been recorded in the northern part of Harjumaa, North Estonia).

Vilbaste considered Helle quite knowledgeable about plants and argued that he must have used as an aid an herbal (*Kräuterbuch*), published in the 16th to 18th century in Germany, as the list included names of plants that had not been found in Estonia (Vilbaste, 1993). Although Helle plagiarized *Lexicon Esthonico Germanicum*[3] (Dictionary of Estonian and German), when compiling his lexicon (Kask, 1955), the plant list can be considered largely original. This is mainly because the *Lexicon Esthonico Germanicum* contained a few plant names from southwestern Estonia, while Helle's list included mostly plant names from northern Estonia. Methods of this collecting work are unknown and the reliability of plant identification is also quite poor, as his naming of plants that were not growing in Estonia may point to other mistakes as well. Still, the work being the first and the only plant name registry from such an early period, its importance as a historical source cannot be overestimated.

3 *Lexicon Esthonico Germanicum* was written by Salomo Heinrich Vestring (1663–1749), a pastor in Pernau (now Pärnu, southwest Estonia) and later provost.

Johann Wilhelm Ludwig von Luce

The most important Baltic German in the history of Estonian ethnobotany is the pastor and doctor Johann Wilhelm Ludwig von Luce (1750–1842). Von Luce was born in Hasselfelde, Electorate of Brunswick-Lüneburg, where he also completed preliminary theological education. In 1781, he came to the island of Ösel (also Oesel, now Saaremaa) and already in 1783 became a pastor in Püha parish, but found the position unsuitable and left after one year. Von Luce aspired to study medicine probably because of the illness and the following premature death of his wife, which was caused by the lack of access to medical care in Ösel at that time. He returned to Germany and from 1787 to 1792 studied medicine at the universities of Göttingen and Erfurt. In 1793, von Luce returned to Ösel and in 1801 took his license examination in St Petersburg, working for a short time after that as a pharmacist in Arensburg (now Kuressaare), administrative centre of Saaremaa.

During the years 1799–1810 he worked as an overseer and doctor in the hospital built on the Tori islet in Arensburg and suggested many innovative techniques for improving the medical and economic conditions of peasants, using his experience from working at manors. Von Luce was also keenly interested in the topography, flora, ethnography, history and language of Saaremaa and did extensive research in these areas. He published the results of these studies in over fifty works, some more extensive than others. In his studies published in Estonian, von Luce promoted the cultivation and use of native and alien plants among peasants to diversify the range of foods and disperse economic risks associated with the cultivation of monocultures. Many of his books, in which he advises the peasants to take care of their health, are the first of their kind in Estonia, although they follow the ideological and scientific framework of his contemporaries in Europe (EEVA 1).

His most important ethnobotany-related books that were published in Estonian were *Terwise katekismusse ramat* (Health catechism; von Luce, 1816), describing local diseases and other problems related to health and their treatment, and *Nou ja abbi, kui waesus ja nälg käe on* (Advice and help for when poverty and famine strike; von Luce, 1818), in which Luce taught peasants the use of twelve wild plant taxa. In the history of Estonian ethnobotany, von Luce is remembered by his two profound publications on the medicinal plant use in Saaremaa. The first, *Topographische Nachrichten von der Insel Oesel, in medicinischer und ökonomischer Hinsicht* (Medical and economic aspects of the topographical outlines from the Ösel island; von Luce, 1823), provides a full systematized list of plants growing on Ösel with vernacular names for many plants and use for some. The second, *Heilmittel der Ehsten auf der Insel Oesel* (Remedies of the Estonians on the Ösel Island; von Luce, 1829) gave the botanical description and provided local medical uses of 59 locally growing and 13 imported plant taxa, and 14 pharmacy drugs.

Unfortunately, all we know about his methods of collection is that, as the local doctor familiar with the local conditions, he questioned peasants personally and carried out some observations. As von Luce collected and published folk plant names and was one of the best-learned botanists, his identification of plants can be considered reliable. He also helped his contemporary Baltic Germans, among them Johann Heinrich Rosenplänter, to identify plants.

Johann Heinrich Rosenplänter

Pastor and Estophile Johann Heinrich Rosenplänter (1782–1846) was a theologian. He was educated at the University of Dorpat (now Tartu) from 1803 to 1806, served church in Torgel (now Tori) for some years after graduation, and in 1809 became pastor at Pernau St Elisabeth Church, where he served for the rest of his life. Rosenplänter was actively interested in Estonian culture and began to publish an academic periodical about Estonian language and culture, *Beiträge zur genauern Kenntniss der ehstnischen Sprache* (Towards a more precise knowledge of the Estonian language; EEVA 2). Only twenty issues of the periodical were issued between 1813 and 1832, before it was closed down due to financial difficulties. Many well-known intellectuals contributed to the journal with a goal of bridging the language barrier between Estonians and Germans. Among the authors was also von Luce who wrote about Estonian plant names and uses.

Being a sociable person, Rosenplänter talked to local peasants and wrote down local plant knowledge. In addition, he collected plant specimens growing in the surroundings of Pernau. His impact on the development of Estonian medical ethnobotany is comparable with von Luce's; unfortunately, his writings on the subject remained mostly unpublished. He had an ambitious project to collect the herbarium of all the plants of Estonia and to systematize them according to Carl Linnaeus' system.[4] A collection of 1,000 voucher specimens is still preserved in

4 Such a capacious work would assume profound botanical knowledge, which Rosenplänter did not possess. That was the main reason why he did not finish this work. Only in 1882 the first systematic book on plants was published by schoolteacher Juhan Kunder (1852–1888). Estonia adopted the new system in 1918, when the first list of official plant names was published. This was the beginning of the end of the multiplicity of vernacular names.

the University of Tartu Herbarium. The collection contains 11 maps, of which only one is systematized and identified to the species level according to German and Latin name. On the remaining ten maps the data is incomplete or missed. The identification notes on the first map were probably made by von Luce. From a botanical point of view Rosenplänter's collection is worthless, because it lacks information about the provenance of specimens. From an ethnobotanical point of view this is the oldest collection in Estonia where the folk names can be unmistakably related to plant species. Of particular importance from a folk medicinal point of view is his draft manuscript written on the paper on which he dried his plant specimens. The manuscript, on loose pages, contains about 70 reports on the plant use, mostly describing their medicinal purpose, and about 60 voucher specimens. The year 1831 is marked on the first pages of the manuscript; the same date features on the title page of another manuscript, *Öppetuse katse maa Rohtudest ja pudest* (An attempt to teach about herbs and trees), covering the first hundred specimens of the above mentioned herbarium. The manuscript's introduction is written in German and the chapters on plants, describing mostly their use, in Estonian. In the introduction, Rosenplänter (1831) concedes: "I can call my work a mere experiment, as it is the first attempt at describing plants and trees with the words and thoughts that are peculiar to Estonians, as I have heard from them and written down".

Rosenplänter was the first to use and preserve dried plant specimens for ethnobotanical purpose in Estonia and the first to attempt to write a book on plant use in Estonian. The book was never published, probably owing to the limited appeal of botanical literature among peasantry at the time. Gustav Vilbaste published some of Rosenplänter's ethnobotanical data in his book on Estonian plant names (Vilbaste, 1993), and some in a separate article describing and analyzing the manuscript (Vilberg [Vilbaste], 1932a).

Johann Georg Noël Dragendorff

A German-born professor of pharmacy, Johann Georg Noël Dragendorff (1836–1898) worked as the head of the Institute of Pharmacy at the University of Dorpat (Tartu) from 1864 to 1894 and invented a new alkaloid analysis method (now known as Dragendorff reagent and used by phytochemists until the present day). In 1898, Dragendorff compiled his *Die Heilpflanzen der Verschiedenen Völker und Zeiten* (Medicinal plants of different peoples and times) in which he described 12,700 plants. He believed that Estonian plant lore may be of great value and wanted to present this knowledge in one book; thus, in 1877, he asked Mihkel Veske (the first doctor of Finno-Ugric languages of Estonian origin) to address the members or the Estonian Writers' Society with an appeal to collect information about the use of plants (Niggol, 1877, p. 85, a translation of Dragendorff's questionnaire is published in Sõukand & Raal, 2005, pp. 177–178). Unfortunately there are no extant records about the outcome of this appeal (Vilbaste, 1993).

The later period: Estonian collectors

The ethnobotanical collections of the later period, lasting from 1888 until now, are compiled by native Estonians with a purpose of preserving the folk heritage. In the following we introduce these researchers who had developed specific methods for collecting ethnobotanical data and have left a considerable mark on the ethnobotanical history of Estonia.

Jakob Hurt and Matthias Johann Eisen

The beginning of the corpus of Estonian herbal lore can be traced back to 1888 when Estonian linguist, folklorist and pastor Jakob Hurt (1839–1907) launched his famous appeal to "active Estonian sons and daughters" to collect, among other folkloristic information, plant uses and beliefs about the plants. "The use of the plants for medicinal purposes has proven a solid ground and even learned doctors could benefit from folk wisdom," Hurt (1989 [1888]) claimed. His collection of general folklore was accumulated with the help of 1,345 correspondents (Viidebaum, 1934, p. 241), and the information about folk medicinal practices, including healing with plants, in this collection amounts to at least 959 use reports collected by 188 correspondents (Sõukand & Kalle, 2008).

Hurt did not ask the questionnaire respondents to submit a plant specimen or make a detailed identification of the plant. He listed nearly 40 plants by their popular names (which referred to some diseases or the therapeutic qualities of the plants), providing also Latin equivalents for some of them. Since peasants were virtually illiterate in Latin, the impact of this questionnaire on the precise species reported can be considered minimal. Earlier in his questionnaire he had provided a list of human diseases and asked to send somewhat longer explanations about them. Hurt later gave recognition in nation-wide newspapers to every contribution he received, though he did not emphasize receiving information about plants separately but as part of the general data related to folk medicine.

Some of his correspondents provided also Latin names of the plants listed by vernacular names and many respondents gave plant description or region-specific plant names, so about 80 percent of the plant names provided in the use reports in Hurt's collections can be identified to the level of the plant species or family with high accuracy (Sõukand & Kalle, 2008; cf. Łuczaj, 2010b). In addition, Hurt himself collected on his expedition to Setu region in southeastern Estonia in 1903 at least 19 reports about plant use for popular treatment, which also lacked plant specimens but informed about plant name equivalents in Latin and/or German.

The pastor and folklorist Matthias Johann Eisen (1857–1934) was engaged in collecting Estonian folklore around the same time as Hurt. Eisen's correspondents also sent him some herbal lore, but the information that he received largely duplicates the material that was sent to Hurt, especially since Eisen did not collect herbal lore systematically.

Mihkel Ostrov

The only collector of ethnobotanical material who focused solely on folk medicinal practices was the military doctor Mihkel Ostrov (1863–1940). He became fascinated with collecting folk knowledge about popular remedies as a university student, when he accompanied Jakob Hurt in folk song collection expeditions to Virumaa and Läänemaa with future folklorist and politician Oskar Kallas (1868–1946). Later Ostrov told: "While collecting olds songs, I found everywhere that plant knowledge is widespread among the common people; they collect plants from pastures and meadows and use them against several diseases" (Ostrov, 1891a, b, c). In April 1891, he put out in Estonian newspapers *Postimees* (Ostrov, 1891a), *Olevik* (Ostrov, 1891b) and *Sakala* (Ostrov, 1891c) a call for collecting local medicinal plants; in the announcement he described in detail how to collect and dry plants, how to mark an herbal exemplar with vernacular name and exact use. Later the same year he published two reports, indicating that he received 17 deliveries from 13 respondents: altogether 192 voucher specimens with 53 medical uses indicated. Sending dried plants in boxes must have been quite expensive and inconvenient for the respondents. Ostrov repeated his call in spring 1892, again in three newspapers, but according to the report from 1892, he then received only four responses with 48 voucher specimens. The third call in spring 1893 gave no responses. Ostrov rewrote the texts sent by the respondents and added the plant names identified according to the sent specimen. He systematized his material according to plant family and Latin names (Kalle, 2008). Only part of Ostrov's autographical reports have been preserved to date and all attempts to find the missing data and the voucher specimens have been unsuccessful. Ostrov can be considered the first Estonian who used dried specimens in identifying plants in reports about plant use.

Gustav Vilbaste

The greatest collector and researcher of Estonian plant lore was the botanist, journalist, school teacher and nature conservator Gustav Vilbaste (1885–1967, until 1935 Gustav Vilberg)[5]. The nation-wide campaign for collecting vernacular plant names, organized in 1907 by the Estonian Students' Society (*Üleskutse*, 1907), gave him the first impulse to collect plant lore. The goal of this campaign was to draw up a uniform list of plant names in Estonian. The list was finally published in 1918; Gustav Vilbaste is mentioned in the introduction of this publication as the one who sent highly important information (*Kodumaa taimed*, 1918). Being inspired by such activity Vilbaste started to collect plant vernacular names on his own initiative while studying Botany at the University of Tartu in 1919–1026. He graduated from the University of Vienna and defended there his Ph.D. dissertation in 1928.

His first call, published in several Estonian newspapers and journals was targeted at collecting plant names; for easier identification of the plant he also asked respondents to supply Latin, German or Russian equivalent (Vilberg, 1923a, b, c, d; 1928a, b, c). Since 1929 he had asked respondents to send information about the use of the plants as well as general knowledge about plants: What was the plant used for in the past (medicine, dyeing, magic, food, etc.); what kind of fairytales are known about plants, and what agricultural tasks had to be performed during the blooming or ripening of certain plants (e.g., Vilberg, 1929). This call also contained instructions for preparing plant specimens. As a result of Vilbaste's and his correspondents' enthusiasm, his collection grew quite quickly: in the following public call he indicates, that as of 20th January 1934, his collection contains 32,542 reports on plant names and 8,578 reports on plant use. He also mentions that many of his correspondents have sent material repeatedly (Vilberg, 1934a).

After Vilbaste's death in 1967, his archive collections were donated, as specified in his will, to the Estonian Literary Museum and are stored in the Estonian Folklore Archives in the fund bearing his name. The part of this archive collection related to ethnobotany consists of 11 volumes, the total of 8,319 pages, and contains, as Vilbaste himself pointed out in the first volume of his collection,

5 For more information about Gustav Vilbaste as ethnobotanist see Kalle and Sõukand, in press.

16,891 records about plant use and 100,842 records on plant name (Vilbaste, TN: 1, 1205–1284). He had more than a thousand correspondents; also he had copied vernacular plant names from most of the botanical and pharmaceutical literature published in Estonian, and in Estonia, up to the middle of the 19th century. Vilbaste's last call for collecting folk botany was published after his death, in 1968, with the questionnaire addressed to the correspondents of the Estonian Literary Museum. Now it is impossible to tell how many responses it received.

During his lifetime Gustav Vilbaste published over 1,400 publications (mostly articles), among them 29 books and booklets. Still, among these there was only one article solely dedicated to the use of plants in folk medicine (Vilberg, 1932b), also a detailed analysis of popular use of plants was given in his book *Meie kodumaa taimi rahva käsitluses* (Popular views on plants native to Estonia; Vilberg, 1943b; 1935). Unfortunately, due to financial problems he published only two of the five planned volumes. Vilbaste also authored the botanical and folk medical sections of every plant chapter of the only herbal[6] published in Estonian in the Soviet period. His personal fund in Estonian Cultural History Archives (f 152) contains also handwritten drafts of lectures (composed probably after Second World War) about 15 medicinal plants.

Vilbaste was ahead of his time in Estonia: to preserve the disappearing folk knowledge about plants he collected it combining traditional and innovative research methods, using public calls, personal approach to collectors and fieldwork with identification of the plant with the dried specimen (most of them are still preserved in the herbarium of Estonian University of Life Sciences. His collection contains at least 6,519 use reports related to medicinal use of plants (Sõukand & Kalle, 2008).

Richard Viidalepp

The Estonian folklorist Richard Viidalepp (1904–1986, until 1935 Viidebaum), contemporary to Gustav Vilbaste, undertook parallel activities to collect plant folklore. Working during his entire career at the Estonian Folklore Archives (later Fr. R. Kreutzwald's Literary Museum) in Tartu, focusing on collecting

[6] Only the first edition of this herbal was published in Vilbaste's lifetime (Kook & Vilbaste, 1962). While five editions altogether were published of the herbal, only the last edition (Tammeorg *et al.*, 1984) had an additional chapter on the medicinal plants that were not accepted by the official medicine; this chapter was prepared by Vilbaste already for the first edition, but due to unfavorable attitudes toward folk botanical use it was not published earlier.

and storing folk heritage, he published his call for collecting folklore in 1936. The questionnaire No. 3 of the Estonian Folklore Archives issued instructions for folklore collectors, and sought answers to questions about what types of plants are used for healing, magic, fortune telling, dyeing and playing. Viidalepp listed over 60 vernacular plant names, but unfortunately did not ask for voucher specimen. In another chapter, he asked also additional questions about folk healing methods, listing many well-known folk disease categories (Viidalepp, 1936). By this time, the Estonian Folklore Archives had developed their own network of correspondents who regularly collected folklore and were sent all questionnaires without charge. Although at this stage of research it is difficult to evaluate the exact influence of Viidalepp's questionnaire to the collected plant lore, it has definitely left its mark on the amount and quality of folk botanical heritage. The questionnaire was the most important of its kind in the history of Estonian Folklore Archives and was used also after the Second World War. Viidalepp himself also collected herbal lore during his numerous expeditions in 1927–1966, recording at least 165 use reports about the medical use of plants (Sõukand & Kalle, 2008).

After the foundation of the Estonian Folklore Archives in 1927 the collecting work was also carried out, next to amateur collectors, Gustav Vilbaste and Richard Viidalepp, by other professional folklorists like Rudolf Põldmäe, Herbert Tampere, and many others. The collection, accumulated after the Second World War, was intensively collected by mostly professional Estonian folklorists, although non-professionals still sent in large amounts of material. In addition to folklorists and non-professional collectors, herbal medical lore was also collected by some university students of botany: among them stood out Aimre Lindre who, in addition to extensive fieldwork conducted in western Virumaa, re-systematized and complemented the ethnobotany card files at the Estonian Literary Museum in 1969.

In the 1990s, new questionnaires including questions on plant use were compiled by Mall Hiiemäe, Mare Kõiva, Ain Raal, and Anu Korb. Also, in 2005 and 2006 Hiie Tarto, host of a popular Estonian television program for the elderly, *Prillitoos*, carried out a collection of plant lore on specific plants. More recently, the authors of the present article developed a questionnaire to document not only the use and names of plants, but also people's attitudes toward plants and their use, literature used to find information about the plants, the use of these sources and ways of identifying the plants.

Conclusions

The folk medicinal and folk botanical knowledge of the Estonians that has been gathered on a few enthusiasts' personal initiative over the last three centuries represents a valuable source for ethnographic as well as ethnomedicinal research. The early data was put together by Baltic Germans from linguistic concern (Helle), from the need for translation, or to pursue botanical interests (von Luce and Rosenplänter).

The collections created by native Estonians were first and foremost driven by the need to preserve the disappearing local plant knowledge. This is probably the reason why of the seven most important and outstanding collectors of herbal folk heritage discussed here only two—Rosenplänter and Vilbaste—left behind collections that could be analyzed according to modern ethnobotanical standards. Nevertheless, the significance of researchers collecting folk botanical knowledge without the aid of plant specimens (Helle, Hurt, and Viidalepp) and especially those using herbal specimens as a temporary aid to identify plants (von Luce and Ostrov) in the light of the cultural value of such plant knowledge, from the international perspective, cannot be overestimated.

When considering the possibility to determine the credibility of the collected data according to the plant taxa, knowledge about the background of the collector is of crucial importance. In the future, such insight may be gained also about the less known collectors of the entire corpus of Estonian medical ethnobotany for the purpose of assessing its identification credibility and collectors' impact on the quality and quantity of the collected data.

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Botanical Garden of the University of Tartu (Dorpat) and the Botanical Network in the First Half of the 19th Century

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Abstract: *The paper deals with the establishment of the Botanical Garden of the University of Tartu (Estonia) in 1803 and its further developments in the first half of the 19th century. A decisive role in the establishment of the Botanical Garden was played by Gottfried Albrecht Germann, the first professor of natural history (botany) at the university, and by a learned gardener Johann Anton Weinmann. Owing to the scientific contacts between these two men, species richness in the Botanical Garden increased rapidly. In 1810, after the collections had been moved to their present location of the garden in the autumn of 1808, the garden contained 4,586 species. By 1927, the garden's species richness had grown to 10,449 taxa and by 1845 – to about 14,000 taxa on account of the live plants and seeds collected by the subsequent teachers of botany and leaders of the Botanical Garden – Carl Friedrich von Ledebour, Alexander Georg von Bunge, Ernst Rudolph Trautvetter and Carl Johann Maximowicz on their expeditions, as well as with the help of contributions from many other botanists, pharmacists, collectors, etc. According to the analysed manuscript registration lists of plants and seeds from the years 1823–1832, 1839–1841 and 1846–1852, the garden received 48,096 accessions from nearly 350 persons and nearly 30 nurseries, with 32 persons having sent more than 400 accessions. Among the contributors were many then well-known botanists of Europe.*

Keywords: *19th century, botanical garden, botanists, contributors of plants and seeds, species richness, Tartu (Dorpat)*

Introduction

By the end of the 18th century, a solid botanical network had emerged in Europe, involving many researchers and amateur naturalists, academic plant taxonomic research and publishing at universities, numerous extensive expeditions, botanical gardens, private collections, nurseries and developments in ornamental gardening. Great numbers of plants had been collected in botanical and private gardens, herbaria had been established, many local and foreign floras had been examined and an extensive botanical bibliography published (Pritzel, 1851, pp. 1–330, 379–391; Meyer, 1857, pp. 254–288; Hill, 1915, pp. 190–223).

Botanical science in Russia in the 18th and 19th century was advanced largely by natural scientists educated in Germany, France, England, Denmark and Sweden, who had settled in Russia in the 18th century for their research and for arranging research expeditions. At the same time, researchers also emerged from among the Baltic Germans. All these researchers published also their numerous scientific works in Germany and Russia (Trautvetter, 1837, pp. 4–50, 57–75; Kolchinsky, 2004, pp. 106–116; Sokoloff *et al.*, 2002, pp. 129–191). Thirty-six better-known botanical gardens with various purposes and names are mentioned in Russia from the 17th century onward (Trautvetter, 1837, pp. 51–54). Private gardens were actively established also in the provinces of Estonia and Livonia, and also the park culture here was highly developed (Hupel, 1791, pp. 534–553; Germann, 1805, pp. 17–32; Hein, 2007, pp. 15–87).

The first private botanical gardens in Russia were established in the 18th century in the manor of Demidov near the village of Krasnoe Solikamsk in the Urals (1731), in the Neskuchny Manor of Prokopy Demidov in Moscow (1756), and in the manor of Alexei Razumovsky at Gorenki (in the late 18th century). In 1771, Ivan Lepekhin registered 422 species in the garden of Solikamsk, several of them being exotic species. The plant catalogue of the Neskuchny Garden contained 2,000 species in 1781 and 4,363 species in 1806. The Gorenki Garden was led in its early years by botanists Friedrich Christian Stephan (1798–1803), Ivan Redowsky (1803–1805), and Friedrich Ernst Ludwig von Fischer from Germany (since 1806), each of them giving a contribution to increasing the species richness of the garden. Owing to Fischer, seeds and plants were sent or brought there by many Russian explorers. In 1803, the garden contained 2,846 species, while the collection had increased to 8,036 species by 1812 (Trautvetter, 1837, pp. 52–53; Sokoloff *et al.*, 2002, pp. 161–169, 182–183; Elina, 2006, pp. 582–583).

By the time the Botanical Garden of the University of Tartu began to be established, botanical gardens had existed in Europe for 250 years and a large variety of plants had been introduced there from various regions of the world. In addition, good contacts had been established between the botanical gardens, botanists and explorers in Western Europe and Russia. Many researchers who had been educated in the universities of Europe had given a great contribution to studying the flora of Russia, and many plants were preserved in bigger collections and herbaria (Trautvetter, 1837, pp. 1–145; Sokoloff *et al.*, 2002, pp. 129–191). All this contributed to the rapid formation of species richness in the Botanical Garden of the University of Tartu. New plants were obtained from many locations and the garden evolved into one of the biggest and most significant botanical gardens in Russia in the 19th century, first of all due to the diversity of plants from East Asia.

This paper deals with the formation and changes of species richness in the Botanical Garden of the University of Tartu in 1804–1851, also providing an insight into the garden's leading staff as well as the provenance and contributors of live plants and seeds in the above period.

Methods and material

The paper builds on published literature and on manuscripts preserved in the Estonian Historical Archives in Tartu (EAA 1) – general plant lists of, and data on contributors of plants to, the Botanical Garden of the University of Tartu. The general lists cover the years 1804, 1816–1818, 1822, 1823–1840, 1842, 1843, 1846, 1848 and 1851. Two general lists are stored in the Botanical Garden of the University of Tartu. One of them is untitled and thus it remains unclear which data it concerns, while the other one is the general list for 1845 (*Enumeratio*..., 1845). Both have been analysed before (Sander, 2010, pp. 90–93). The plant names occurring in the manuscripts are written in ink on the left-hand pages together with the names of the species' authors and often also with the names of senders of the plants. In places, plant names in the manuscripts have been crossed out, recorded by numbers or just by the names of authors, and a few entries have also been added in between. The right-hand pages contain additional data, which are often written in pencil and appear to have been added later. The lists do not reveal their compilers – only in some single cases are they signed and stamped by the then directors of the garden.

Also the registration lists of seeds or live plants sent to the botanical garden have been preserved from the first half of the 19th century. These contain the following data: the name of the sender, place of dispatch, number of accessions received on the respective date, and the date of arrival or registration. The names of senders are missing in places. In most cases it is also mentioned whether the parcel contains seeds or live plants, although the latter were sent only in very rare cases. Also the names of plants are listed. The lists cover the following periods: 23 Jan 1823–7 Nov 1832, 10 Apr 1839–22 May 1841 and 12 May 1846–1854 (EAA 2).

Leaders of the Botanical Garden of the University of Tartu

In the first half of the 19th century, the Botanical Garden of the University of Tartu had three directors: Gottfried Albrecht Germann (1803–1809), Carl Friedrich von Ledebour (1811–1836) and Alexander Georg von Bunge (1836–1867) (Siilivask, 1982, pp. 185–188). Next to the directors, a great contribution to the development of the Botanical Garden was made by the assistant directors and learned gardeners (Meikar, 2002, pp. 61–73) (Table 1). The latter immediately started to lead the work in the garden and had a great impact on the actual situation in the garden.

Table 1. Directors and learned gardeners of the Botanical Garden of the University of Tartu in the first half of the 19th century (Meikar, 2002, p. 65)*

Directors	Assistant directors	Head gardeners
Gottfried Albrecht Germann (1803–1809) Carl Christian Friedrich von Ledebour (1811–1836) Alexander Georg von Bunge (1836–1867)	Ernst Rudolph Trautvetter (1833–1835) Carl Albert Rathlef (1835) Carl Herrmann Bluhm (1835–1836) Anton Bärnhoff (1836) Friedrich Julius Seetzen (1836–1846) Friedrich Wilhelm Kupffer (1848–1850) Carl Johann Maximowicz (1850–1852)	Johann Friedrich Kieser (1803–1804) Johann Peter Buek (1804) Johann Anton Weinmann (1805–1813) Albert Siegmund Natusch (1813–1814) Carl Neumark (1814–1816) Ludwig Riedel (1818–1820) Louis Autem (1821) Heinrich Wilhelm Gebhardt (1825–1832) Friedrich Wilhelm Günter (1833–1834) Wilhelm Eduard Stelling (1834–1876)

** The table does not include short-term substitutes in these positions.*

The Botanical Garden was founded and organised by Professor Germann (1773–1809), the first professor of natural history (botany) at the University of Tartu, whose research at the university focused mostly on botany and ornithology. In his teaching work, he lectured on Natural History, Botany, Zoology, Mineralogy, Entomology and Ornithology. Germann also established a cabinet of natural history for the accommodation of various collections and for teaching work, and assembled an entomological and rock collection and a herbarium (Siilivask, 1982, pp. 185–186; Sander *et al.*, 2009, pp. 46–50).

Germann was assisted in establishing the Botanical Garden by learned gardeners Kieser, Buek and Weinmann (Meikar, 2002, pp. 64–67). In 1805, Johann Anton Weinmann (1782–1858), a practitioner with extensive horticultural experience from Germany, assumed the head gardener's position at the Botanical Garden and held the position until 1813. Prior to coming to Tartu, he worked in the Botanical Garden of Würzburg and as an assistant to Razumowski's[1] palace gardener Rosenthal[2] in Vienna. Weinmann continued the work of his predecessors in the old location of the Botanical Garden and established the garden in its present location in Tartu (Lai 38/40). Planting of the plants transferred from the old garden, as well as new ones, started under his guidance in the autumn of 1808 and the new garden was mostly completed by 1810 (Weinmann, 1810, pp. XI–XIII; Le Lièvre, 1997a, pp. 36–38; Sander & Meikar, 2009, pp. 72–85). In 1813, Weinmann moved to St Petersburg, where he initially worked in the garden of the Gatchina Palace and two years later became the supervisor of the gardens of Pavlovsk Palace. He was a flora researcher and taxonomist, with his research involving, next to vascular plants, also bryophytes, lichens, algae and, in particular, fungi. He was elected a correspondent member of the St Petersburg Academy of Sciences in 1831 (Siilivask, 1982, p. 186; Lipshits, 1947, pp. 77–78).

After Germann's death, the position of professor of botany remained vacant, while the duties of the director of the Botanical Garden were assumed by Weinmann (Tänavots, 1994, p. 30). Initially, there were several candidates for the position of professor of botany, including Karl (Carl) Asmund Rudolphi (1771–1832), Ledebour's teacher at the University of Greifswald, who, however, withdrew his candidacy. Yet no elections were held for some reason. The second

[1] Count Andrei Razumowski (1752–1836), a Russian diplomat, worked in 1777–1779 in the Russian Embassy in Vienna, since 1794 the Russian ambassador in Vienna. Later lived in Italy, returned to Vienna in 1801.

[2] Johann Konrad Rosenthal was a then famous gardener in Austria, in particular in Vienna.

time, Ledebour and Tauscher[3] were the only candidates. Ledebour was preferred and took up the position. Ledebour (1785–1851) entered the University of Greifswald in 1802 and graduated as a Master of Science in 1805, earning also his Doctor of Medicine degree in the same year. On his way to Tartu, Ledebour stopped in Berlin, where he became acquainted with C. L. Wildenow[4] and P. S. Pallas[5]. Ledebour worked at the University of Tartu for 25 years (1811–1836) (Levitskii, 1902, pp. 344–348; Tankler & Pullonen, 1994, p. 17).

Ledebour lectured on Botany, but also Pharmacological Botany, Terminology of Botany, History of Botany, etc., and, to a small extent, also Zoology and Mineralogy. He also taught practical courses for advanced students and guided botanical tours (Tankler & Pullonen, 1994, p. 12).

Ledebour also made great efforts to extend the Botanical Garden. At his demand, the greenhouses and teaching and residential buildings were renovated, construction of the wall surrounding the garden was completed, and the territory of the garden was extended on account of the neighbouring plots. An additional parcel of land was bought in 1822, and the area behind the pond was filled and made usable (in parallel with cleaning of the pond) in 1824. The outdoor planting area tripled as a result of various earthworks. The budget of the garden was increased from 1,200 to 4,000 roubles at his request, and additional 2,000 roubles were allocated to the garden in 1829 (Tankler & Pullonen, 1994, p. 18; Tänavots, 1994, p. 30; Poots, 1994, p. 37). Ledebour also replenished the equipment of the Chair of Botany, bought state-of-the-art microscopes and expanded the teaching herbarium and scientific herbarium. The plant collections of the Botanical Garden also increased considerably during his time (Siilivask, 1982, p. 186) and the seed collection began to be created, amounting to 8,617 specimens in 1837 (Mushinskii, 1911, p. 149).

Ledebour also organised significant expeditions. The first one, to the Crimea, was carried out from May to October 1818 together with Carl Anton Meyer (Trautvetter, 1837, p. 38; Tankler & Pullonen, 1994, p. 19). The second expedition, a two-year journey to Altai, was undertaken in 1826–1827 together

3 August Michael Tauscher (1771–1841) was a philosopher, botanist and entomologist. He lived in Russia in 1806–1812, organising scientific expeditions in 1806 and later. Since 1814 he lived in Saxony and since 1826 in Dresden.

4 Carl Ludwig Wildenow (1765–1812) was a German botanist, pharmacist and plant taxonomist. He worked as a professor of natural philosophy and botany at the Berlin Collegium and University of Berlin and was the director of the Botanical Garden of Berlin from 1801 until his death.

5 Peter Simon Pallas (1741–1811) was a German zoologist and botanist who worked in Russia in 1767–1810.

with Alexander von Bunge and Meyer. Each of the three took a separate extensive route (Trautvetter, 1837, pp. 18–21; Poots, 1994, pp. 39–40; Le Lièvre, 1997a, pp. 52–54).

Together with Meyer, Bunge and other botanists, Ledebour examined the plant material collected by botanists Adelbert Chamisso and Morten Wormskjold and zoologist Johann Friedrich Eschscholtz during their participation in the round-the-world journeys of Otto von Kotzebue (1815–1818 and 1823–1826), as well as the material collected by Carl (Karl) Eduard Eichwald during his expedition to Southern Russia in 1825–1826 (which started and ended in Kazan). Ledebour also examined the plant material collected by Finnish zoologist Alexander von Nordmann and Th. Döllinger in Southern Russia in 1836 (Trautvetter, 1837, pp. 6, 30–31; 33). On the basis of the plant material collected by him and others on the expeditions, he wrote several works, including a four-volume Flora Altaica (together with Bunge and Meyer, published in 1829–1833), a two-volume travelogue on Altai (published in 1829 and 1830), and a four-volume Flora Russica, published in 1842–1853 (Trautvetter, 1837, pp. 19, 61; Siilivask, 1982, pp. 186–187; Kask, 1994, pp. 22–29; Poots, 1994, p. 41; Le Lièvre, 1997a, pp. 41–52).

Bunge, who was elected as professor of botany, head of the Chair of Botany and director of the Botanical Garden of the University of Tartu after the retirement of Ledebour in 1836, studied medicine at the University of Tartu in 1821–1825 and obtained his doctorate of Medicine in 1825. In 1826, Bunge commenced work as a physician in Barnaul, Tomsk Governorate, and participated in the Altai expedition of Ledebour and Meyer. He worked in the expedition area (Barnaul, Zmeinogorsk, eastern Altai) until 1830. In 1830–1832, he participated in an expedition to Mongolia and from there to Bejing through the Gobi Desert as part of a diplomatic mission. In 1832, Bunge carried out a second expedition to Altai. In 1833, he was elected as an extraordinary professor of botany of the University of Kazan and nominated a correspondent member of the St Petersburg Academy of Sciences. In 1834 and 1835, Bunge carried out expeditions in Southern Russia. In 1857–1859, he participated in an expedition of the Russian Geographical Society to Persia (Iran).

Bunge wrote monographs on many complicated plant genera: *Acantholimon* (Plumbaginaceae), *Anabasis* (Chenopodiaceae), *Astragalus* (Fabaceae), *Cousinia* (Asteraceae), *Echinops* (Asteraceae), *Gentiana* (Gentianaceae), *Heliotropium* (Boraginaceae), and others. He has written papers on the flora of Russian steppes, Central Asia, Mongolia, China and Iran. As an excellent taxonomist, Bunge also examined the plant collections of Alexander Gustav von Schrenk; Alexander Theodor von Middendorff; Gustav Radde, explorer of the Crimea, Caucasus and East Siberia; Alexander Lehmann, explorer of Central Asia; Alexander Czekanowski, explorer of East Siberia; and others. Bunge organised expeditions (some of them together with Meyer) to the then Estonian, Livonian and Curonian governorates in 1823–1851 and published a concise overview of the flora of the region in 1853. Bunge also replenished the collections of the Botanical Garden. The greenhouses of the garden were modernised in 1855–1857 at his demand and an additional, fifth greenhouse was built in 1858 (Trautvetter, 1837, pp. 21, 41, 45; Bunge, 1847, pp. 1–139; 1853, pp. 1–292; Siilivask, 1982, p. 188; Kaavere, 1978, pp. 517–520; Le Lièvre, 1997a, pp. 52–54; Läänelaid, 2006, pp. 255–272).

Due to his high workload and long-term expeditions, Ledebour was requesting since 1820 that an additional position be opened for an assistant to deal mainly with the Botanical Garden. The position of assistant director of the garden was allocated in 1833 and assumed in the same year by Ledebour's student Ernst Rudolf Trautvetter (1809–1889). Trautvetter graduated from the University of Tartu with a gold medal in 1829 and returned to his city of birth Jelgava (Mitau) until assuming the position in Tartu. In addition to performing the duties of the assistant director, Trautvetter worked since 1834 as a private docent, lecturing also on the local flora (*Flora Livonica*). After leaving Tartu in 1835, he worked in 1835–1838 as a junior assistant director in the St Petersburg Botanical Garden under director Friedrich Ernst Ludwig von Fischer and moved to the University of Kiev in 1838, becoming a professor of botany there and establishing the university's Botanical Garden in 1841. He was also a dean at Kiev University in 1841–1847 and rector in 1847–1859. In 1837, Trautvetter was elected as a correspondent member of the St Petersburg Academy of Sciences. Retiring in 1864, he returned to work in St Petersburg, became the acting director of the Botanical Garden and was elected as the director in 1866 and 1870. Trautvetter published his first scientific paper in 1830 and the last one in 1888. He stood out for his phytogeographic and floristic works (Trautfetter", 1873, p. 178; Regel, 1889, pp. 661–672; Hasselblatt & Otto, 1889, p. 144; Siilivask, 1982, p. 187).

For the entire first half of the 19th century, the assistant director's position was held by alumni of the University of Tartu with different specialisation. Rathlef (1810–1895), who held the position for a brief period, studied theology and philosophy at the University of Tartu in 1828–1832, continued his studies in Berlin for one year and worked as a private tutor in Tartu in 1833–1835. Later, in 1854–1858, he worked in Tartu as an extraordinary professor of history and in 1858–1866 as a full professor of history. Bluhm (1812–1904) studied medicine in Tartu in 1831–1836 and also received a degree of Doctor of Medicine there, working as an assistant director of the Botanical Garden during either his studies or study breaks. Since 1837, he worked as a practicing physician in Jelgava. Bärnhoff (1812–1855) studied medicine in Tartu in 1831–1835, worked as an assistant director of the garden for a brief period after his graduation and as a physician in Alūksne (Marienburg, Latvia) since 1838. Seetzen (1810–1885) studied medicine in Tartu in 1830–1836, worked as an assistant director of the Botanical Garden in 1836–1846 and thereafter worked in St Petersburg. Kupffer studied mathematics in Tartu in 1833–1837 and worked as a private tutor in Curonia after leaving the assistant director's job in Tartu (Hasselblatt & Otto, pp. 177, 198, 209, 213, 226; Siilivask, 1982, p. 159). Thus, despite the fact that Ledebour had been requesting for years for an assistant director's position to be allocated, no competent worker who would also be an outstanding researcher emerged for this position after Trautvetter during the first half of the 19th century.

Another assistant director of outstanding merit, next to Trautvetter, was Carl Johann Maximowicz (1827–1892), who graduated from the University of Tartu in 1850 as a student of Bunge. His two-year period in Tartu is regarded as preparation for his subsequent grand works. After leaving Tartu, he moved to work as herbarium curator in the St Petersburg Botanical Garden (1852–1855, 1858–1859, 1864–1869), where he became the head botanist in 1869 and was elected as the temporary director of the museum and biology laboratory of the Botanical Garden in 1870. In 1855–1858 and 1859–1864, Maximowicz worked as a botanist-explorer. In 1853–1854, he participated in a round-the-world expedition on the ship *Diana* together with Leopold von Schrenk and, in 1854–1857, explored the vegetation of the Amur region. His later expeditions took him to Mongolia, Tibet, China, Korea and Japan (Trautfetter", 1873, pp. 181–182; Siilivask, 1982, p. 188; Le Lièvre, 1997b, pp. 131–143; Barnes, 2001, p. 3).

Learned gardeners are known to have changed frequently during Ledebour's time. On some occasions there were none working at the garden and Ledebour himself had to do the work. The only noteworthy learned gardener at this time was Gebhardt from Riga, who worked in this position for a longer period than the others (Willkomm, 1873, p. 23). Unfortunately, he died in 1832 at the age of 29. Gebhardt may have been dealing with the plants and herbaria brought along by Ledebour from his journeys (Le Lièvre, 1997a, p. 40). Gebhardt was succeeded in the position of learned gardener by Wilhelm Eduard Stelling, who started in 1828 as a gardener's apprentice and later worked as assistant to the learned gardener. The administration was satisfied in all respects with his work and he was repeatedly acknowledged for the excellent order attained in the garden (Meikar, 2002, p. 67).

Species richness in the Botanical Garden in 1810–1851

According to literature data based on Weinmann's list from 1810, there were 4,360 plant species growing in the garden in 1810, with 509 of them being native plants (Siilivask, 1982, p. 186). The list contained 4,586 species from 968 genera. The mode of cultivation was not specified for two of them. Of the remaining 4,584 taxa, 742 were growing in a heated greenhouse, 1,508 were growing in a cold greenhouse, and 2,358 – in the open ground. This makes a total of 4,608 taxa, of which 24 occurred in two sites, mostly both in a cold greenhouse and in the open ground (Weinmann, 1810, pp. 1–170; Sander & Meikar, 2009, p. 82). After 1810, the number of plant species in the garden increased, although the increase was not continuous but variable between years. In 1827, the garden had 10,449 species (Ewers, 1827, p. 439), and no other numerical data are known to have been recorded for that year. Of the 10,449 species, 4,477 were growing in greenhouses and 7,627 were growing in the open ground. As we can see, there were more plants growing in the garden in total than recorded on the species list. Thus, 1,655 species were growing both in greenhouses and in the open ground. The biggest plant genera were *Allium* (with 90 species), followed by *Astragalus* and *Rosa* (both with 76 species), *Potentilla* (65), *Campanula* and *Euphorbia* (both 56), *Medicago* (54) and *Iris* (52). The collection also included over 800 Siberian species brought by Ledebour from his 1826 expedition, some of which were completely new to science and some had not been brought into cultivation earlier. The Botanical Garden also had a herbarium of Altaian flora with 1,600 species.

All registered plant names were counted separately from the volumes of 1845 and 1851. In 1845, the left-hand pages contained 13,665 species from 1,707 genera, with more than 1,500 taxa being woody plants (*Enumeratio*…, 1845). The genera *Alnus*, *Betula* and *Carpinus* appeared on torn-out pages. Part of the 13,665 taxa have been crossed out later and rather many are unidentified and recorded with numbers. Considering the fact that eight pages had been torn out (with an average of 35 taxa per page) and three were partly torn out, the list may have included approximately 14,000 taxa. In places, plants have been recorded also on right-hand pages – these are pencil-written and appear to have been added later. A total of 438 additional taxa from 81 genera were listed on such pages, 87 of them being woody plants (*Enumeratio*..., 1845). The most extensively represented genera were *Silene* (190 taxa), *Hieracium* (160), *Veronic*a (148), *Centaurea* (131), *Rosa* (128, of which 40 were unidentified), *Potentilla* (116), *Thalictrum* (104) and *Salvia* (100 taxa), followed by *Dianthus*, *Iris*, *Triticum* and *Vicia* (each with 94 taxa). Of woody plants, the genus *Rosa* was represented with 166 supposed taxa, of which 13 were recorded just by the author's name and 27 were recorded with numbers. The genus *Rosa* was followed by *Ribes* (42 taxa); *Pyrus,* incl. *Malus*, (39); *Crataegus* (31); *Pinus* (incl. *Abies*, *Larix*, *Picea*), *Erica* and *Cytisus* (27); *Lonicera* (25); *Acer* (20); *Caragana* (19); *Rhamnus* (18); and *Rhododendron* and *Cotoneaster* (14).

By 1851, the species richness of the garden had not decreased – the list contained 13,180 taxa from 1,886 genera (EAA 1). The most extensively represented genera were *Silene* (196 taxa), *Hieracium* (158), *Potentilla* (152), *Veronica* (123), *Centaurea* (115), *Iris* (114), *Thalictrum* (110), *Allium* (109), *Astragalus* (95) and *Salvia* (90). The biggest genus of woody plants was *Rosa* (90 taxa), followed by *Crataegus* (38), *Spiraea* (35), *Lonicera* (31), *Fraxinus* and *Berberis* (25) and *Acer* (22). Also the genus *Clematis*, which includes both herbaceous and woody plants, was numerously represented – with 45 taxa.

Contributors of live plants and seeds in 1823–1854

General data

In the period covered in this paper, the Botanical Garden received 48,096 accessions of live plants and seeds. In eight years the number of accessions amounted to more than three thousand. The largest number of accessions (nearly 4,000) was received in 1840. The figure for 1839 refers to accessions received in April and the one for 1846 refers to the ones received in May (Table 2).

The senders of live plants and seeds to the Botanical Garden are referenced in the manuscripts by their names and places of dispatch. The title 'professor' (prof.) and the initials are sometimes added, and the first name is added in very rare cases. The authors are of the opinion that the persons referred to in this paper are likely to have been the senders. Data on the persons were obtained from various encyclopaedic publications, websites of universities, various overviews (Trautvetter, 1837, pp. 137–145; Pontt & Döhren, 1845; Pritzel, 1851; Meyer, 1857; Trautfetter", 1873; Hasselblatt & Otto, 1889; Levitskii, 1902/1903; Lipshits, 1947–1952; Bugyi, 1965; Rowell, 1980; Morton, 1981; Siilivask, 1982; Minelli, 1988; Barthlott, 1990; Peterson, 1996, pp. 77–80; Doctor, 2001; Kongo, 2003; Bumblauskas *et al.*, 2004, pp. 29–39; Zdenek & Zalewska-Galosz, 2004, pp. 1033–1034; Ričkienė, 2009, pp. 168–169; Franz Paula von Schrank 2011; *Index Collectorum*, 2011; *Italian botanists*, 2011).

Contributions were received from a total of nearly 180 persons and nearly 10 nurseries, with 32 persons having sent more than 400 accessions and 12 persons

– over 1,000 accessions (Table 3). A total of 35,708 accessions (74%) were received from the 32 persons.

In addition to the 32 persons listed in the table, 301–400 accessions were received from five persons: **Martin Martens** (1797–1863), professor of chemistry and botany at the Louvain Catholic University, sent 357 accessions from Louvain; apothecary **Williams** – 357 from Tbilisi; botanist and agronomist **Joseph Decaisne** (1807–1882) – 378 from Paris; botanist **Jean Baptiste Verlot** (1825–1891) – 365 from Grenoble; and **Ernst Rudolph Trautvetter** – 370 from Kiev. 200–300 accessions were received from 18 persons.

Table 2. Accessions received by the Botanical Garden in different years

Year	No. of accessions	Year	No. of accessions	Year	No. of accessions	Year	No. of accessions	Year	No. of accessions
1823	2,534	1824	3,031	1825	3,227	1826	3,230	1827	2,019
1828	1,909	1829	3,578	1830	3,546	1831	3,452	1832	3,685
1839	726	1840	3,965	1841	2,835	1846	368	1847	1,250
1848	1,116	1849	766	1850	629	1851	2,395	1852	1,054
1853	1,774	1854	1,007	Total 48,096					

Table 3. Major contributors of accessions to the Botanical Garden of the University of Tartu

Senders and places of dispatch	Years of sending	No. of accessions	Senders and places of dispatch	Years of sending	No. of accessions
Carl Anton Meyer, St Petersburg, Caucasus, Baku, Kazbek, Balastan (Iran)	1828–1831 1850–1854	2,908	Gustav Schübler, Tübingen	1825–1832	790
Johann Jakob Bernhardi, Erfurt	1823–1832 1840, 1841 1846, 1847	2,417	F. Hunneman, London, Mexico, South America, Chile	1830, 1831 1832	767
Jens Wilken Hornemann, Copenhagen	1823–1825	2,314	Gustav Kunze, Leipzig	1840, 1841 1847–1851	747
Christoph Friedrich Otto, Berlin	1823–1832 1840, 1841	2,232	Friedrich Georg Gottlieb Bartling, Göttingen	1841, 1846–1848 1850, 1852 1853	743

Senders and places of dispatch	Years of sending	No. of accessions	Senders and places of dispatch	Years of sending	No. of accessions
Friedrich Ernst Ludwig Fischer, St Petersburg	1825–1832 1840, 1841 1846	2,059	Curt Polycarp Joachim Sprengel, Halle	1823–1825 1828–1832	740
Heinrich Gottlieb Ludwig Reichenbach or his son Heinrich Gustav Reichenbach, Dresden	1823–1825 1827, 1828 1830, 1832 1839, 1840 1848–1852	1,761	Michał Szubert, Warsaw	1823–1828 1830, 1832 1840, 1841	731
Heinrich Adolf Schrader, Göttingen	1823–1832	1,659	Wilibald Swibert Joseph Gottlieb von Besser, Krzemeniec	1823–1825 1827, 1828 1830, 1832	678
Carl Friedrich von Ledebour, Kazan, Tomsk, Barnaul	1826	1,498	Ernst Meyer, Königsberg	1828–1832 1840, 1841 1847–1851	637
Charles-François Brisseau de Mirbel, Paris	1829–1832 1841, 1847 1848	1,431	Bartels, Kharkov	1823–1825 1828–1830	621
Johann Georg Christian Lehmann, Hamburg	1823–1826 1828–1832 1840, 1841 1847–1854	1,369	Georg Matthias von Martens, Munich, Trieste, Christiania (Oslo)	1827, 1830–1832	618
Carl Constantin Christian Haberle, Pest	1823–1830 1832	1,260	Frederic von Gebler, Barnaul	1823–1828 1839	615
Ludolph Christian Treviranus, Wroclaw, Prague, Bonn	1823–1832	1,046	Johann Anton Weinmann, Pavlovsk, St Petersburg	1824, 1825 1828–1830 1840, 1853	598
Alojzy Rafal Estreicher, Krakow	1824, 1826 1829–1831 1840, 1841	995	Friedrich Sigmund Voigt, Jena	1823–1825 1827, 1830–1832 1841 1847–1849 1851	526
Jósef Jundziłł, Vilnius	1824–1829	829	Eduard August von Regel, Zürich	1847–1852 1854	513
Vincenz Frantisek Kosteletzky, Prague	1831, 1832 1840, 1841 1847, 1851 1853, 1854	809	Michele Tenore, Navre?	1840	508
Christian Friedrich Hornschuch, Greifswald	1823–1825 1828, 1830–1832 1847, 1850 1851	807	Vassili Matveevich Tschernajew? (Czernajew)	1840	481

Major contributors of live plants or seeds

The biggest amount of live plants and seeds was contributed by **Carl Anton Meyer** (1795–1855, St Petersburg), who sent 2,908 accessions in the years 1828–1831 and 1850–1854 (Table 3). He was born in Vitebsk, studied pharmacy at the University of Tartu in 1813–1814 and continued his studies at the University of Königsberg, where he earned his doctorate in Philosophy in 1825. Meyer carried out several botanical expeditions in Russia and authored scientific works both on his own and together with August Gustav Heinrich von Bongard, Bunge, Ledebour, Trautvetter and Fischer from St Petersburg. He examined the vascular plant collections of several researchers, wrote treatments of the flora of the Vyatka area and of various plant genera, and described numerous new plants. Meyer was the assistant director of the St Petersburg Botanical Garden in 1831–1851, the director in 1851–1855 and full member of the St. Petersburg Academy of Sciences since 1845. In 1850–1855, Meyer also supervised the collections of the botanical garden (Trautvetter, 1837; pp. 19, 31–33, 28, 45, 61, 64, 88–90, 96, 122, 134; Trautfetter", 1873, pp. 158, 177–178, 211; Hasselblatt & Otto, 1889, p. 60).

The second most active contributor after Meyer was **Bernhardi** (also prof. Bernhardi) from Erfurt. The name ‘Theod. Bernhardi’, also from Erfurt, is also referenced in one case. The former is likely to be the above-mentioned **Johann Jakob Bernhardi** and the latter – **Theodor Bernhardi** (who sent 11 accessions in 1850). Three parcels were received from Erfurt in 1846 from a gardener and botanist **Friedrich Adolph Haage** (1796–1866), member of a famous family of ten generations of gardeners. He was the founder of a small cacti and succulent trade and seed gardening company in 1822.

From his first journey to the Crimea, from May to October 1818, **Ledebour** brought approximately 200 plants to the Botanical Garden (Tankler & Pullonen, 1994, p. 19). Ledebour also sent forty-two parcels with live plants and seeds by mail from the Altai expedition carried out in 1826–1827 together with Bunge and physician and botanist Meyer, with 500 of the species being new to the Botanical Garden. The botanical collection contained 1,600 species on herbarium sheets, 241 species of live plants for the Botanical Garden of Tartu, and seeds of 1,341 species (Poots, 1994, pp. 39–40). Another source (Tänavots, 1994, p. 33) refers to the seed registration list, according to which 1,404 species were brought along both as live plants and as seeds. The material was collected from several locations and some species were therefore repeated (Tänavots, 1994, p. 32). According to the registration list of plants and seeds, Ledebour sent 1,498 accessions in 1826.

Contributions were received from St Petersburg from **Friedrich Ernst Ludwig von Fischer** (1782–1854), the director of the botanical garden of Gorenki (1806–1822), compiler of plant catalogues (1805, 1808, 1812) and later director of the St Petersburg Botanical Garden (1823–1850); and from **Stanisław Boniface Jundziłł** (1761–1847), professor and director of the Botanical Garden of the University of Vilnius. Next to Jundziłł, contributions were sent from Vilnius by **Stanislaw Batys Górski** (1802–1864), a student and successor of professor of pharmacy (1810–1831) Jan Fryderyk Wolfgang (Johann Friedrich Wolfgang; 1775–1859) at the Vilnius University. Górski was a Polish botanist, entomologist, physician and pharmacist, head of the Botanical Garden of the University of Vilnius. After the closure of the University of Vilnius in 1832 by special decree of Czar Nicholas I (Venclova, 1981, p. 38), plants of 261 species were obtained from its botanical garden in 1841.

Of the better-known researchers, contributions were sent by **Karl Konstantin Christian Haberle** (1764–1832), naturalist and meteorologist, teacher of botany at the University of Pest; **Jens Wilken Hornemann** (1770–1841), Danish botanist, professor of botany at the University of Copenhagen since 1808 and director of the Botanical Garden since 1817; **Johann Georg Christian Lehmann** (1792–1860), a botanist, professor of physics and natural sciences and head librarian at the Gymnasium Academicum in Hamburg, the founder of the Hamburg Botanical Garden; **Christoph Friedrich Otto** (1783–1856), a German gardener and botanist, supervisor of the Berlin Botanical Garden from 1805 to 1843; **Heinrich Adolf Schrader** (1767–1836), professor and director of the Botanical Garden of the University of Göttingen; **Kurt Sprengel** (1766–1833), professor and director of the Botanical Garden of the University of Halle; **Heinrich Gottlieb Ludwig Reichenbach** (1793–1879), a naturalist, zoologist and botanist, professor at the Surgical-Medical Academy of Dresden, founder of the Dresden Botanical Gardens; and **Friedrich Siegmund Voight** (1781–1850), a palaeontologist and botanist, professor of medicine and botany and director of the Botanical Garden of Jena University.

Many accessions were sent also by **Ernst Heinrich Friedrich Meyer** (1791–1858), professor of botany and director of the Botanical Garden of the University of Königsberg, and by the Czech botanist **Vincenc Frantisek Kosteletzky** (1801–1887), who taught Medical Botany at the famous botanical research school in Prague. Among the contributors were also **Gustav Schübler** (1787–1834), German naturalist, professor of botany, natural history and agricultural chemistry and founder of applied meteorology in Germany, and by his colleague **Georg Matthias Martens** (1788–1872), member of the German Academy of Sciences Leopoldina since 1832. Schübler and Martens worked together in describing and classifying new species. Other contributors included **Friedrich Gottlieb Bartling** (1798–1875), German botanist, researcher of Hungarian and Croatian flora, lecturer at the University of Göttingen since 1822 and director of the botanical garden since 1837; **Frederic Gebler** (1781–1850), alumnus of the medical faculty of the University of Jena (1802), who worked in Russia since 1808, being a physician at Barnaul since 1810 and also a naturalist, explorer and founder of the Barnaul Museum; **Wilibald Swibert Joseph Gottlieb Besser** (1784–1842), botanist, plant taxonomist, gardener and founder of the Kremenets (Krzemieniec) Botanical Garden; **Vassili Matveevich Tschernajew (Czernajew)** (1796–1871), professor of botany at the University of Kharkov and the director of the Botanical Garden; and **Bartels** from Kharkov. Overviews of Russian botanical science and botanists (Trautvetter, 1837, pp. 137–145; Borodin, 1908, pp. 1–158) do not refer to Bartels.

In 1853, nine deliveries arrived from Jena from **Mattias Jacob Schleiden** (1804–1881), student of Bartling at the University of Göttingen. He initially studied law at the University of Heidelberg and received a degree of Doctor of Medicine there. In 1832, he began to study medicine in Göttingen, where he became interested in natural sciences, in particular botany. In 1839, Schleiden became a Doctor of Philosophy and extraordinary professor at the University of Jena, becoming a full professor and director of the botanical garden in 1850. He was one of the founders of the cell theory together with Theodor Schwamm. In 1863, Schleiden became the first teacher of plant physiology at the University of Tartu, from where he returned to Dresden in 1864 due to misunderstandings with the university (Moorits, 1968, pp. 138–151; Siilivask, 1985, pp. 93–94).

Polish botanist and entomologist **Alojzy Rafal Estreicher** (1786–1852) studied at the Jagiellonian University in Krakow, earning his doctorate in Medicine there in 1807 and doctorate in Philosophy in 1811. Since 1809, he led the Chair of Botany and Zoology at the same university and worked at the university as a professor, rector (1831–1833) and the first director of the botanical garden. He sent 995 accessions.

Ludolph Christian Treviranus (1779–1864) sent 1,046 accessions from Wrocław, Prague and Bonn. He was a German botanist, since 1806 a professor of natural history and botany at the University of Rostock and director of the botanical garden of the university. Later he worked as a professor at the universities of Wrocław and Bonn, being also the director of the Botanical Garden of the University of Bonn.

Eduard August von Regel (1814–1892) sent 513 accessions from Zürich in 1847–1852 and 1854. He graduated from the University of Bonn and worked in 1832–1842 at the Botanical Garden of Göttingen and later at the botanical gardens of Bonn and Berlin. Since 1842, Regel was the head of the Botanical Garden of Zürich and lectured at the Zürich University. In 1855–1892, he headed the Botanical Garden of St Petersburg.

Italian botanist **Michele Tenore** (1780–1861) sent 508 accessions in 1840. He worked in Naples, Italy. In 1810, he was nominated director of the Botanical Garden of Naples (established in 1807).

Botanist **Roberto de Visiani** (1800–1878) from the Botanic Garden of Padua sent 195 accessions. Visiani graduated from the medical faculty of the University of Padua in 1822 and became an assistant of Giuseppe Antonio Bonato (1753–1836). After Bonato's death, he became his successor as the head of the Chair of Botany and the director of the Botanical Garden of Padua since 1837.

58 accessions were sent from Bologna by **Bertoloni**. The sender could have been either **Antonio Bertoloni** (1775–1869), famous botanist and compiler of the 10-volume *Flora of Italy*, or his son **Giuseppe Bertoloni** (1804–1878), professor of botany at the University of Bologna. Plants or seeds were sent from Italy also by **Bartolomeo Biasoletto** (1793–1858), pharmacist and botanist from Trieste, and by **Carlo Donarelli** (1797–1851), physician, professor of practical botany and director of the Botanical Garden of Rome at the University La Sapienza from 1833 to 1851.

Contributors of rare plants from exotic locations

Plants were sent from Mexico by **Christian Julius Wilhelm Schiede** (1798–1836), a German physician and botanist born in Kessel. He studied natural sciences and medicine at the universities of Berlin and Göttingen, where he earned his doctorate in 1825. Thereafter, he worked as a practicing physician in Kessel. In 1828, he emigrated to Mexico, where he accompanied the naturalist Ferdinand Deppe (1794–1861) on his expeditions. The two explorers collected zoological and botanical specimens for various museums, universities and botanical gardens of Europe. In the summer of 1828, Schiede and Deppe settled in Jalapa and organised research expeditions throughout the state of Veracruz. Schiede sent 97 accessions in 1829 from Jalapa, Laguna, Pico de Orizaba and California.

Thirty accessions were sent from Guatemala in 1852 by **Jegor Julius von Sivers** (1824–1879), descendant of the Sivers family of Õisu (Eusekûll) Manor, born in Heimtali (Heimthal) Manor (Estonia) in the family of Peter Reinhold Sivers. He is known as a naturalist, literature historian, economist and poet. Sivers travelled in Central America in 1850–1852 (von Sivers, 1861a, pp. 1–334; 1861b, pp. 1–388).

In 1825 and 1827, 64 accessions arrived from **Eschscholtz** from Brazil, Chile and Kamchatka, from his second round-the-world journey led by Kotzebue.

A total of 230 accessions was received in 1827–1829 from St Helena Island, Jamaica, East India and from two places with poorly legible names. These appear to have been sent via **William Jackson Hooker** (1785–1865), a British botanist and taxonomist. In 1820, Hooker accepted the Regius Professorship of Botany at the University of Glasgow. He compiled the *Flora Scotica* and helped to build up the Glasgow Botanic Gardens. In 1841, Hooker was appointed director of the Royal Botanic Gardens, Kew. Together with the Scottish botanist George Arnott Walker-Arnott (1799–1868), he examined the materials collected by Captain Frederick William Beechey (1796–1856) on his expeditions, including plants collected from North America. Arnott, together with the Scottish surgeon and botanist Robert Wright, also examined the plant material collected by Wright in India over 30 years. The seeds sent to the Botanical Garden of Tartu appear to originate from several collections.

The same is likely to concern also the 40 accessions sent by **Lindemann** in 1840. These originated from Jelgava (Mitau) and the states of Rio de Janeiro and Minas Gerais of Brazil and could have been sent from Jelgava by the hobby botanist **Emanuel Lindemann** or his son **Eduard Lindemann**. Emanuel Lindemann established an extensive herbarium and his work was carried on by Eduard. Their herbarium amounted to 200,000 specimens and was replenished with contributions from 844 collectors from across the world. The Lindemanns exchanged plants with some of the most famous botanists of the 19th century (Byalt *et al.*, 2008). Emanuel Lindemann (1839) is also known as the compiler of the *Flora of the Baltic Governorates*.

Exotic plants were sent by **F. Hunneman** (Hunneman, Hünnemans) from London and from South America: Mendosa (Argentina) and Chile. The places of dispatch also include Mexico, New Orleans, Nepaera?, Nova Hollandia (Australia), India Orient (India) and Iwan Rivers (Indonesia, Kalimantan Island). Hunneman sent 767 accessions in the years 1830, 1831 and 1832. **Tables** sent 77 accessions in 1832 from Las Palmas, Quintero (Chile), and the Andes, South America. Professor **Murrey** sent 97 accessions in 1830 from Calcutta, Jergentabao?, Mauritius and a place with a poorly legible name.

Some outstanding persons and other contributors of plants

Seeds were received on several occasions via Count **Nikolai Petrovich Rumyantsev** (1754–1826) (Tankler & Pullonen, 1994, p. 18), who may have dispatched plant seeds obtained from the round-the-world expedition of Adam Johann von Krusenstern in 1803–1806, and from Vassili Golovin's round-the-world expedition in 1817–1819 with the participation of Ferdinand von Wrangell, as Rumyantsev was on very good terms with Krusenstern and Wrangell (Lundalin, 2011). The Imperial Garden of Pavlovsk (St Petersburg) received 270 tropical plant species in 1825 as a gift from Empress **Maria Fyodorovna** (supposedly *via* Weinmann) and a greenhouse was built for them in the valley in the central part of the garden in 1825 (Siilivask, 1982, p. 186).

In 1823, 215 accessions were received from London from **Lieven**, apparently from **Christoph-Heinrich von Liewen** (1774–1839), who was a Russian military general with Livonian roots, born in Kiev. He was the Russian ambassador to London in 1812–1834 and later the tutor of Russian Czar Alexander II. The plants are likely to have been sent via him, although it is also possible that they were sent by his wife **Dorothea von Lieven** (1785–1857), who was very well known in Europe for her beauty, extensive knowledge and a broad scale of activities.

James G. Booth from Hamburg was the son of **Jacob James Booth** (1760 or 1770–1814), founder of the former famous nursery James Booth & Söhne (Booth & Sons). The nursery was founded jointly with Baron Kaspar von Voight (1752–1839) in 1795 at Flottbeck, near Hamburg, and operated until 1884(6). The nursery was mainly a distributor of the novelties of the day and represented an important mark in the history of German rose breeding. The nursery was also specialised in North American trees (Pontt & Dähren, 1845). Booth sent 226 accessions in the years 1840, 1841, 1847–1850 (each year) and 1852 and 1853.

Swiss botanist **Alphonse de Candolle** (1806–1893) sent 36 accessions in 1840 from Geneva. Candolle initially studied law but graduated in botany and later succeeded to his father's chair at the University of Geneva. His father, naturalist Augustin Pyramus de Candolle (1778–1841), was interested in botany in his youth, commenced medical studies in Geneva, continued his studies in medicine and natural history in Paris and was appointed as professor of botany at the Medical School in Montpellier and later in Geneva. His scientific research covered plant taxonomy, phytochemistry, plant pathology, medical botany, agronomy and phytogeography. A. de Candolle's son was the botanist Casimir de Candolle (1836–1918).

Charles-François Brisseau de Mirbel (1776–1854) was a French botanist and politician, founder of the science of plant cytology. In 1806, he rose to the post of superintendent of the gardens of Napoleon's Château de Malmasion, becoming the chair of the Botany Department of the Sorbonne University in 1808 and head of the National Museum of Natural History and *Jardin des Plantes* (the main Botanical Garden in France) in Paris in 1829.

Johann Jakob Friedrich Parrot (1791–1841) studied medicine at the University of Dorpat (Tartu) and was a professor of physics at the university. He was keen on botany and explored also the local vegetation on his expeditions. When travelling in the Crimea and the Caucasus in 1811–1812 and later in France, Spain, Italy and the Alps, he made observations on the flora there. The best-known journey of Parrot took him through Southern Russia to Mount Ararat, lasting from September 1929 to March 1930. An overview of the expedition was published in Berlin in 1834, describing the vegetation of the surroundings of Ararat, listing the herbaceous plants, trees and shrubs growing there and describing the collection of specimens (Trautvetter, 1837, p. 30; Parrot, 1834, pp. 180–185). Parrot sent 15 accessions in 1825. In 1830, two accessions arrived from him and 114 accessions collected from Tbilisi and Ararat arrived from **Julius Friedrich Adolph Hehn**, who participated in his expedition.

George François Reuter (1805–1872) was a French botanist and plant collector. He worked as a professor of chemistry in the Atheneum of Luxembourg since 1848 and as the director of the Botanical Garden of Geneva from 1849 until his death. Reuter sent 38 accessions in 1851 and 1852.

Franz Paula von Schrank (1747–1835) was a German botanist, entomologist and member of the Jesuit Order. Schrank attended a Christian school in Passau and joined the Jesuit Order. After a period as a novice in Vienna, he took part in a mission to Brazil, where he became interested in natural sciences. He continued his theological career, however, and earned a doctorate in Theology in Vienna in 1776. Already the same year he became a professor of mathematics and physics at the Lyzeum of Amberg (Bavaria) and in 1784 he took up the position of professor at the University of Ingolstadt. Between 1809 and 1832, Schrank worked as the first director of the Botanic Garden of Munich. He also assisted in analysing the materials of naturalists Johann Baptist von Spix and Carl Friedrich Philipp von Martius, who travelled together in Brazil.

The Botanical Garden also received contributions from botanists **Carl Peter Thunberg** (1743–1828) and **Johan Emanuel Wikström** (1789–1856). The botanical explorer Thunberg studied medicine and natural philosophy at the

University of Uppsala and defended his doctoral dissertation in 1767. In 1770, he continued his studies in Paris, Amsterdam and Leiden. In 1772–1778, he travelled in South Africa and East Asia, working in Japan for a prolonged period. Since 1781, Thunberg worked as a professor of medicine and natural philosophy at the University of Uppsala. Among his most significant scientific works were overviews of South American and Japanese floras. He also collected big quantities of live plants and seeds for botanical gardens. Since 1818, Wikström was the director of the Bergius Botanical Garden, Stockholm. Thunberg sent 62 accessions in 1823–1825 and Wikström sent 15 accessions in 1823.

In 1839 and 1840, 196 accessions were sent from Munich by the botanist **Joseph Gerhard Zuccarini** (1797–1848), professor of botany at the University of Munich. He commenced medical studies in 1815 at the University of Erlangen-Nürnberg, with botanist and nature philosopher Christian Gottfried Nees von Esenbeck being his teacher of natural history. Zuccarini was invited in 1826 to work as an extraordinary professor at the University of Munich, where he became a full professor of agricultural botany and forest botany in 1835. In 1836, he also became the curator of the Botanical Garden of Munich. Zuccarini worked since 1820 on the taxonomic treatment of the Brazilian plant collections of Carl Friedrich Philipp von Martius (above all Cactaceae) as well as the plants collected in Japan by Philipp Franz von Siebold, a German physician and traveller. Zuccarini also described plants discovered in other areas, including Mexico. **Nees von Esenbeck** (1776–1858) sent 63 accessions from Wrocław in 1847 and 1849.

Summary

Similarly to the respective developments elsewhere in Europe, botanical science had developed to a high level by the end of the 18th century and the first decades of the 19th century also in Russia, where the development of botany was fostered by links with Carl Linné and his school, academic research together with extensive expeditions, collection of plants and exchange of seeds, establishment of herbaria and development of ornamental gardening and park culture (Trautvetter, 1837, pp. 4–136; Rowell, 1980, p. 15; Kolchinsky, 2004; Sokoloff *et al.*, 2002, pp. 129–191). When the Botanical Garden of the University of Tartu was about to be established, all preconditions were in place for the rapid growth of its species richness. This was undoubtedly fostered also by the network of botanical researchers formed in the 18th century, and by the Society of Corresponding Botanists (established in 1815), which involved 70 botanists, pharmacists,

teachers, medical students, etc. in the 1820s, including such active contributors of plants and seeds to the Botanical Garden of the University of Tartu as Christian Gottfried Nees von Esenbeck, Karl Wilhelm Eysenhardt, Christian Friedrich Hornschuch, Gustav Kunze, Johann Georg Christian Lehmann, Ernst Heinrich Friedrich Meyer and Diederich Franz Leonhard von Schlechtendal (Röther *et al.*, 2006, pp. 597–602; Feistauer *et al.*, 2006; Sigrist *et al.*, 2006).

The development of the botanical garden was also fostered by the proximity of St Petersburg, the then capital of Russia, and the high level of botany and horticulture there. A significant role was also played by the research activities, expeditions and personal contacts of the professors of botany and directors of the Botanical Garden of the University of Tartu Germann, Ledebour, Bunge, Maximowicz and Trautvetter. All this was reflected in the growth of species richness in the garden on account of plants and seeds sent by many persons, with the new plants and seeds originating both from the distribution areas and from other botanical gardens. According to the data of 1810, there were 4,586 species of plants from 986 genera at the present location of the Botanical Garden. In 1827, the number of taxa totalled at 10,449, in 1845 – at about 14,000, and in 1851 – at 13,180 taxa from 1886 genera. The species richness in the Botanical Garden also increased on account of bringing into cultivation of numerous plant species new to science, in particular East Asian species. In the period covered in this paper, the Botanical Garden of the University of Tartu was not much inferior in its species richness to Europe's older and bigger botanical gardens in more favourable climates, while even surpassing in its species richness the St Petersburg Botanical Garden, a rapidly developing and the region's most important botanical garden in the first half of the 19th century. The latter garden contained no more than 1,500 species in 1823, 5,682 species in 1824, and 12,000 and 12,061 species in 1830 and 1850, respectively. (Trautfetter", 1873, p. 203)

The broad range of persons who sent live plants or seeds to the Tartu Botanical Garden is indicated also by the manuscript registration lists of arriving accessions. In 1823–1832, 1839–1841 and 1846–1852, the garden received 48,096 accessions from about 180 persons and nearly 10 nurseries, with 32 persons having sent more than 400 accessions (35,708 in total; 74%) and 12 persons having sent over 1,000 accessions. Of the 48,096 accessions, 32,937 (68.5%) arrived from 134 persons from Western Europe, 13,346 (27.7%) – from 38 persons from Russia, 1,466 (3.0%) – from 8 persons from Central and South America and East Asia, and the place of dispatch remained unknown for 347 accessions. Among the contributors were most of the then well-known researchers from Western Europe and Russia, but also physicians, pharmacists, travellers and other persons. By the middle of the 19th century, the Botanical Garden of the University of Tartu had been effectively integrated into the world network of botanical gardens and botanical researchers, as evidenced by the comparison of the research published here and the species richness in the garden with those in other botanical gardens. Authentic plant material in the form of seeds was also sent to other researchers. Ledebour sent seeds collected from his expeditions, for example, to William Hooker, professor of Botany of the University of Glasgow, who received from him 188 accessions of high quality seeds of Altaian plants (Le Lièvre, 1997, pp. 50–51).

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Fighting Schizophrenia: Beginnings of Somatic Treatments in Psychiatry in Riga Sarkankalns Hospital in the 1930s

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Abstract: *In the 1930s the first somatic treatments of schizophrenia were developed – insulin coma treatment in 1933 (by Manfred Sakel, Vienna) and chemical-convulsive therapy in 1934 (by Ladislas Meduna, Budapest). In 1936, Hermanis Saltups from the Riga Sarkankalns Hospital, Psychiatric Clinic of University of Latvia, went to the Neuropsychiatric University Clinic of Vienna to study the insulin coma treatment. At the end of 1936, the insulin coma treatment was started in the Riga Sarkankalns Hospital. The chemical-convulsive therapy was started in 1937.*

From the beginnings of the insulin coma treatment the main complications, even deaths, were associated with protracted or prolonged coma, when, despite glucose administration, patients could not be revived. In the Sarkankalns hospital, after accidental 47 hour long insulin coma, the mental health of a patient dramatically improved and the psychotic symptoms disappeared. These findings encouraged psychiatrist Verners Kraulis to use protracted coma for therapeutic purposes. He developed a method that allowed prolonging the coma for 12 hours and more. The modified treatment was used in treating schizophrenics who failed the classical shock treatment and were considered otherwise untreatable.

Keywords: *chemical-convulsive therapy, insulin coma treatment, psychiatry, shock therapy*

Introduction

At the beginning of the 20th century, most psychiatrists believed that schizophrenia was an endogenous 'heredodegenerative' disease and therefore not curable (Meduna, 1956). In the 1930s, the first somatic treatments of schizophrenia, the so-called shock therapies, were developed – insulin coma treatment (ICT) in 1933 and chemical-convulsive therapy (CCT) in 1934. Both therapies were taken up enthusiastically because they provided the first virtual cure for previously hopeless patients, who suffered from this major mental disorder. The new methods spread explosively through the leading psychiatric clinics all over the modern world.

Origins of ICT and CCT

ICT was developed by the Austrian psychiatrist Manfred Sakel (1900–1957) in the Neuropsychiatric University Clinic of Vienna in 1933. The idea that insulin could be used in treatment of mental disorders goes back to the second half of the 1920s, when Sakel worked in the Lichterfelde Sanatorium, Berlin, a private clinic for the treatment of opiate addiction. He found that the treatment of morphine addicts with small doses of insulin relieved abstinence symptoms, such as vomiting and diarrhea, increased weight and decreased the craving for opiates. Precise dose of insulin was unknown and some patients during the treatment unintentionally slipped into hypoglycemic coma. Sakel observed that previously mentally disturbed, agitated patients after recovering from coma became calm and he speculated that the same treatment might also tranquillize psychotic patients. In 1933, he returned to Vienna and began to study insulin coma effect on patients suffering from schizophrenia (Shorter, 1997). Sakel based his theory on belief that schizophrenia might result from malignant but less robust brain cells and he sought to destroy those cells by stress of hypoglycemia (Fink, 1990).

In 1935, he published his results of a trial with 50 patients, who experienced their first episode of schizophrenia. Sakel (1935, p. 111, cited in Shorter, 1997, p. 210) claimed an improvement rate of over 88%. This publication was followed by rapid and widespread implementation of ICT throughout the mental hospitals elsewhere. The enthusiasm started to diminish in the 1950s when the efficacy of ICT was questioned by publications, criticizing that ICT may lack evidence and rationale (Ackner *et al.*, 1957; Bourne, 1953). Starting in 1952 (Purvins

& Purvina, 2002), ICT was progressively replaced by chlorpromazine, the first antipsychotic drug. According to a comparative study, published in 1958, chlorpromazine had the same efficiency, but was safer, easier to administer, and better suited to long-term management (Fink *et al.*, 1958). Thus the decline of ICT coincided with the rise of modern psychopharmacology.

Another shock therapy, CCT, is considered the forerunner of electroconvulsive therapy (ECT), a method still being used to deal with several mental states, despite the controversial results (Read & Bentall, 2010). CCT was developed by the Hungarian neuropathologist Ladislas Meduna (1896–1964) at the state asylum in Budapest-Lipótmezö in 1934. Before that he had studied postmortem brain specimens of epileptic and schizophrenic patients and had observed the differences in glial cells between the two groups (Kragh, 2010).

> *From that time on, I was convinced that there is a biological antagonism between the process which produces epileptiform attacks and the process which produces schizophrenia. I had only to find a convulsant drug which could be safely used in human beings.* (Meduna, 1956, p. 78)

Injections of camphor-in-oil were known to induce epileptic seizures, but in 1934 a safer and more predictable drug, pentylenetetrazol (Cardiazol, Metrazol), was introduced. Meduna began Cardiazol injections for treatment of schizophrenia. By 1936 he had already treated 110 patients; half of them went into apparent remission. CCT was practiced until the introduction of ECT by Ugo Cerletti (1877–1963) and Lucio Bini (1908–1964) in Rome in 1938 (Shorter, 1997).

Introduction of ICT and CCT in Riga

In the late 1930s, world's scientific journals were overwhelmed with implausibly optimistic reports from mental hospitals where the new-found methods were successfully applied. The first results of shock treatment seemed to be so efficacious and promising that the whole International Congress of Psychiatrists held in Switzerland in the spring of 1937 was dedicated to Sakel's new treatment of insanity (Sakel, 1956). Among the participants of the congress was the Latvian psychiatrist Hermanis Saltups (1901–1968), assistant in the Department of Psychiatry at the University of Latvia. By then, Saltups had already introduced both shock therapies in the Riga Sarkankalns Hospital, the psychiatric clinic of University of Latvia (Saltups, 1937a).

The Department of Psychiatry at the University of Latvia was founded and ran by the professor Hermanis Buduls (1882–1954) (Viksna, 2002). Buduls was a progressive psychiatrist, who followed contemporary research in psychiatry and implemented novel methods into the clinical practice in Riga Sarkankalns Hospital. In 1923, he introduced malaria fewer treatment for general paralysis of the insane in Sarkankalns hospital (Buduls, 1926) – the first biological treatment in the history of psychiatry, developed by the Austrian psychiatrist Julius Wagner-Jauregg (1857–1940) (Whitrow, 1990). Buduls encouraged his students to work in the field of science and gain experience in the leading mental facilities abroad. In 1936, persuaded by Buduls, Saltups went to the Neuropsychiatric University Clinic of Vienna to study the methods of shock therapies (Saltups, 1943). In December 6, 1936, after returning to Latvia, Saltups injected five patients suffering from schizophrenia with insulin, and with this began the "insulin era" in the Riga Sarkankalns Hospital. The CCT was introduced in the spring of 1937 (Saltups, 1937a).

Soon after the ICT was started, newspapers picked up the newfangled shock therapies with exaggerated favor.

> *An absolutely novel method is used for treating mental illnesses in the Sarkankalns hospital and laudable results are achieved. A number of feeble-minded, previously doomed to spend the rest of their lives in aberration of the mind living in lunatic asylums, are completely recovered and returning to life and work. There are no consequences of the disease and they can return to their previous duties, even those demanding a certain degree of responsibility* (Briva Zeme, 1937a, p. 79).

A few weeks later, Buduls, in an interview for the same newspaper, tried to reduce this all-embracing but unfounded optimism. He evaluated this method of treatment quite cautiously.

> *We are facing an unreasonably positive hearsay about practicing insulin shock... I must remind you that the state of unconsciousness is a critical condition and we can't expose each and every patient to it. A strong and otherwise completely healthy organism is needed to cope with up to 50 comas repeatedly. The method by itself is very difficult and requires the highest degree of cautiousness from the doctor and medical stuff. The patient during the unconsciousness must be continuously monitored by a nurse to ensure that the coma is not overly deep.* (*Briva Zeme*, 1937b, p. 7).

A pressing problem in Latvian healthcare was the congested patient flow in the mental health system. At the end of the 1920s, the need for inpatient treatment exceeded the capacity of psychiatric facilities over 25% (Buduls, 1929) and sometimes the acutely ill despite the need for inpatient care had to be rejected. Therefore, the Riga City Council was greatly interested in the development of the promising shock therapies.

> *The Riga City Council supports a large number of mentally ill. There are more than 900 patients in the Sarkankalns hospital alone. It is in the best interests of the city to help them to return to work as soon as possible or at least return to their families.* (*Jaunakas Zinas*, 1937, p. 7).

Formation of the insulin unit

The Sarkankalns hospital opened the so-called "insulin beds" for the new treatment. But soon physicians insisted that shock therapy must be provided in a special ward (Saltups, 1937b).

ICT required special equipment, such as nasogastral tubes, syringes, sphygmomanometers, lumbar puncture kits, etc. and a wide spectrum of medications (e.g., coramin, adrenalin, camphor) to manage possible complications. A separate, quiet unit, isolated from the rest of the hospital, was essential (Saltups, 1937a). ICT also required highly qualified medical stuff consisting of doctors, nurses and ancillary personnel. In March 1937, the Riga City Council sponsored formation of the first insulin unit with 14 beds, finding an opportunity to treat and consequently discharge patients with schizophrenia. The method demanded considerable financial resources and a co-payment from the patients was required: 3 Lats per day from residents of Riga, 6 Lats from nonresident patients (*Latvijas Kareivis,* 1937, p. 3).

The insulin unit became comparable and even better equipped than the departments in somatic hospitals. The implementation of insulin units brought psychiatry closer to the mainstream medicine and psychiatrists became from supervisors and controllers to "real medical doctors" (Doroshow, 2007). In his memories of the early beginnings of ICT, Sakel described his attempts to liberate psychiatric hospitals from the reputation of lunatic asylum.

> *I wished it to be not merely a place of transit for new mental patients on their way to an asylum, but, like any other hospital, a place where possible cures might be achieved* (Sakel, 1956, p. 24).

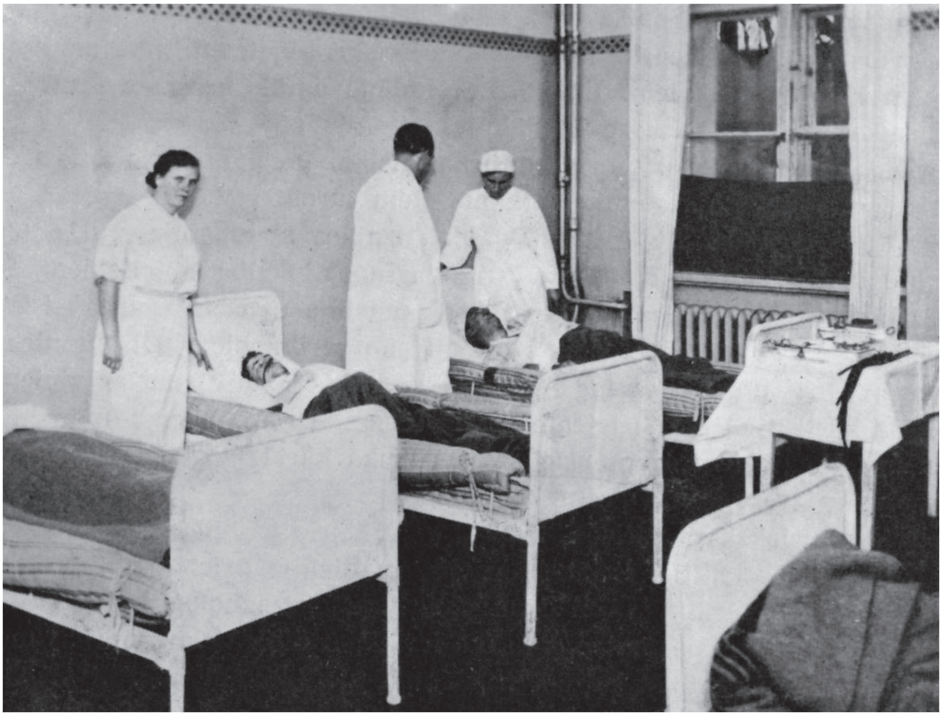

Figure 1. Insulin unit (Buduls, 1938, p. 241).

Looking back on the development of the Riga Sarkankalns Hospital, Buduls (1938, p. 243) highlighted "Today the equipment of several departments does not differ from the departments of other hospitals where active treatment is administered".

Clinical practice of shock therapies

The techniques of Cardiazol convulsive and insulin shock treatment were described in detail for the Latvian audience by Hermanis Saltups in *Journal for Latvian Doctors* at the end of 1937. In the Riga Sarkankalns Hospital the classical method of ICT, the so-called 'Sakel's treatment', was used. It consisted of three phases (initially of four phases, but later the method was simplified) – adaptation phase, shock phase, and polarization phase (Sakel, 1956). Although the method was originally elaborated by Sakel, it was slightly changing with each psychiatrist and their experience in administration of the ICT. Saltups (1937a, p. 308), describing the method used in the Sarkankalns hospital, admitted, "any regularity is hardly achievable and the experience is critical".

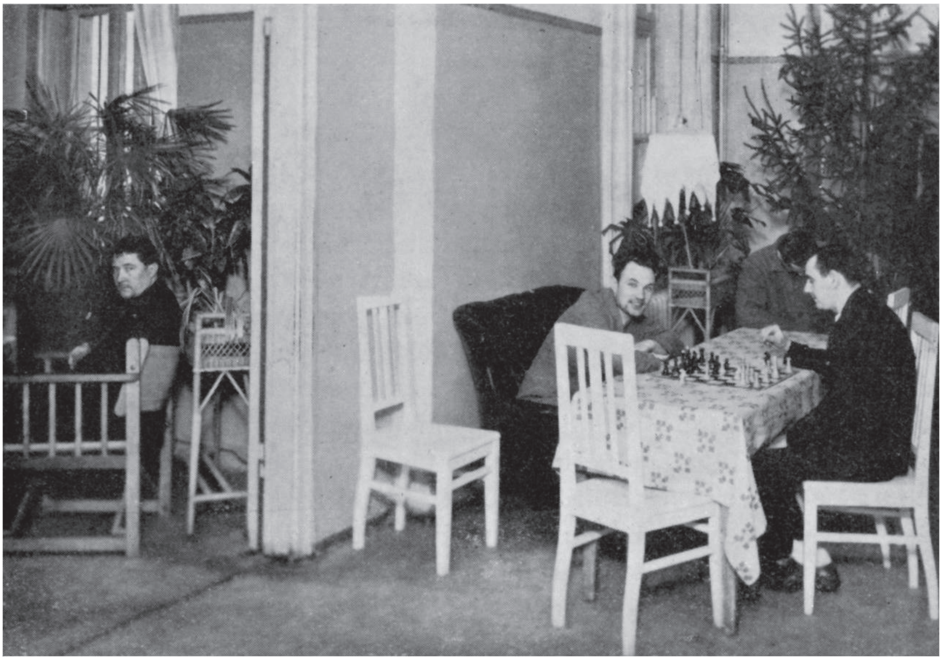

Figure 2. Patients resting after shock treatment (Buduls, 1938, p. 243).

During the adaptation phase the dose of insulin was gradually increased (5 to 15 units daily), till the 'shock dose' was reached. Shock dose was the amount of insulin needed to induce hypoglycemic shock. Shock phase could arouse two types of hypoglycemic reactions: coma, the so-called 'wet shock' (accompanied with profuse sweating), and convulsions, the so-called 'dry shock'. Both 'wet' and 'dry' reactions were considered therapeutic (Saltups, 1937a). Sometimes during the 'wet shock', patients slipped into deep coma with suppressed brain stem reflexes, such as corneal and gag reflexes. While in coma, the vital signs of the patients (heart rate, blood pressure, respiration and body temperature) were closely monitored. Typically the patient was put in hypoglycemic coma for up to two hours and then revived with glucose solution, administrated through nasal tube or, less commonly, intravenously. The number of induced comas and the length of the treatment were not explicit; they varied widely depending on the experience of psychiatrist. The shock phase continued till there was a satisfactory psychiatric response or the patient was considered untreatable, usually after 50–60 comas. The final phase of Sakel's treatment was polarization, when subcoma doses of insulin were injected, followed by sugar solution orally. The length of the polarization phase was 6–8 days and after that the treatment was finally finished. In total, the length of classical ICT in the Sarkankalns hospital varied from 3 to 12 weeks.

In April 20, 1937 the CCT was started in the Sarkankalns hospital. CCT was administrated alone or in combination with ICT. The patients received injections of seizure-provoking medicine – Cardiazol. Cardiazol provoked a classical epileptic fit approximately 30 seconds after the injection. Seizures were provoked every second or third day and were repeated 2–30 times.

After 10 months of experience, Saltups (1937a) reported the first results of shock treatments used in the Sarkankalns hospital. 60 patients were exposed to ICT and CCT. The therapy was considered accomplished for 53 of them. For those who underwent complete course of therapy, full remission was obtained in 30% (16), partial remission – 19% (10), and "social" remission – 21% (11). The intervention had to be interrupted in the rest of cases; one patient died during the treatment. Saltups concluded that the treatment was more effective in patients with new onset of the disease (history less than 6 months) – 88% of them were discharged home. However he admitted that "fresh" patients had an overall better prognosis and more often went into spontaneous remission without any treatment necessary.

Development of protracted shock method

Psychiatrists had to cope with a great deal of complications during the shock treatment, some of them were extremely dangerous and life threatening. From the beginnings of the ICT the main complications, including death, were associated with protracted or prolonged coma, when, despite glucose administration, patients could not be revived (Billig & Sullivan, 1942). Few months after the ICT was started in Riga the first protracted shock was observed (Saltups, 1937a). Luckily, this hazardous condition had an unexpected outcome – after accidental 47 hour long insulin coma, the mental health of a delusional patient improved dramatically and the psychotic symptoms disappeared.

These findings encouraged Verners Kraulis (1904–1944), a promising assistant of the Department of Psychiatry, to use protracted coma for therapeutic purposes. Kraulis (1938) developed a modification of the classical Sakel shock treatment that allowed prolonging the coma for 12 hours and more. This method included administration of sugar in doses (10–15 grams every two hours) small enough to maintain the coma but sufficient to avoid serious disturbances of vital functions. The patients awoke when larger amounts of sugar were administered. For greater efficiency, Kraulis also modified the Hagedorn-Jensen method for blood sugar measurement, thus he was able to determine blood sugar in 14 minutes. Kraulis pointed out that blood sugar level is not always correlated with the depth of coma and observation of vital signs was determinative.

The first results of protracted insulin shock therapy were surprisingly successful: Kraulis (1938) did not report any fatal outcome, while four out of six patients, who had previously failed treatment with the classical ICT and CCT, improved considerably. After few protracted shocks, these patients improved enough to be discharged and return to work. Kraulis (1938, p. 328) admitted that "the dangers of the method are still far from clear" and suggested that the method should be used with great caution. Given the positive experience, Kraulis expected that one of the main advantages of protracted shock could be shortening the length of stay in the hospital.

> *But if artificially protracted shock is as safe as it seems now to be, one might consider treating even acute cases in this way since the period of treatment might thus be shortened considerably* (Kraulis, 1938, p. 328).

At the end of the 1930s several papers about protracted, mostly unintentional, comas were published (Binzley & Anderson, 1938; Horwitz *et al.*, 1938; O'Neill, 1938). Kraulis had turned this dangerous side effect into a novel treatment of schizophrenia. His work was published in prestigious medical journals (Kraulis, 1938; 1939) and attracted widespread interest. The method of protracted shock was referenced in a number of scientific papers and was considered as apparently safe. (O'Neill, 1938; Billig & Sullivan, 1942) Kraulis (1940) noted that Sakel's classical ICT gave good results in patients with the new onset of the disease. But if the disease persisted for more than five years, a satisfactory result was almost impossible. "He is like a living dead separated from the outside world by a wall, spending decades in psychiatric hospitals or home-nursing," wrote Kraulis (1940, p. 65) when describing the schizophrenic with a long medical history. Sakel usually criticized attempts to modify his original method, but agreed with Kraulis on the value of prolonged shock, especially in the treatment of well-fixed delusions (Last, 1938).

By 1940, 79 chronic patients in the Sarkankalns hospital underwent protracted shock therapy (Kraulis, 1940). According to Kraulis, full remission was obtained in 22% (17), but partial remission in 25% (20) of them. Patients from these two groups were discharged home. The mortality rate of 2.5% (2) was estimated by Kraulis as fairly low and comparable with mortalities during simple surgeries.

The question of how to treat the mentally disordered in an ethically acceptable manner remains controversial (Fennell, 1996). Kraulis was aware of the ethical issues regarding the inability of a patient to give voluntary consent for advisable therapy. He asked for informed consent from the patient's relatives, explaining all the risks and side effects. Kraulis (1940, p. 70) claimed "They understand that the best for those otherwise untreatable patients is to give a possibility to return to the normal life, even if you have to risk a life".

In 1941, after the invasion of Latvia by Nazi Germany, Kraulis was forced to leave the Riga Sarkankalns Hospital and the University of Latvia (Stradins, 2004), supposedly due to his social democratic views. Kraulis was transferred to practice psychiatry in a province hospital in Liepaja. Dr. Verners Kraulis died in 1944 weakened by pulmonary disease (*Latvijas Arstu Zurnals,* 1944). During the Second World War, German forces executed 501 patients in the Riga Sarkankalns Hospital (Viksne, 2007, p. 335) and in 1942 the hospital was shut down (Buduls, 1978), thus putting a bitter end to the "insulin era" in the Riga Sarkakalns Hospital.

Role of somatic treatments in the history of psychiatry

The articles published in the 1930s do not give a full insight into the risks and benefits of shock treatments. Presumably, considering the all-embracing enthusiasm, unfavorable results were hushed up while successful cases were exaggerated. The methods were empirical, supported by clinical observations as the only source of evidence. Consequently, the shock treatments have to be seen in historical context as an episode in the history of psychiatry where each new treatment was more effective and less dangerous than the former. Without evaluating the ethical issues and the real efficiency of ICT and CCT, this paper acknowledges the distinctive contribution of shock therapies in the development of Latvian psychiatry. The establishment of somatic treatments stimulated the process of 'medicalization' of psychiatry in Latvia and legitimated psychiatry as a field of medicine, where cure can actually be achieved.

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Abolishment of the Military Guard at the Riga Alexander Heights Institution in 1856: War as a Monitor of Humanization?

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Abstract: *The system of state institutions created in the late 18th century in Russian Empire – asylums for the insane – had three major problems: lack of a solid legal framework in the form of medical legislation, lack of professional staff as well as the traditional negative public perception of insanity. All taken together resulted in the close coexistence of two social practices: the practice of charitable care and the practice of isolation, which existed side by side in Livonia. Isolation of the insane coexisted with isolation of another groups of outsiders – prisoners and venereal patients. Initially, the existence of charitable penal institutions – correctional and work houses and their inhabitants – caused the necessity of the presence of military guard at the charitable institutions like the 'Alexander Heights' in Riga. The presence of the military guard and its duties were regulated by relevant parts of the legal code in case of the above-mentioned correctional institutions, and could be extrapolated on the insane to prevent acts of aggression, accidents and escapes. The insane were also a subject of control of the military veterans due to the shortage of professional staff. One of the first signals of a change in the situation were the "small" reforms of the system of charitable care as a consequence of the state's unsuccessful Crimean campaign: prohibiting the stationing of hourly guards in the Riga insane asylum in 1856, and, finally, closing of all the penalty institutions at the 'Alexander Heights' institution in the 1860s.*

Keywords: *Alexander Heights charitable institution, early Baltic mental asylums, history of psychiatry in Latvia, Livonia Board of Social Care, military guard, military veterans as part of the system of care of the insane*

The issue of charitable care for the mentally ill at Alexander Heights (AH) institution in Riga during the 19th century is covered by several authors, among whom mention should be made primarily of G. Holdt (1867), J. Luiga (1904), J. Brants (1925), H. Buduls (1938), Z. Sochneva (1956; 1974; 1974) and V. Kuzņecovs (2011). In particular, charitable care associated with behavioral control of the clients at AH is examined primarily with regard to mentally ill patients. This report is intended not only to continue to study this topic, but also to expand it, taking into account historical aspects of charitable care of the mentally ill patients as part of the system of philanthropic institutions, which included penitentiary facilities, and provided for use of the military guard for the reason of order and safety.

Mental asylum as a part of the system of charitable institutions of the Livonia Board of Social Care

As it is known, the beginning of regular charitable care of the mentally ill in the Baltic provinces of the empire was provided for in the federal Statute on Provincial Administration of 7 November 1775 (Yudin, 1951, p. 36). Before the advent of the first Baltic insane asylum, charitable care of these patients might have been provided sporadically, relying on municipal, church and personal charity. Most patients were cared for by families, sometimes in the most primitive and inhumane manner; or they lived as homeless drifters. According to the law of 1775, care for the insane was entrusted to the new provincial administrative structure as well as to a charitable institution, the Livonia Board for Social Care. The scope of activity of the board was very broad. Among the charitable institutions within its ability to provide services were almshouses, schools, homes for the terminally ill, hospitals, insane asylums (which by law were not considered hospitals); correctional facilities, a work house (to earn one's living, but also for those convicted of begging and indolence) and a correctional house (for people of both sexes "who lead a dissolute and intemperate life"). The same law of 1775 foresaw, along with a humane attitude to mentally ill persons from the side of administration and care persons, the measures of safety against their possible aggression, and first and foremost, the reliable isolation. The use of military veterans, "conscientious and careful", was proposed by the law along with paid careers (*Polnoe Sobranie Zakonov…* , 1830). As shown by the activity of the Livonian Board for Social Care (Russ. *Lifliandskii Prikaz obshchestvennogo prizreniia*, Germ. *Livlandische Collegium für allgemeine Fürsorge*), several such institutions might have existed in one territory and even within a single building, such as the first insane asylum in Riga (1787–1823) (Kuzņecovs, 2007).

In Europe the first correctional/work houses appeared in the 16th century (Pullan, 2001). The presence of mentally ill patients in such institutions probably was a rule rather than an exception. Originally the tendency to combine homes for the insane, immoral persons, criminals as well as the venereal patients into a single entity was dictated by the moralizing atmosphere of the society, which encouraged isolation of these kinds of marginalized persons in the first hand for the reasons of safety and re-education of the "poor insane", and only later on by the reason of their treatment (Nolan, 1993, pp. 29–31). The merging of wards for the mentally ill with correctional or infectious (including venereal) facilities was practiced in different countries, such as England, Holland (Haarlem) and Germany. Thus, in Berlin, patients were transferred to the hospital from the penitentiary building only after a fire occurred there in 1798 (Bartlett, 2001, p. 435).

In Russia, probably, similarly to the German model, the insane asylum, or *dolgauz*, (Russ. *долгауз* from German *Tollhaus*, 'mental asylum') since the end of 18th century was often combined with the correctional house (Rus. *цухтгауз* from German *Zuchthaus*, 'correctional house') in Moscow, St Petersburg, Novorossiisk (later Yekaterinoslav), Kharkov, Ufa, Vyatka and other provincial cities. In Moscow, the majority of the mentally ill patients were placed in the correctional house; calm patients were kept in the almshouse, and only violent patients were cared for in insane asylum. At the beginning of the 19th century violent patients from the insane asylum of the Obukhov Hospital in St Petersburg were transferred to the correctional house – the official part of the Obukhov institution (Yudin, 1951, pp. 34–37, 64). According to eyewitnesses (1801?) the military guard was stationed at the entrance of the St Petersburg (Obukhov?) hospital building. The presence of an internal guard was observed only in areas of seclusion and restraint for prisoners of correctional facility,

> *Although they are at fault for nothing other than as servants being angered by something that their masters – nobles, wealthy merchants and others – had done, and by order they were sent here, where they also were kept. They wear neck irons and are watched over by guards… They work here, and for that they receive black bread and water two times a day. They are held here for a week or two, a month or two, or up to two or three years, then they are released. Sometimes it happens that their master does not remember some of them, and so they end their days in custody. If the master wishes they can be released immediately.* (Buyanov, 1989, pp. 45–47)

The text notes the seemingly extrajudicial character of prisoners kept under guard, and the terms of their sentences being determined arbitrarily. However, according to the law of 1775 the basis for referring persons to the correctional houses could be not only a court sentence but a determination by the Provincial Administration; a petition by private individuals, fathers, mothers; or a petition by three relatives (*Polnoe Sobranie Zakonov Rossiiskoi Imperii*, 1830, p. 275). The text also notes the presence of an external military guard (for all the hospital branches?) and an internal military guard for the correctional house.

It still is unclear when and why was the presence of military guards for guarding prisons extended to include patients. According to an early report this took place after 1801 when the Board of Medical (the central agency of medical administration) and the Secret Police were closed due to the formation of government ministries. After that the mentally ill patients who were under the authority of these agencies were transferred to the Board of Social Care using the prior system of protection (Konstantinovsky, 1887, p. 550). According to another report the need for the use of guards was primarily due to a shortage of staff for the mentally ill (Yudin, 1951, p. 56). Anyway, with its penalty institution, it subdued to the rules of guarding of prisoner places by military guard formulated by contemporary laws (*Svod zakonov…*, 1857) that could be expanded to the neighboring branches like the mental asylum and venereal hospital mainly for the reasons of safety for the prophylaxis of suicides, accidents and escapes.

Alexander Heights in the first half of the 19th century

The institution ‘Alexander Heights’ (Russ. *Aleksandrovskaia vysota*, Germ. *Alexandershöhe*) was opened in 1824. A new complex was constructed at Alexander Heights on the grounds of the former royal park on the banks of the Daugava River outside the city limits. After moving, the old house of the Board for Social Care in the Citadel was closed and turned into a city jail (pointedly underscoring continuation of the essence of understanding of the insane asylum as a ‘psychiatric prison’!). The new institution inherited the structure and the very spirit of the old *dolgauz* with majority of pure social clients in its five wards. The first requirement of the law of 1775 remained, which required that the insane asylum (as well as, in the corresponding article, the Correctional House) must be “spacious and fortified so that it would be impossible to escape from it”. This section on the insane asylum was followed directly by guidance on “making efforts to treat them” – which was unrealistic considering the limited degree of medical development at that time with its lack of psychiatric help (*Polnoe Sobranie Zakonov Rossiiskoi Imperii*, 1830, p. 274). Statutory acts for confining people in the Correction House often had a moral character: disobedience to parents, profligacy, debauchery, drunkenness, laziness, unwillingness to work and much more. These and other crimes and misdemeanors were supposed to be treated by continual labor. The "lazy and disobedient" were punished by putting to bread and water for three days, confining to a cell for a week, or flogging (*Polnoe Sobranie Zakonov Rossiiskoi Imperii*, 1830, p. 275). The latter was performed according to the Alexander Heights' statutes, by use of the house whip (*Hauspeitsche*), not more than three strikes for one misdemeanor. Punishment of the mentally ill was prohibited by state law and by the Alexander Heights' statutes (Luiga, 1904, p. 26). However, as Luiga also justifiably observed, it often was difficult for personnel and the guards (who could be civil persons from penitential wards) to distinguish a client of the correctional division from a patient, who might accidentally be subjected to the punishment mentioned: "Just who in general would be able to distinguish a mentally ill patient from a tramp? There was no psychiatrist at all, and a permanent physician […] was appointed around 1845. Justice and punishment were in the hands of the caretakers and the guards." (Luiga, 1904, p. 26) Starting at least in the 1840s, the Interior Ministry asked the Livonia Board for Social Care about terms of confinement, the dynamics of admission and discharge, compensation for the labor of residents of the correction house, and compliance of conditions of confinement with requirements with the Code of Institutions and Statutes on Confinement under Guard from Volume 14 of the Legal Code (*Svod zakonov…*, 1857).

Thus, on 6 October 1852, the Ministry asked the (Civil) Governor as the head of Livonia Board about the numbers and lengths of stay of residents in the correctional institutions of Alexander Heights who were sent to such houses for bad behavior since 1847 (Inquiry of the Ministry of Internal Affairs from 6 October…, 1852). On 14 November 1852 the Livonia Board reported about only three persons (one of them entered twice), who were in the correctional division "at the request of the society" or at the request of the parents for bad behavior with different duration of stay up to one year (Answer of the Livonia Board of Social Care from 14 November…, 1852).

According to federal law, the goal of the Work House of the Board for Social Care was to provide roof over one's head and work for the impoverished, or those without a permanent residence for being fed. However, based on a detailed draft of the Riga Alexander Heights' statutes (1824), it follows that the basis for confinement in the work house, first and foremost, was the negative moral quality of these individuals – laziness, understood as lack of desire to work and begging that went along with it, for which the police detained them. Originally the minimum duration of stay at the Alexander Heights Work House was defined as six months. But the same statute reads, "The completely incorrigible remain in the institution indefinitely" (Riga Alexander Heights statutes' draft, 1824, p. 24). Accordingly, a universal means of correction for all residents, and especially for the correctional divisions at Alexander Heights, was permanent residency – labor of various degrees of intensity and heaviness, different for men and women. But also at that time in Lübeck, Germany, the term of confinement for prisoners of local work house could be without term (*Plan uchrezdenia rabochego doma*, 1821). In time, the difference between now penitential institution was equated, they were called 'work-correctional institutions'. On the whole the number of correctional prisoners in the institution steadily declined over time with improvement in laws, and the number of mentally ill patients, especially chronic patients, rose at AH.

Meanwhile, strictly mentally ill patients originally occupied only 52 (30 men, 22 women) out of 221 beds in the five wards of AH institution in Riga in 1824. The rest of the beds were occupied by social clients from the almshouse (veterans constituted about one-third of its inhabitants), two correctional facilities and a venereal hospital. The inhabitants included a quite number of asocial residents of the penitentiary and venereal departments of the hospital – tramps, alcoholics, thieves and prostitutes. Due to a shortage of space, patients, as it already has been said, might have been relocated to the social division and vice versa. In real life the use of soldiers from garrison battalions, retired veterans from almshouses, and other clients of the social wards for patients care at that time was widespread practice associated in the first place with a shortage and expensiveness of personnel hired on their own free will (Yudin, 1951, p. 56). However, psychosocial attitudes also could play a role. The ex-servicemen from the army in asylums of that time "were much liked by superintendents because of their disciplined background and their ability both to lead and to be led" (Nolan, 1996, p. 49). It was not rare that in the first part of the 19th century the Alexander Heights' superintendents themselves were retired military officers (Brants, 1925). According to the reports of the Alexander Heights, in 1824 there was one paid male attendant (for prisoners) who lived on the territory of the institution but was not its client. In 1826 the staff included six attendants from different wards, in the majority partly paid clients of social units. The same is true for the majority of the caregivers and various supporting staff in 1847 with its partly paid 45 persons (Kuzņecovs, 2008, pp. 92, 95–96). "The asylums were expected to be self-financing and this meant that labor costs had to be kept to a minimum" (Nolan, 1996, p. 47).

With regard to the mentally ill, patients were subjected by law to the right of unlimited internment in the institutions of the Board for Social Care at the request of the administration of the province (mostly police and medical doctors), the criminal court (from crimes committed in a state of mental disorder), and in connection with a loss of capacity and appointment of guardianship by decision of the Senate. Such patients were released by the court "after recovery" (Janovsky, n.d., pp. 953–960). The issue of their special guarding and care was not regulated at the level of federal law.

The military guard at the Riga Alexander Heights institution

The number of military guards and their duties was mentioned only minimally, even in such meticulously compiled documents as statutes of institutions. Early sources report on the number of military guards at the building Livonia Board of Social Care (with asylum) at the Riga Citadel in 1818: forty-four soldiers and two non-commissioned officers were thought to guard all the Board building's inhabitants, the mentally ill and prisoners (Kuzņecovs, 2007, p. 64). When Alexander Heights opened in 1824 there were seven military guard posts. The guarded objects included the main buildings of the institutions' wards: three buildings constructed in 1823 and the big building of the work house (1835) for prisoners. Two of the posts were placed near the main gates, which still exist today, one facing the woods and the other on the opposite side of the Daugava River. Possibly, the latter one was near the bridge over the river, which belonged to the institution. The bridge at least in part could be maintained by two persons from the Alexander Heights almshouse (Alexander Heights 1st tertial report, 1826).

The exact number of military guards at Alexander Heights remains unknown to this day. As early as in 1826 the administration proposed to the Board for Social Care an increase in the number of military guards by an additional 12 soldiers and one officer (Kuzņecovs, 2011, p. 157). The guard had to be present at the post day and night to prevent the possibility of escape by the residents of the work and correctional houses. The guard also was supposed to make rounds inside the buildings and patrol the grounds to prevent escapes and other incidents which might threaten the security of the institution or its residents. For prevention of emergencies, besides the military guard there also was a local team of disabled retired military veterans from the local almshouse. Their duties included night watch, as well as prevention and extinguishing of fires (Kuzņecovs, 2011, p. 158). Lighting for offices at night during the first decades of Alexander Heights' existence consisted of oil lamps, and the risk of fire was great. The problem of individual and social security for residents of the institution was increased by the large expanse of the grounds – a former imperial park, covering about 17 hectares. Compared to several tens of meters of the courtyard of the Board for Social Care's building in the Riga Citadel, which also had utility rooms and in which it was nearly impossible for patients to go for strolls, the difference literally was huge, both in the positive sense (the calming effect of nature), as well as the negative sense (increased risk of escape, accidents and suicides). Upon any detected violations the commander of the guard was supposed to inform the steward, who also was the superintendant of the institution. At night the steward kept the keys to the main gates and the premises of the correctional departments of the institution (Kuzņecovs, 2011, p. 158).

Nevertheless, escapes took place. As early as in 1824 the administration of the Alexander Heights proposed the issuance of a pass to residents for preventing escapes, and the cloth badges for prisoners with the letters 'Z.H.' (*Zuchthaus*) (Administrative Committee report, 1824). However, in the third tertial report of 1826 (September–December) three persons escaped from the Correctional House including one insane person (Third tertial report, 1826). An investigation was conducted by the commandant of Riga, Major-General Wrangel, and his report to the civilian governor of April 23, 1848 contains information about the escape of three "civilian prisoners" from the Work House that they managed to accomplish on the premises of the hospital where they were being treated. A private of the Olonets Infantry Regiment who was on hourly guard duty at the hospital, was found guilty in the investigation (with participation of the Commander of the 4th Infantry Division), as well as a non-commissioned guard officer who did not inform about the escape in time. It also was determined that the spaces between bars of windows, through which the escape took place, were too wide. They were supposed to punish the guilty guard and replace the window bars (Riga Military Commandant Report from 23 April…, 1848). Also three night posts around the Work House were established before the installation of the new, narrower bars (Riga Military Commandant Report from 23 April…, 1848; Riga Military Commandant letter from 23 October..., 1848; Report by the commandant from 25 October..., 1851). In another report by the commandant to the Civilian Governor Essen, he speaks about the need to prevent the possibility of escapes by prisoners held in the Work House while returning from work at dusk. The commandant proposed organizing the return of prisoners before the onset of darkness (Riga Military Commandant letter from 23 October…, 1848). The civilian governor, in turn, reported to the Livonia Board about the investigation of the circumstances of the escape of four prisoners, who crawled through the fence of the wood storage shed. An increase in the height of fences around the Alexander Heights was proposed in order to prevent future escapes

(Memorandum of the governor from 5 December…, 1853). In 1854, the guarding functions at the Alexander Heights were executed by the staff of the Revel Regiment of Chasseurs (Report from the Ordonans-Gauz, 1854).

It is not ruled out that, as in the Citadel asylum, armed guards could be summoned by personnel for the oversight of aliens and calming of agitated patients (Kuzņecovs, 2007, p. 64), although provisions of the draft statutes of Alexander Heights suggest that such action by the military guard was not specifically foreseen. However, as already mentioned above, other sources (Konstantinovsky, 1887, p. 550) indicate that the military guard was stationed not only outside of buildings, but also inside the premises as an internal guard. It was the same not only in penitentiary institutions but also in the insane asylum. It was the same in various cities throughout the empire. After a personal visit by Czar Nicholas I to the insane asylum in Riazan in 1832 he issued an order for immediate removal of the military guard from the insane asylums, since "weapons, due to incautiousness of the military guard, easily could harm the unfortunate and those bereft of reason, and the very sight of one [a weapon] must make an unpleasant impression on their imagination." (*Polnoe Sobranie Zakonov Rossiiskoi Imperii*, 1833). The Imperial Decree of 1 October 1832 went to press in 1833 as the seventh volume of the Legal Code. However, although the Minister of Internal Affairs right away announced the Imperial Decree to the civilian governors throughout the country, the military guards were removed only from the internal premises of patients (Konstantinovsky, 1887, p. 580). Having the force of law the Imperial Decree of 1832 on elimination of the military guard *de facto* was not accepted also at the institutions of the Livonia Board for Social Care. The reason probably was the above-described structure of the institutions of the local Board for Social Care, which was changed at the end of the 1860s with the closure of the penitentiary departments. Nevertheless, as archival materials indicate, removal of the military guard at Alexander Heights took place according to a special Imperial Decree as early as on 16 September 1856 – earlier than it took place in other provinces.

Problems associated with the need to station a military guard for oversight of clients at Alexander Heights was complicated at the beginning of the Crimean War (1853–1856). In April 1854, due to the possibility of an enemy attack, and according to the command of the Commander-in-Chief, the military guard had to be transferred to the main guard house in the Riga fortress to join other troops. The military guard was supposed to be replaced by a so-called 'disabled veterans' team', composed of the persons living in the Alexander Heights almshouse (Letter of the Livland Governer from 7 April…, 1854). But later in April the Commander-in-Chief suggested that the most dangerous prisoners were transferred to the city jail in the fortress, and to replace the military guard due to possibility of the allied forces attack with 15–20 veterans from the Home Guard forces (*vnutrennie voiska*) in order to guard more effectively the institution's property and people (Letter of the Commander-in-Chief from 27 April…, 1854). The initiative received the support of the Riga military governor Prince A. A. Suvorov who communicated to the vice-Commander of General of the 1st district of the Home Guard corps in order to follow the above proposal. The military governor suggested the replacing of the military guard with 20 serving veterans associated with the Home Guard (Correspondence of governors from 4 May…, 1854).

The expected attack by Allied forces did not take place, and the supposed transfer of the guard to the Citadel seemingly lost it actuality for some time. However, by the end of the war, that local initiative received support from the high-ranking person from St Petersburg, Adjutant General Frolov. The General came to Riga by imperial order for inspection of local military post and guarding service. The acting commandant of Riga, Colonel Z (S?) Kotzebue (*З. Коцебу*), in his report of June 12, 1856 to the Livonian Civilian Governor, referring to Frolov, proposed replacing the military guard of all six posts "of the insane asylum" (obviously referring to the entire complex of institutions at Alexander Heights) with 12 veteran guards. The military hourly guards were supposed to remain for guarding only prisoner places. That last post was supposed stationed in a building of the Work/Correctional House. The guards were supposed to be stationed near the entries of its front and back doors; the new post was supposed to be stationed at gates facing the wood. But the post at the "exit gate" (facing the river?) was supposed to be closed. Kotzebue also mentioned the nine convoy soldiers that were supposed to be sent to the Alexander Heights "as before" for the control of prisoners working for the institution. The reason for this replacement by Kotzebue is reminiscent of the Imperial Decree of 1832 (possibly cited by General Frolov during his inspection), "because an hourly guard with a weapon has nothing to do with the insane" (Report of Colonel Kotzebue from 12 July…, 1856).

However, the real changes took place only after an Imperial Decree from 16 September 1856 from Czar Alexander II on the reduction of military guard registries: "instead of … hourly guards, formerly stationed in the Riga insane asylum and now phased out, appointing 12 men from the disabled veterans of the second category as permanent guards" (Letter of Riga governor from 5 November…, 1856). They were there, apparently, because of the three then existing categories of disabled veterans teams – mobile, able to serve, and unable to serve (totally disabled). In other provinces the external military guard was removed only later – 29 April 1859 in accordance with the Imperial Decree prohibiting the stationing of hourly guards in the insane asylums not only in the institutions of the Board for Social Care, but also in departments for the insane in military hospitals (Konstantinovsky, 1887, pp. 580–581). According to archival data, the guarding functions at the Alexander Heights in the second quarter of the 19th century were performed both by the soldiers of active army and by forces of the Home Guard.

Ironically, the implementation of the human law of abolishing the military guard in mental asylums of Czar Nicholas I could started only after the death of it author on 18 February (2 March) 1855. The question of softening control of patient behavior was accompanied by a gradual transition to specialized services and the closure of penal institutions at Alexander Heights in the 1860s. Generally speaking, the question if war could serve as the driving force of humanization sounds rhetorical. However, in the given context the answer might sound positive at least for this author. As it is known, confrontation with the coalition of Western Nations, which ended unhappily for the empire, resulted in a systemic crisis of old practices poured out in the liberal Great Reforms of the 1860s. To some extent the described "small" reforms of the liberalization of the confinement of mentally ill patients in the 1850's Livonia can be considered forerunners.

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Advertisements in Professional Lithuanian Pharmaceutical Journals, 1923–1940

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Abstract: *Lithuanian pharmacists during the interwar period published two journals to meet their professional needs – Farmacijos žinios (Pharmacy News) and Lietuvos farmaceutas (Lithuanian Pharmacist). These journals also published advertisements for pharmaceuticals, pharmaceutical manufacturers, medical items, and various other goods. This paper will analyze which products did Lithuanian and foreign companies advertise in the Lithuanian pharmaceutical journals and discuss the contents of these advertisements.*

During their early years, the pharmaceutical journals contained mostly advertisements for patented medicines, submitted by individual pharmacies. The Palanga's pharmacy, for example, submitted the majority of such advertisements, including those for 'Trejos Devynerios' (Three nines), 'Essentia Cordialis' (essential cordial), and veterinary medications.

Gradually, independent drug and chemical manufacturers emerged and started the mass production of drugs and chemicals. Individual pharmacies could not compete with them. This resulted in a decrease in the amount of advertisements from individual pharmacies and an increase in the amount of advertisements from the newly-established pharmaceutical companies and their distributors. The majority of the advertisements were submitted by such Lithuanian pharmaceutical companies as GerMaPo and Sanitas (the former being more active in their advertising campaign).

Advertisements from distributors were abundant as well. They sold products of such well-known European producers as Knoll, *Merck, C.F. Boehringer & Soehne, Sandoz, F. Hoffman-La Roch, J. D. Riedel, and E. Schering.*

Later on, foreign producers began to run their own advertising campaigns. German companies were the most active ones. Bayer and C.F. Boehringer & Soehne took the lead, while Merck, Knoll, and Hoechst were somewhat less active.

The earliest advertisements resembled informational announcements. The advertisers would simply list their products without any praising comments, or simply state that "Sandėlyje yra visuomet viskas kas aptiekoms reikalinga" ("In our warehouse we have everything that pharmacies might need"). Only in the fourth decade, major foreign and Lithuanian producers started to use visual advertisement, logos, and suggestive texts. Advertisements of the Bayer company were the most creative in this respect.

Keywords: *advertisements by medical and pharmaceutical companies, history of pharmacies*

Introduction

During the interwar period Lithuanian pharmacists published two journals to meet their professional needs – *Farmacijos žinios* (Pharmacy News) and *Lietuvos farmaceutas* (Lithuanian Pharmacist). The magazine *Farmacijos žinios* (1923–1940) was the main specialized pharmaceutical magazine in Lithuania which reflected pharmaceutical problems of that time and was concerned with ways of solving them, and the activity of organizations. The Union of Lithuanian Pharmacists (established in 1921) and the Society of Lithuanian Pharmacists (established in 1922) were the publishers of this journal. The first society consolidated the workers, while the second one the owners of pharmacies, and only they could become real members of the organization. The Society of Lithuanian Pharmacists united about 80% pharmacy owners all over the country (Savickas, Gudiene & Stankūnienė, 2003). The main readers of the journal were owners and managers of pharmacies – the basic drug trade marketing partners. This journal also included advertisements for pharmaceutical manufacturers, medical items and various other goods.

The second magazine, *Lietuvos farmaceutas*, was published by pharmacy workers. However it was being published for only one year in 1933. Drug manufacturers and drug wholesalers put only a few advertisements in this magazine, because it had only a small audience of ordinary consumers. The magazine advertised stationery, flowers, and even – coffins.

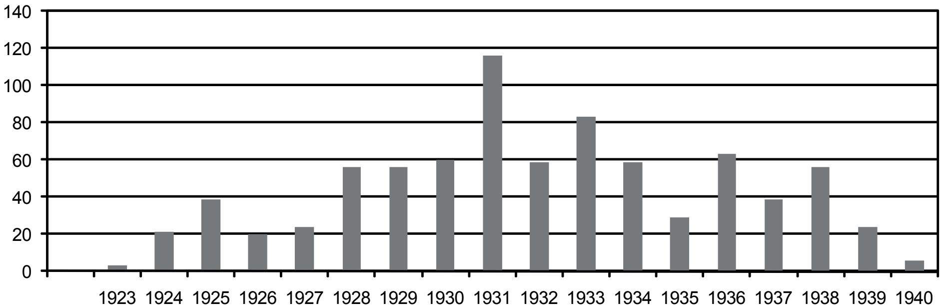
The journal *Farmacijos žinios* was significantly more important for providers of advertisements, because the magazine was popular, and its readers were more influential in Lithuanian apothecary business than the readers of the magazine *Lietuvos farmaceutas*. A page of advertising in *Lietuvos farmaceutas* cost 75 Lt, and in *Farmacijos žinios* – 50 Lt.

Quantitative dynamics of advertisements

Comparing the advertising tradition in Lithuania in the first half of the 20th century with the American and West European advertising in the same period, we can state that advertising in Lithuania was still under development. It was very reserved, and the specialists' attitudes towards drug advertising were critical. For example, during the 1924 Lithuanian Doctors Congress doctor V. Bagdonas said: "Advertisement in matters of health is impermissible, harmful manifestation; therefore it should be eliminated and is considered an offense against Medical Ethics. […] It is like this in America: medical and pharmaceutical advertising has reached the most impudently shameless degree there […]" (Bagdonas, 1926). However, Bagdonas' ideas and the opponents of advertisements did not receive any response from the publishers of the journal.

We have carefully reviewed, analyzed, evaluated and summarized the pages of all advertisements found in the journal *Farmacijos žinios* (available at http://www.epaveldas.lt). The advertisements of individual pharmacies were placed on the third or fourth pages of the journal, while major enterprises and drug wholesalers were given even the first or second pages in each issue of the journal. The biggest number of advertisements were published during the years of recession from 1929 to 1933 (Chart 1). Drug sales were lower (Statistical Survey of Public Health, 1934) but the scope of pharmaceutical advertising in press was larger. In 1925–1940, Lithuanian drug manufacturers and pharmacists were very active in creating patent drugs. Besides, imported drugs were competing with the local ones.

Chart 1. The number of pages allocated to advertisements (x) in Farmacijos žinios *per year (y)*



There were two declines in advertising. In 1926, the publishing of the journal was close to bankruptcy. In 1939 and 1940 the country and business lived in fear of war. Even ceasing the publishing of the journal was considered. It was difficult to prepare interesting articles, and the number of advertisements decreased. Usually we could see an obvious correlation between the popularity of a publication and the number of advertisements included. In some issues, advertising took up as much as 30% of publication space. It is interesting to note that the second issue of *Farmacijos žinios* of 1938 was meant to commemorate the 20th anniversary of independent Lithuania. The journal came out in larger than the usual size, but contained no advertisements.

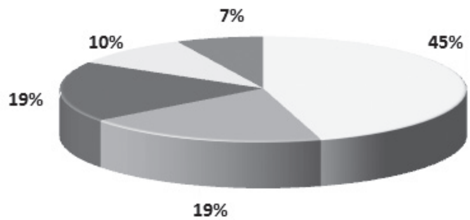
About 70% of advertisements in the journal *Farmacijos žinios* were designed to advertise drugs. The publishers did not hesitate to urge pharmacists, readers of the publication: "Dear pharmacists! Buy only from these institutions and supply the buyers only with these products that are advertised in our journal!" ('Farmacijos žinios', 1932, p. 34).

Advertising suppliers

Pharmaceutical companies and pharmacies often combined several activities: for example, pharmacies did not only sell drugs to the people but also manufactured patented drugs and distributed them to other pharmacies. Drug wholesalers established manufacturing laboratories and drug manufacturers set up drug wholesalers. The Lithuanian companies GerMaPo and Pharmakon distributed not only their production, but also products by foreign companies. Therefore, when dividing advertisement suppliers into categories, their basic activities were taken as the defining criteria.

We tried to find out what enterprises, organizations, and individuals had advertized themselves in the journal, and what kind of drugs, tools and equipment did they advertise. Considering these criteria, the advertising suppliers were divided into five groups (Chart 2):

Chart 2. Amount of advertising space taken up by various groups Farmacijos žinios *1923–1940*



Lithuanian drug manufacturers and wholesalers – 45%;
Lithuanian pharmacies – 19%;
Foreign drug manufacturers – 7%;
Lithuanian pharmacy equipment manufacturers – 19%;
Other – 10%.

I

The first drug manufacturing companies were established in 1921–1922 (Vaistija and Chemical & Pharmaceutical Laboratory 'Sanitas' in Kaunas, Galen in Šiauliai) but in 1937 there were already eight registered chemical and pharmaceutical laboratories in Lithuania: Pharmakon, Vaistas, GerMaPo, Central Public Drug Wholesaler (Žukienė, 2005). They pursued mostly moderate advertising campaigns. The first Lithuanian drug advertisements appeared in 1923 and were supplied by the joint stock company Vaistija ('Vaistija', 1923, p. 2). What were the enterprises proud of? Both Vaistija and Sanitas emphasized in their advertisements that namely their company was the first drug manufacturing enterprise in Lithuania ('Vaistija', 1927, p. 32). Most advertisements, visually probably the most interesting ones, were by Sanitas. Today it is a successfully operating drug manufacturing plant. In 1926, Sanitas published only a very modest ornamented advertisement ('Sanitas', 1926, p. 34). Later the enterprise created its trademark which was featured together with the advertising text. It is possible that the enterprise borrowed the idea for the trademark design – a cross designed from the company's name – from the Bayer company ('Sanitas', 1934, p. 41). Yet there is no information about whether intellectual property rights were violated in this case or it was caused by other reasons. The company Sanitas paid more and more attention to making its activities

Figure 1. Advertisement of the chemical, pharmaceutical and cosmetic manufacturer 'Sanitas' (Kaunas, Lithuania), 1931.

known, and in 1931 used very modern advertising for that time – depicting a huge company building, smoke tumbling from chimneys, with drug bottles and boxes laid out in the background ('Sanitas', 1931, p. 28; Fig. 1).

The Lithuanian company GerMaPo which carried out wholesale and drug manufacturing was established by three manufacturers, A. Gerdvilis, V. Malela and V. Podleckis, who used for the company name the first syllables of their surnames (Kaikaris, 2000). GerMaPo advertisements were not distinguished by drawings or fanciful slogans; they merely informed about new products, sometimes presenting their prices, too ('GerMaPo', 1937, p. 32).

The company Pharmakon in Klaipėda pursued analogous activities. It bought the largest number (83) of advertising pages in this journal. The Pharmakon factory, having strong historical links with Germany, was developing the field of wholesale and supplied Lithuanian pharmacists with drugs from Germany, England, and Denmark.

II

The second group of advertising providers were pharmacies. They made up 19% of all published advertisements. Lithuanian pharmaceutical industry was born only at the beginning of the third decade of the 20th century. During the first years of independence (from 1918) pharmacies were the main drug producers. They not only made any drug as per doctors' prescriptions, but developed their patent medicine. Pharmacy laboratories made patent medicine intended for a significant segment of the pharmaceutical market, but they were poorly advertised.

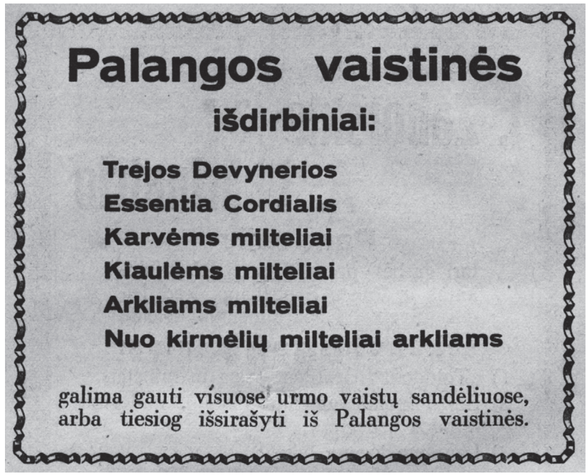


Figure 2. Advertisement of the Palanga pharmacy (Palanga, Lithuania), 1930.

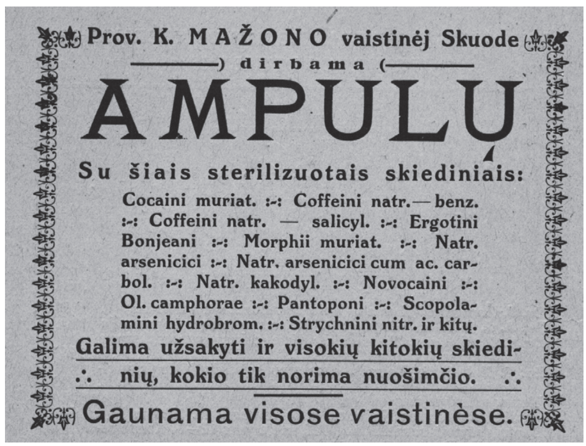


Figure 3. Advertisement for injection drugs by pharmacist Kazys Mažonas (Skuodas, Lithuania), 1921.

The Palanga pharmacy pursued the most active and consistent advertising campaign in press. The advertising of this pharmacy made up more than half (54%) of the advertisements in this group. It is a marvel that this historical pharmacy, founded in the middle of the 19th century, is still in operation. In interwar years, patented medicines were manufactured there, the best-known of which, and one still being produced, is the bitter herb mixture Trejos devynerios ('Three nines' made of 27 different herbs; Fig. 2). The Palanga's pharmacy provided drugs for heart diseases, *essencia cardiales*, as well as medicine for cows, pigs, horses, as there were no separate veterinary pharmacies in the interwar period (Palanga pharmacy, 1930, p. 40).

The pharmacist Kazys Mažonas from a small town Skuodas advertised his injection drugs (Fig. 3). He manufactured injection solutions with narcotic substances (morphine, cocaine, etc.) and arsenic saline solutions in his laboratory and advertised in the professional publication for physicians in the journal *Medicina* (Mažonas, 1921, p. 161). Later on, big drug manufacturing companies pushed the small pharmacies out from the market.

III

The third group of advertising providers includes foreign drug producers and their representatives in Lithuania. They made up only 7% of all advertisements. Only those advertisements that promoted foreign pharmaceutical manufacturers and their products were assigned to this group.

From 1924 onwards, representatives of foreign drug producers in Lithuania advertised in *Farmacijos žinios* drugs mostly by the famous Merck, Knoll, Bayer, F. Hoffman-La Roch, C. F. Boehringer & Soehne G., Ciba, Schering, Riedel, Hoechst, etc.

The famous German drug manufacturers C. F. Boehringer & Soehne were represented by Fr. Süssmann (Süssmann, 1926, p. 1). The pharmacist V. Cirkvicas represented the E. Merck company and provided information about its drugs and reagents (Cirkvicas, 1936, p. 33). The pharmacist J. Luncas was also a representative of Merck and Knoll companies in Lithuania (Luncas, 1924, p. 16). A qualified pharmacist Leopoldas Malcas declared that he even represented five foreign drug manufacturing companies (Malcas, 1926, p. 33).

A little while later, foreign companies began their own advertising campaigns in the journal. Undoubtedly, the Bayer company took the leader position: their first advertisement in the journal was issued in 1936. The advertisements of the company were characterized by originality and large variety. During three years (1936–1939) ten different Bayer advertisements appeared in the journal. They depicted buildings of the pharmaceutical factory, the equipment, test-tubes used for researches, and a drug maker dressed in a white smock (Bayer, 1937, p. 1; Fig. 4); the advantages of the plant are noted in the text: “State-of-the-art methods of thorough cleanliness and constant scientific observation guarantee the standardized quality of pharmaceutical chemicals” (Bayer, 1938c, p. 1).

The advertisements emphasize that while prescribing medicine it is necessary to heed that these were the drugs of Bayer that has been operating for 50 years (Bayer, 1938a, p. 1). Some advertisements depict the same company by demonstrating its power; some others even a drug maker at work in a research laboratory. We can see a historical motif, the process of drug manufacture from picking herbs, crushing, boiling to modern factory technologies and chemical drugs (Bayer, 1938b, p. 1).

Figure 4. Advertisement for Bayer Company products, 1937.

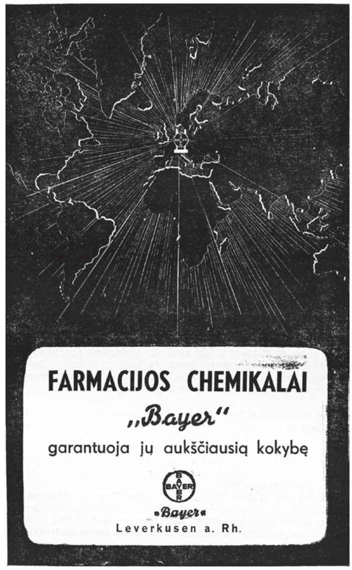


Figure 5. Advertisement of the pharmaceutical and chemical manufacturer Bayer (Leverkusen, Germany), 1939.

The last Bayer advertisement notes that the drugs of their company are spread worldwide: the well-known Bayer trademark is represented by rays connecting every continent in the world (Bayer, 1939, p. 1; Fig 5).

Exceptional is an advertisement of Novarsenobenzol Billon, made in France, proclaiming a cure for syphilis (Specia, 1933, p. 73) and the advertisement of Insulin ‘Tetewop‘ by the joint stock company Theodor Teichgraeber (Insulin, 1924, p. 1; 1925, p. 1).

IV

As the journal *Farmacijos žinios* was targeted at pharmacy owners and managers, it also advertised pharmacy equipment, vessels, bandage, packing implement, and rubber ware. Advertisements of this group made up about 19% of all the advertisements published in the journal. The company A. Mogilevskis and J. Finas (in Kaunas) was the most consistent advertising provider (A. Mogilevskis and Finas, 1923, p. 18). Its advertisements, taking up half the page, can be found in every issue of the journal (1924–1940). A. Mogilevskis and J. Finas bought the Chemical and Pharmaceutical Laboratory 'Sanitas' in 1924 (Žukienė, 2005). Other active advertisement suppliers were M. Rosenzveigas wholesaler (M. Rozencveigas, 1924, p. 16), the cardboard factory Bekara-Kartonož, and the joint stock company Eskulap, a laboratory equipment and cosmetics supplier.

V

The advertisement providers that could not be ascribed to any of the above-mentioned groups make up group number five. These are importers and sellers of soap and cosmetics, societies, printing houses, lottery organizers, co-tutors, and individuals.

Conclusions

In the 1930s, the tradition of medical and pharmaceutical advertising in Lithuania was still under development but the rapid growth of advertising was stimulated by Lithuanian and foreign drug producers and the publishers of pharmaceutical journals. During the interwar period Lithuanian pharmacists published two journals dedicated to their profession – *Farmacijos žinios* (Pharmacy News, 1923–1940) and *Lietuvos farmaceutas* (Lithuanian Pharmacist, 1933).

The publishers of *Farmacijos žinios* focused their attention exclusively on advertising pharmaceutical news, because publishing advertisements was the main source of their income and helped them to keep the journal's popularity for 18 years. The publishers of the journal received 30% to 41.5% of money from advertisement providers and 15% from their subscribers.

The publishers of the advertisements in the journal *Lietuvos farmaceutas* focused on products for personal needs. Drug manufacturers and drug wholesalers put only a few advertisements in this magazine, because their circle of readers was too small.

The commercial advertising of drugs made up the biggest share of advertisements published in *Farmacijos žinios*. As a rule, the advertisements were put on the extra hard pages at the beginning or the end of a journal copy. The pages were not colored, but were brownish, greenish, grayish – very different from the usual yellow journal pages.

In the first year the publishers confined themselves to very moderate information, only marking the advertised commodity: “rubber articles”, “carbonic acid cylinders”, “hygiene articles”. The production was praised in a few words: “long-lasting”, “standardized quality”. Later attempts were made to catch a potential client’s attention and focus it on the quality of production and service. It was emphasized that orders would be fulfilled fast and honestly, at optimal prices, and the client would be able to settle an account for the drugs later. All this was put in such phrases: “Fast and orderly fulfillment of orders”, “Our basic attitude is to provide the first-rate commodity”.

At the same time Lithuanian advertisers played on the ethnic sentiment and recommended the products of one’s own country (*Farmacijos žinios*, 1933, p. 72).

When reviewing the advertising of this period, it seems that advertisers and publishers did not aspire to include as much information as possible in the advertisements: only rare advertisements featured phrases praising the company, and most of them would only tell the names of drugs, traded by the particular company. Today, the advertising of that period is an interesting source of information, supplying us with information about drug manufacturers, business conditions, etc.

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Riding toward the Civil Society: Bicycle in Nineteenth-Century Estonia

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Abstract: *The diffusion of the predecessor of the modern bicycle, the velocipede, started in Europe at the end of the 1860s. Around this time the velocipede also arrived in the area populated by Estonians, at the same time as in the neighboring Finland. The popularity of the bicycle started to grow in the 1880s, when the Baltic Germans first started to found bicycle clubs. In Estonia and northern Livonia, the Baltic Germans had the best possible means of acquiring a manufactured bicycle from abroad. However, this was not the only example of cycling culture in the governments of Livonia and Estonia; also the ordinary people had been interested in cycling since the 1880s. Estonians started to form their bicycle clubs in the 1890s, when the sales of bicycles were growing all over the world. Perhaps, the foundation of bicycle clubs can be partly explained also by the political situation in Estonia and Livonia and the national awakening of the Estonians. Similarly to other types of clubs, the bicycle clubs also offered people a chance to discuss social matters and politics. Thus, the civil society was partly built in bicycle clubs, too.*

Keywords: *bicycle, civil society, history of technology, technology diffusion*

Introduction

In contemporary Europe, there are many different cycling cultures. For example, in France and Italy, cycling is considered mostly a competitive sport. In Denmark and the Netherlands, bicycle is an everyday means of transport. Cycling, however, has not been in the focus of professional historians, and in many countries the history of cycling has not been rigorously studied. In Estonia, the most visible forms of cycling nowadays are racing and bicycle touring.

Therefore, books on the history of cycling, published in Estonia, deal mostly with racing (Kask, 1986; Ojamets, 2001; Piisang & Maidlo, 2001; Lääne, 2006).

Newspapers in the European countries and in Estonia sometimes publish popular articles discussing the history of the bicycle. In an article published in the Estonian daily newspaper *Postimees* in autumn 2010, the author claims that “the first bicycles arrived in Estonia probably already in the 1850s, but they did not attract any special attention” (Liloson, 2010). As the author does not tell more about the cyclists or their machines, some questions arise. When was the bicycle or its predecessor introduced in Estonia? Who where the early cyclists? And where did they get access to their machines? The object of this article is to study the introduction of the bicycle in Estonia and its diffusion among Estonians at the end of the 19th century. The use of bicycle among the Baltic Germans will be also studied. An interesting question is whether Estonian cycling history had some unique features compared with, for example, Finland. Even though Estonia and Finland share a lot of similarities in their history, there are perhaps more differences between them. Let us give an example. In 1809, Finland achieved the position of an autonomous Grand Duchy within the Russian Empire. The Grand Duchy, for instance, had had an autonomous acting government since the 1860s, while the Estonians did not have such national political system in the 19th century.

The source material used here are published sources dealing with cycling, such as the statutes of bicycle clubs. Some archive materials have been used as well. The parts of the governments of Livonia and Estonia that were populated by Estonians are mainly represented by Tartu and its surroundings. This area is probably exemplary since Tartu was the intellectual and spiritual centre of the governments of Livonia and Estonia. It is not obvious that the events and developments that took place in Tartu could have happened earlier or differently in other parts of northern Livonia and Estonia.

Dorpat wird immer mehr Weltstadt!

Since the Age of Enlightenment, there have been ideas of constructing a human-powered vehicle (Lessing, 2003; Kylliäinen, 2007a, pp. 7–10). This type of three- and four-wheeled machines were also built, but they remained expensive and clumsy. The first bicycle model which became internationally successful was developed in France during the 1860s. The French contemporaries called the machine *vélocipéde*. Its diffusion in Europe started after the *Exposition Universelle* of 1867 in Paris. Based on the examples seen at the exposition, velocipedes brought home by the visitors, and drawings published in journals, it was possible to construct a copy of the velocipede (Ekström, 2001, pp. 17–19; Green, 2003, pp. 13–14; Kielwein, 2005, p. 7; Lessing, 2006, p. 48). At the end of the year 1868, a small-scale commercial velocipede production was started in England and the Netherlands (Fuchs & Simons, 1977, pp. 19–21; Moed, 2008, pp. 213–215; Green, 2003, pp. 14–17). In 1869, the popularity of the new vehicle was at its highest (Besse & Henry, 2008), and production was started in Sweden and Bohemia (Ekström, 2001, pp. 17–19; Stenqvist, 2006, pp. 19–22; Králik & Vozniak, 1999, pp. 25–27). The velocipede was introduced also in Finland in April 1869 (Kylliäinen, 2008, pp. 29–32).

French velocipedes were ordered to Germany already during the Paris exhibition in 1867. Some of them were displayed in museums, newspapers wrote about them and published drawings describing them (Kielwein, 2005, p. 7; Lessing, 2008, p. 195). During the autumn 1868, a couple of entrepreneurs started to make velocipedes, and in spring 1869 some dozen of manufacturers marketed their products in newspapers. At least 37 German velocipede manufacturers are known from these years (Kielwein, 2006, pp. 2–4). At the end of 1869, some German velocipede makers announced that they had sold hundreds of velocipedes, and in some cases a remarkable share had been ordered from abroad (Kielwein, 2006, p. 5; Matthies, 1993, pp. 45–46).

The Baltic Germans had close relations with Germany, and some German velocipede makers advertised their machines in Baltic German newspapers. At the end of March 1869, Mr Perschmann from Brunswick informed the readers of the newspaper *Dörptsche Zeitung*, which was published in Tartu, of his selling durable and elegant two- and four-wheeled machines, which he had named, exceptionally, *velocimobilen* (*Velocimobilen mit 2 und 4 Rädern…*, 1869). Elegant were also the velocipedes that were offered for the people of Tartu by Mr Hugo Pietsch from Berlin. He thoroughly informed the public about the quality of his machines. Since 1867, the diameter of the front wheel had grown: that of Pietsch's machines was 40 inches. The whole front wheel was constructed of iron and it had rubber tires (*Aus dem Haupt Depot vom…*, 1869). In June 1869, yet another German velocipede manufacturer, Mr Hennings from Berlin, marketed his machines for the people of Tartu. His velocipedes were stable, comfortable, cheap – and elegant, of course (*Neue Erfindung*, 1869).

Before the inhabitants of Tartu made velocipede deals with the German makers, they were astonished by a "forever industrious and inventive citizen Borck" who had been riding his self-made velocipede at the beginning of May. He had probably built it according to the examples that had appeared in German newspapers. Editor of the *Dörptsche Zeitung* greeted the event with satisfaction: "*Dorpat wird immer mehr Weltstadt!*" (*Vom Dorpater Trödelmarkt*, 1869). In 1869, it seems to have been quite a common practice in different parts of Europe and Northern America that people built velocipedes by themselves after foreign examples (Ekström, 2001, pp. 16–21; Norcliffe, 2001, pp. 90–91; Kylliäinen, 2008, pp. 30–32). In Germany, for example, even booklets on the theme "how to build a velocipede" were published (Kielwein, 2008, p. 23).

Dorpater Velocipedisten-Club

At the beginning of the 1870s, the velocipede fever in Europe was settling. Because of the Franco-Prussian war, the development of the French velocipede industry had halted and the production of the velocipedes was continued in England. Before the war, the velocipede had already changed a lot because of many inventions: most importantly, the diameter of the front wheel had grown so that it was finally between 48 and 60 inches (Kylliäinen, 2007a, pp. 21–24). The end of the 1870s saw a new rise in the popularity of the bicycle. Also, in different parts of the Russian Empire the cyclists started to found clubs and societies. In Riga, a club had been founded already in 1876, and in St Petersburg cyclists formed a club in 1882 (Mähar, 1986, p. 7: Lääne, 2006, p. 10). In the Grand Duchy of Finland, cyclists founded an unofficial club in the capital, Helsinki, in the following year, and its rules were officially approved in 1887 (Kylliäinen, 2007b, p. 56).

During the 19th century, club activities following the German example had become part of the social life of the Baltic Germans (Jansen & Rosenberg, 2005, p. 375; Zetterberg, 2007, pp. 329–331; Woodworth, 2009, p. 103). The founding of different kind of clubs and societies had been especially active in Tartu (Jansen & Rosenberg, 2005, p. 375). In Germany, bicycle clubs were founded already in 1869, but since the late 1870s, more and more clubs became active (Hochmuth, 1991, pp. 45–46). The Baltic-German cyclists in Tartu formed their own club in 1888, when 21 gentlemen signed the statues of an association that became founded following the example of a club in Riga (von Kieseritzky, 1898, p. 1; Mainla, 2005, p. 570). Ten years later, the chronicle of the club informed the readers that there was a great interest in cycling in the town, and when the club, named *Dorpater Velocipedisten-Club*, assembled for the first training, the number of members was 34. For the training, the club had bought two bicycles from the bicycle maker Leutner in Riga. (von Kieseritzky, 1898, p. 1–4)

Dorpater Velocipedisten-Club organized its first competition in autumn 1889. The length of the race was 24 versts (25.6 km), and the cyclists were split into two classes: one class was formed of riders using high wheel bicycles, the other class raced on 'safeties'. The clear advantages of the safety, the new low bicycle model with chain gear and rubber tires, were evident in the first competition in Tartu, too. Because of the windy weather the winner of the safety class was six minutes faster than the winner of the high-wheeler class (von Kieseritzky, 1898, p. 5).

In 1890, the club changed its name for the first time, becoming now the *Dorpater Radfahrer-Verein* (von Kieseritzky, 1898, p. 6). During the first years of its existence, the activities of the club became established. The club offered its members guided training, organized competitions, and in 1893 built a velodrome for track racing. In connection with the races, a festive parade called *Corso* was held. Dozens of cyclists, whose vehicles were decorated with flowers, took part in the parade. The club also organized parties, balls, and humor nights for gentlemen. An impressive incident took place in 1892, when Grand Duke Vladimir Alexandrovich of Russia visited the town. In spite of the storm and pouring rain, 20 brave cyclists altogether rode four miles outside the town and saluted the Grand Duke with cheers (von Kieseritzky, 1898, pp. 6–14, 59).

Part of the activities of the club was maintaining communication with other bicycle clubs in the Baltic area. For example, in 1890 the cyclists of Tartu met the cyclists of Riga at a party held in Valga, located on the boundary of the areas populated by Estonians and Latvians. Three years later the Baltic cyclists were invited to meet in Viljandi, where cyclists from Estonian towns of Tallinn, Valga, Pärnu and southern Livonian towns of Riga, Valmiera (Wolmar) and Cēsis (Wenden) had also arrived (von Kieseritzky, 1898, pp. 7–8, 13). According to the extant correspondence of the cyclists' club of Pärnu, the Baltic German cycling clubs seem to have had regular and intensive contacts with each other (*Eingelaufene Papiere etc*., 1899).

The membership of the *Dorpater Radfahrer-Verein* grew steadily since its foundation. At the end of the first year of activity, there were 68 members, and by the next year the number of members had exceeded one hundred. At the end of the year 1895, the club had 230 members, and when the chronicle of the club was published in 1898, the final statistics from the end of the previous year showed that the number of members had been 287. During the years 1889–1897, altogether 531 persons had been members of the club. The club also kept statistics of the professions of the members. Among the members of the club, there were eight artists or architects, 17 noblemen, 20 professors or docents, 21 teachers, 44 doctors. Best represented were clerks (90), various entrepreneurs (88), civil and military authorities (75), and shopkeepers and merchants (68) (von Kieseritzky, 1899, p. 61).

In 1897, the population of Tartu was around 40,000 inhabitants (Berendsen & Maiste, 2005, p. 118). According to the statistics of the bicycle club founded by the Germans, about 0.7% of the population was members of the club. The first reliable record dealing with the number of cyclists in Tartu is from the years 1905–1906, when the police office in Tartu started the registration of bicycles and automobiles. At the end of the year 1906, there were altogether 515 bicycles and automobiles in the town. Among the general population, the share of bicycle and automobile owners was 1.2% (*Register of bicycles and automobiles,* 1905–1916). Compared to the city of Tampere in Finland, the proportion of cyclists to the general population in Tartu seems to have been nearly half of that in Tampere before the First World War (Mauranen, 2007, pp. 117–121). In spite of the limited number of cyclists, the police considered it necessary to set limitations to cycling. Already in 1890, driving or wheeling a bicycle on pavements became forbidden, and a year later the restriction involved also riding on streets and squares. Fortunately, the Chancellor of the University of Tartu gave permission to ride, in the mornings, in the surroundings of the cathedral ruins on Toomemägi hill (von Kieseritzky, 1898, pp. 4–8). Similar restrictions were introduced in other towns at the same time (*Orts-Statut über das Velocipedfahren auf den Straßen und öffentlichen Plätzen in der Stadt Pernau*, 1894).

In 1897, the proportion of German inhabitants of Tartu was around 16% (Berendsen & Maiste, 2005, p. 128). Not all members of the *Dorpater Radfahrer-Verein* were German, as there were, obviously, Estonian members. For example, probably not all shopkeepers, merchants and clerks in Tartu were Germans. The chronicle of the club sometimes mentions Estonian family names, especially in the record table of the club (von Kieseritzky, 1898, p. 62). The most successful of the Estonian club members in the field of racing was Carl Rüütel, son of a sausage maker, who competed also in Helsinki, Riga, Warsaw, St Petersburg and Moscow (Mähar, 1986, p. 9). When the cyclists' club in the capital of Finland, *Helsingfors Velocipedklubb*, had its tenth anniversary in 1897, Rüütel and two other cyclists were sent to Helsinki to take part in the international competition. This time, the Finnish cyclists triumphed over the famous Rüütel (Wilskman, 1907, p. 313; von Kieseritzky, 1898, p. 52). The following year, Rüütel had his revenge, when the Finnish cyclists visited Tartu (Wilskman, 1907, p. 316). The cyclists' clubs in Tartu and in Finland cooperated also in other ways. In 1897, the Finnish cyclists founded an association to promote cycling tours. The association sought contact persons from abroad. In Tartu, it had four members, among them apothecary von Kieseritzky, the secretary of the *Radfahrer-Verein* (*Kertomus Suomen Syklistiliiton toiminnasta 1899–1900*, p. 10; Wilskman, 1907, pp. 327–329).

Taara, Wambola, Kalev…

> *Once in autumn, when the soil was already wet, a man riding a miraculous machine appeared in the inn's courtyard. The front wheel was extremely high with fine wooden spokes, but the back wheel was much smaller. Above the machine, there was a seat resembling a saddle. The man sat in the saddle leaning on the handlebar, dabbling his feet, and the hem of his coat was flaring. There were other people in the inn, and the driver acted arrogantly – he was said to be the tailor of the village. When he left, everybody stood to see him and wonder his speed.* (Tuglas, 1940/1960, pp. 43–44, author's translation)

This is how Friedebert Tuglas (1886–1971), one of the most famous Estonian authors, has described the moment when he was a child and saw a bicycle in his home district near Tartu for the first time.

Tuglas's description of the peculiar vehicle dates to around the mid-1890s. The story contains some remarkable facts. First, the bicycle had been obviously self-made or constructed by a village smith, because bicycle factories had used steel spokes for over two decades. Second, the owner of the machine had been a tailor, presumably Estonian. Third, the tailor had arrived from somewhere and he continued his course; and probably he was not just riding for fun.

In Finland, Estonia's northern neighbor, bicycles and cycling became popular among the peasants and handicraftsmen in the 1880s. Thus, not all Finnish cyclists of that time were members of the Swedish-speaking upper class as is often thought. Some Finnish handicraftsmen in the towns even started to make bicycles for sale at the end of the decade (Kylliäinen, 2003, pp. 17–19; 2007b, pp. 68, 76–79). The episode witnessed by the young Friedebert Tuglas is an example of a similar situation in Estonia and Livonia, where the bicycle was also used by different social groups. The noblemen and German burghers were not the only cycling groups, but bicycle was also used by Estonians living in the rural areas.

For the bicycle race which was organized by the *Radfahrer-Verein* in Tartu in 1893, a special class for cyclists who had built their bicycles by themselves was formed. Six Estonians – mostly smiths and locksmiths living in the town's outskirts – participated in the competition. Three of them rode a high-wheel bicycle, while the other three had built a low machine after the model of the chain-driven low safeties. Three fastest riders, as well as the builder of the best machine, got prizes.

The first prize for the fastest ride went to smith Taavet Rähn, who also got the prize for the low bicycle that he had built (von Kieseritzky, 1898, p. 19; Mähar, 1986, p. 8). The organizing committee considered the self-made bicycles quite clumsy, but the following year some self-made bicycles were praised as elegant and light. In 1894, the competition for cyclists driving self-made bicycles brought together 12 contestants (von Kieseritzky, 1898, p. 24).

The bicycle clubs founded by the Baltic Germans were located in towns, and only people living in those towns were allowed to become club members. It is told that the first bicycle club in the countryside was founded because some Estonians living in the country had tried to join the *Radfahrer-Verein* in Tartu (Lääne, 2006, p. 11). Even though the Baltic-German bicycle club in Tartu has been considered to represent more nationalities than the corresponding club in Tallinn (Mähar, 1986, p. 8), the country men were sent back home without membership cards. Annoyed by this, they decided to found their own club in autumn 1896. In the founding meeting, there were 22 cycling enthusiasts present to lay down the statutes of the club (Lääne, 2006, p. 11). The club was called *Saadjärwe Jalgratta sõitjate selts* and its statutes were ratified by the governor's office at the end of the same year. According to the statutes, the object of the club was to act as a link between cyclists and promote bicycle as a meaningful and fast vehicle. The club planned also to organize meetings, bicycle tours and competitions (*Põhjuskiri Saadjärwe Jalgratta sõitjate seltsile*, 1897, p. 3). The following summer, in 1897, the club built a cycling track from soil, clay and gravel. In Estonia, track racing was the most popular form of bicycle sports in the 1890s (Lääne, 2006, pp. 10–12).

During the latter half of the 19th century, at the surge of national awakening in Estonia, the Estonians started to found their own societies and clubs after the example of the Baltic Germans (Zetterberg, 2007, pp. 428–432). The founding of the societies was active in Tartu and in its surroundings (Jansen & Rosenberg, 2005, p. 375). Thus, in addition to the club of Saadjärve, another cyclists' club was founded in Krüüdneri in southern Estonia. It was called *Kiirus*, 'Speed' in English. In Krüüdneri, even the local Baltic-German baron was so excited of the idea that he gave the society land to build a race track (Mainla, 2005, p. 570; Lääne, 2006, p. 12). Clubs were founded in other parts of Estonia and Livonia as well: the statutes of the Estonian bicycle club of Tartu, *Taara*, were passed in 1898, Narva got its own Estonian bicycle club in 1899 and Pärnu's club *Wambola* was founded in 1900 (*Jurjewi jalgratta sõitjate seltsi "Taara" põhjuskiri*, 1899; *Narwa Eesti jalgratta seltsi põhjuskiri*, 1900; *Pärnu Eesti jalgratta-söitjate Seltsi "Wambola" põhjuskiri*, 1901; Mainla, 2005, p. 570). In Tallinn, the statutes of the Estonian bicycle club *Kalev* were passed in 1901 (Piisang & Maidlo, 2001, p. 25). Among the organizers of the clubs were, for example, a teacher, a shopkeeper, a miller, a tailor, a gardener and a brewer, all of who represented quite common trades of craftsmen and lower civil servants (Mähar, 1986, p. 9; Lääne, 2006, pp. 11–12).

The founding of the Estonian bicycle clubs coincided with the rapid increase in the popularity of cycling all over the world (Kuva, 1988, p. 26–28; Matthies, 1993, pp. 86–101; Burr, 2006, pp. 124–128), but, perhaps, it can be explained also by the political situation in Estonia and Livonia. Since the 1880s, the object of the government of the Russian Empire had been the unification of the empire, involving language, administration, laws and education. In Estonia and Livonia, many administrative reforms were carried out: for example, German was replaced by Russian as administrative language, and at the end of the 1880s, Russian became the language of education (Zetterberg, 2007, pp. 450–453). The bicycle club of the Baltic Germans in Tartu, *Dorpater Radfahrer-Verein*, had to change its name to *Jurjewer Radfahrer-Verein*, according to the Russian name of the town, Yuriev (von Kieseritzky, 1898, p. 13). The rules of the Estonian bicycle clubs were printed in three languages: the official version in Russian, and the German and Estonian versions were translations (*Põhjuskiri Saadjärwe Jalgratta sõitjate seltsile*, 1897; *Jurjewi jalgratta sõitjate seltsi "Taara" põhjuskiri*, 1899; *Narwa Eesti jalgratta seltsi põhjuskiri*, 1900; *Pärnu Eesti jalgratta-söitjate Seltsi "Wambola" põhjuskiri*, 1901).

The aspirations of the government of the Russian Empire, however, did not succeed particularly well, but they rather accelerated the process of national awakening of the Estonians (Zetterberg, 2007, pp. 457–458). This was the time when many choirs, brass bands, volunteer fire brigades, temperance leagues and other societies were founded (Zetterberg, 2007, pp. 428–432). In different kind of clubs, Estonians could work together for a common purpose independent of their education or wealth. They also became experienced in transacting with different officials (Woodworth, 2009, pp. 114–116). At the meetings of the bicycle clubs, the members did not content themselves with discussions dealing with cycling, but the conversations in the clubs also built the civil society: at least in the clubs *Taara* in Tartu and *Kalev* in Tallinn, the members discussed Estonian culture and social matters (Tuglas, 1940/1960, pp. 116–122; Mähar, 1986, p. 9; Piisang & Maidlo, 2001, pp. 24–25). It has been said that the weekly lectures held in *Taara* dealt with all kinds of social, cultural and political questions, but not cycling at all (Rei, 1961/2010, p. 25). Among the members of *Taara*, there were students, and the later leading politician, social democrat Mihkel Martna participated in its activities. Jaan Tõnisson, the leader of the democratic movement in Estonia, was also influential in *Taara* (Rei, 1961/2010, pp. 26–27; Lääne, 2006, pp. 12–13; Zetterberg, 2007, pp. 439–494; Tuomioja, 2010, p. 54). In fact, discussions about politics were actually possible according to the rules: the club statutes of *Taara*, accepted by General Panteleev, stated that the club organized various meetings and occasions (*Jurjewi jalgratta sõitjate seltsi "Taara" põhjuskiri*, 1899, pp. 14–15). Among the members of *Kalev*, there were many teachers, lawyers, journalists and authors, such as one of the most recognized Estonian authors, Eduard Vilde, who worked in the editorial staff of the reformative newspaper *Teataja* (Piisang & Maidlo, 2001, p. 22; Zetterberg, 2007, p. 461).

Conclusions and comparisons

The introduction of the bicycle in Estonia is greatly similar to the history of cycling in Finland and other European countries. The velocipede was introduced in the governments of Livonia and Estonia at the same time as in Finland, in spring 1869. This marked the first wide-scale cycling fever in Europe, which, however, remained quite short-lived and had settled by the beginning of the 1870s. Cycling became more common in Estonia during the 1880s. In Estonia, the Baltic German cyclists started to found clubs that organized various activities, such as competitions, tours and parties. The founding of the clubs started at the same time as in Estonia's northern neighbor, Finland, in the 1880s (Kylliäinen, 2007b, pp. 56–59).

The first bicycle clubs in Estonia and northern Livonia were founded by the Baltic Germans. The most outstanding cyclists of the 1880s, both in Estonia and Finland, came from a language minority, which nevertheless was influential both politically and economically. In Finland, the image of the late nineteenth-century Finnish cyclist was a student from a wealthy Swedish-speaking family. In Estonia and northern Livonia, the Baltic Germans had the best possibilities to buy a factory-made bicycle from abroad. However, this was not the only example of cycling culture in either of the countries, since the ordinary people had also been interested in cycling since the 1880s. In Finland and Estonia, many peasants and handicraftsman built a bicycle for themselves (Kylliäinen, 2007b, pp. 76–87; Männistö, 2008a, pp. 18–20; 2008b, pp. 19–20).

There are also differences in the cycling tradition of the neighboring countries, Finland and Estonia. In Finland, Finnish- and Swedish-speaking cyclists were members of the same bicycle clubs regardless of language disputes (*Kertomus Suomen Syklistiliiton toiminnasta*, 1900). There were Estonian members, some highly successful in racing, in Baltic German bicycle clubs. The founding of the Estonian bicycle clubs in the 1890s was affected by the national awakening of the Estonians. If there is some special detail characteristic of the Estonian bicycle history, it is the fact that the activities of the bicycle clubs were also political and the Estonian civil society was constructed also in bicycle clubs. It is told that when the bicycle club *Kalev* was founded in Tallinn, cycling was a considered a good basis for founding a club as Russian authorities viewed it as harmless. The club offered a chance to come together and freely discuss social matters and politics. One founding member of *Kalev* is especially well known, although not for his credits as a cyclist, but for other merits (Piisang & Maidlo, 2001, pp. 20–25). He was Konstantin Päts (1874–1956), the first President of the Republic of Estonia.

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Overview of the Early Development of the Lexicography of the Three Baltic Nations (from 17th to 19th century)

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Abstract: *The three Baltic nations (as a geographical and political concept) and languages share many similarities and as many differences. So far no serious comparison of the lexicography of the three languages has been carried out. This paper looks mostly at key general tendencies and key lexicographical works. These show that the bilingual/multilingual beginnings of the 17th century set a tradition for the following two centuries. Also the role of German pastors and the non-native target audience of the dictionaries was retained for the same period. The dictionaries grew in scope and precision. In all Baltic nations the living vernacular language really appeared in dictionaries only in the second half of the 19th century when after the National Awakening dictionaries were made mostly by native philologists. Encyclopedias (Konversationlexikonen), foreign word dictionaries appeared around the turn of the 19th and 20th century. This prepared the ground for the iconic national works which were developed in the early 20th century during the independence period. Yet the bilingual dictionaries of various type have dominated the scene and for the Baltic nations the term 'dictionary' was and is mostly associated with a bilingual one.*

Keywords: *bilingual lexicography, German language, Estonian language, Latin, Latvian language, Lithuanian language, multilingual dictionaries, Polish language*

Introduction

The three Baltic nations (as a geographical and political concept) and languages share many similarities and as many differences. All started with multilingual dictionaries at approximately the same time. The similarities include kindred languages for Latvian and Lithuanian, similar early history for Latvia and Estonia, as both have been under the German and Lutheran dominance while Lithuanian had a Polish-bound Catholic history. Yet also part of Lithuanian-populated territory (Lithuania Minor/Eastern Prussia) was under the German dominance and much of the early Lithuanian dictionary work took place there. Eastern part of Latvia shared Catholic and political affiliation with Lithuania and in the 19th century suffered under similar Russification policies when in the rest of Latvia and Estonia there was a fast surge of economy, education, literacy and nationalism. It should be pointed out that the local people were mostly illiterate until the 19th century. Since the beginning of the 20th century the three nations had a similar history and very similar lexicographical progress. Baltic lexicography shows numerous parallel and amazingly similar processes. Partly this can be explained by coordinated activities of the Churches, partly by well-connected German elites. Finally, the role of the University of Tartu as a centre of the new native intellectual learning (mainly for Latvia and Estonia) should be emphasized. The similarities and parallel processes testify to the common space of knowledge (*Wissensraum*), the concurrent spread of lexicographical memes.

Baltic lexicography so far has been viewed mainly within the confines of each language and nation (Zemzare, 1961; Balode, 2002; Jansone, 2003; Jakaitienė, 2005; Erelt, 2007; Melnikienė, 2009), thus its description lacks a broader regional and European dimension (Simpson, 2004; Consadine, 2008; Cormier, 2010) which lexicography itself does possess. This paper looks mostly at key general tendencies and key lexicographical works. There are numerous others that cannot be mentioned for lack of time and space. There are also valuable dictionary manuscripts in all languages that are important for linguistic studies of the period. Much deeper insights into the collaborative processes should be attempted by a detailed study of lexicographers' links, for example, Mancelius' professorship in Tartu, Valdemārs' involvement with publishing of Wiedemann's dictionary, etc.

Background

The first dictionaries were preceded by the early written monuments which came into being as a result of Reformation ideas that the Word of God should be preached in a language that is understandable or communication with God could proceed individually via the written word and naturally in a language closer to the human. Counter-reformation and Catholic backlash also seems to have helped, as a situation of competition between the churches (Tāgepera, 2010, p. 7) via the texts in native language contributed to more translation and writing. Serious religious literature calls for a broader choice of vocabulary, abstract notions, certain curtailment of dialects and varieties, normativization of the languages which are precursors of literary language. This contributed to the development of writing in the Baltic languages, formation of grammars and dictionaries. A parallel technological process that assisted dissemination of writing was the establishment of print shops in the Baltic area. After the initial attempts, first to be printed were catechisms, followed by the New Testament and finally the Bible in the 18th century. Latvia was an exception where the latter was done faster (1689). Dictionaries or dictionaries together with grammars tended to appear before the full Bible translation, in a way paving the way for the latter.

17th century

The 17th century, after the turmoil of war ceased in 1629, was a stabilizing one in the former territories of Livonia (Latvia and Estonia). They were under the Swedish crown which introduced an orderly management, promoted education in the local languages.

Latvian lexicography

It is usual to date Latvian lexicography from 1638 when the first dictionary, preceding Grammar (1644), was published (Mancelius, 1638). Most of the territory was under the Swedish crown (Latgale was under Poland) and the conditions were favorable for spiritual and cultural development. Latvians at that time were the peasant nation and the official cultural sphere was fully in the hands of non-Latvian governors, German clergy and landowners. This had lasted for about 400 years since the territory came under the German crusaders and bishops. The dominant powers had changed (and will change) from time to time – Danes, Poles, Swedes, Russians came and went, hardly affecting the Latvian language scene as their sole interest was the territory and, to some extent, the nobility. The German nobility, however, retained its positions until the end of the 19th century. It was to develop the link between the church and the peasant nation, between the German-speaking clergy and Latvian-speaking people that the first dictionaries were actually created. The quality of Latvian used by the German clergy in the beginning was not high: Mancelius, the author of the first dictionary, writes in his handbook on biblical plots *Lettisch Vade mecum* (Mancelius, 1631) that after a sermon a Latvian commented, "Who knows what that German cat is saying" (a word-play on *kaķis* [cat] and *katķisms* [catechism]). One can see elements of colonial or missionary language field work in the early dictionaries and grammars.

The first dictionary was a German-Latvian book (Mancelius, 1638) containing about 7,000 words; often several Latvian synonyms are provided to the German word. Naturally, Gothic script was used, yet Mancelius can be credited with developing a relatively reasonable and consistent spelling system. A slash was used to separate words of both languages as well as synonyms. The second part is a thematic lexicon containing about 4,000 somewhat random items about 51 topics called *Phraseologia Lettica* (Mancelius, 1638). Though this part seems to be hastily put together, many of these words and expressions are not in the first part. A later edition of 1685 had another addition of 10 parallel conversation pattern chapters. This division of the macrostructure is to be noted as it tended to repeat in some other later dictionaries.

The other two Latvian dictionaries of the 17th century were of less importance – multilingual Polish–Latin–Latvian (Elger, 1683) published in Vilnius, and a small 1,000-word German–Latin–Polish–Latvian (supposedly Dressel, 1688). Elger was also a translator of Latin hymns and German songs and his dictionary is worth noting mainly because it creates an early link between Latvian and Lithuanian lexicography – it is in fact based on Sirvydas' third edition (1642) supplemented by the Latvian part – and with its 14,000 entries is much larger than *Lettus*. This does not seem to be a case of early plagiarism (or copying [Cormier, 2010, p. 133] or piracy, which was rife until the 20th century [Landau, 2001, p. 43]), but most likely a concerted attempt by the Catholic Church or Polish rulers to spread their influence. Published in Vilnius and representative of the Eastern (Polish-dominated) variety of Latvian, it introduced the Latin script into Latvian, but had many mistakes, including those copied from Mancelius. This dictionary, however, did not contribute to further development of Latvian lexicography as it would be German dominated. It is difficult to pass criticism on these first lexicographic attempts. There are many obvious mistakes, and there is clearly a strong German interference in the description of Latvian lexis, both on the lexical and grammatical levels. Trying to figure out the complexities of Latvian patterns and dialects was certainly not an easy task and it can be supposed that the first compilers did as much as one could reasonably expect.

Estonian

The historical and linguistic backdrop is very similar to Latvian. The end of the 16th century saw prominence of Tartu as a centre of Jesuit and counter-Reformation learning and translation, which established South Estonian as the language of early religious writings in Estonia. The early written texts, like in Latvian case, differed from the spoken language, as they dealt with new and specific topics and were written by non-Estonians. Schools and also publishing in Estonian grew, as well as literacy.

The first dictionary in Estonian is within the first grammar book *Anführung zu der Estnischen Sprach* by Heinrich Stahl (1637) – about a hundred pages of German–Estonian dictionary containing 2,300 German words and 2,200 Estonian words. This set a tradition of adding vocabulary lists to grammars. The book is written in German orthography and reflects North Estonian language. Stahl, to a large extent, codified North Estonian literary language for his followers in a rather Germanic and rigorous Latin tradition. Johannes Gutslaff (1648) produced a similar work in Latin for South Estonian with about 1,700 German(–Latin)–Estonian correspondences.

This was followed by a more substantial Göseken's (1660) book on North Estonian – with an appendix '*Farrago Vocabulorum Germanico-Oesthonicum*' – 400 pages of German–Estonian dictionary containing about 9,000 words. The aim was to improve Stahl's book which was criticized for not being a quality work. Apart from the above publications, some glossary manuscripts were also in use and circulated.

Lithuanian

Lithuanian early history differs from that of Latvian and Estonian. Most of its territory never came under a German dominance, but after early (12th- and 14th/15th-century) adoption of Christianity it was in a powerful union with Poland until the end of the 18th century when it was absorbed by Russia. Hence there was a Lithuanian elite and clergy which, however, tended to become Polonized. Similarly to Latvian, the early dictionaries were compiled for the practical needs of the German protestant pastors in Lithuania Minor (East Prussia) so as to be able to communicate with the Lithuanian peasant population of the region. The first Lithuanian grammar, *Grammatica Litvanica*, was published in Latin in 1653 by Daniele Klein. His dictionary manuscript was not, however, published and is lost. Some other German–Lithuanian dictionary manuscripts were compiled, but remained unpublished.

In Lithuania proper dictionaries were needed for the Catholic priests working in Jesuit schools and not knowing the Lithuanian language. Yet these would be compiled by native Lithuanians, so they would have a better grasp of the language. Thus 1620 saw the first edition of Polish–Latin–Lithuanian *Dictionarium Trium Linguarum* by Sirvydas (1642). A single copy has survived with the initial pages missing, which is why the year of the first publication is doubted. The first edition has more than 8,000 entries, with about 6,000 Lithuanian words, based on N. Volkmar's *Dictionarium linguarum quatuor, latinae, germanicae, polonicae et graecae* (1613). The compiler supplied Lithuanian part also by coined neologisms for the missing items. The second edition (1631) was thoroughly reworked, based on Knapski/Cnapius' *Thesaurus Polono–Latino–Graecus* (1621), but has not survived. The third edition (Sirvydas, 1642), based on the same, published after Sirvydas' death reached 14,000 entries (10,000 Lithuanian words), about one-fifth of the items of the first edition have been removed. The dictionary saw two more editions (1677 and 1713), and its material was much copied in later lexicographical works. It also served as a prototype for Elger's (1683) Latvian dictionary.

18th century

Latvian

In the 18th century Latvia was ravaged by the Great Northern War, plague and changing masters, the territory was frequently split and the atmosphere was not conducive to writing and educational issues. The status of peasants grew even more miserable. Pietism (Moravian movement) in Latvia and Estonia with its home-education drive might have contributed to some increase in literacy as it again clashed with its competitor – the official church (another controversy that was beneficial). It also lead to a manuscript culture (Apīnis, 1987). Small print shops were established.

18th-century Latvian dictionaries (including several unpublished manuscripts) were also made by non-Latvians; they gradually improved in scope and depth. 1705 saw a new edition of Dressel's dictionary with some corrections (Latin substituted by Swedish, etc.), possibly done by Depkin. Elvers' (1748) German–Latvian dictionary contained about 8,000 words, partly replicating Mancelius.

Lange's (1777) dictionary, written about 20 years earlier (the first part published in 1773), had already 15,000 entries in its German–Latvian part and 10,000 entries in the reverse part, also providing information on regional use, borrowings, biblical words and toponyms. The dictionary is strictly alphabetic. Lange did some cleansing of mistaken forms and Germanisms that had accumulated in the previous dictionaries and manuscripts. This is emphasized in the preface. The dictionary has a grammatical marking system, and words from religious texts, not heard in the vernacular, are marked as biblical words and phrases. This dictionary showed many previously unrecorded vernacular words, the existence of which was unnecessarily doubted by Stender.

However the centre-piece of the century is Stender and his dictionary. Stender was a rationalist, enlightener and educator as well as the greatest authority of the time on issues of the Latvian language. Apart from the dictionary (which was an authoritative one for almost a hundred years), Stender was the author of numerous translations, localizations and original writings (altogether about 30). Thus his activities can be viewed as symbiotic – translating enlightening information with didactic goals and in parallel expanding the Latvian lexis.

Stender's first Latvian–German dictionary (Stender, 1761) was a trial attempt for his notable dictionary later. It was an appendix to his grammar. The dictionary had about 4,000 words. Within the general list of words there are also (proper) first names. Latin script is used for Latvian words for the first time in the Germanic tradition (it might have been a deliberate choice, or a way of better visual separating of the language texts as Latin script was often used for Latin texts in German books). Yet this choice was retained in the big dictionary. The dictionary also contained 137 Latvian proverbs and sayings, part of them from previous dictionaries.

The notable *Lettisches Lexicon* (1789) had 1,178 pages, and 7,000 words in the Latvian–German, 14,000 in the German–Latvian part. Stender retained Latin script for Latvian, established the principle of nesting, highlighting the idioms and derivatives. The lexis is exemplified, often by full sentences, rich phraseological and idiom material is on hand. The German–Latvian part provides numerous Latvian synonyms for the German entry. The nesting principle is very broad, thus under German 'horse' Latvian phrases and words also notionally connected with horses can be found. German phraseology and proverbs sometimes have well chosen Latvian analogues, sometimes (perhaps, translated by Stender himself), calques. For German words, mostly internationalisms having no Latvian equivalents, Stender provides extended definition-like Latvian counterparts. The dictionary also pursued the tradition of appendices in both parts, containing toponyms, personal names, names of birds, fishes, insects, plants, trees, fungi (perhaps reflecting Stender's amazement at the huge Latvian lexicon of nature). When making use of previous dictionaries Stender prudently marks those items unknown to him with the initials of the previous lexicographers. This dictionary was extensively used in the 19th century and its material consequently entered the following big ones.

The dictionaries, however, often retained also the mistaken stock of the previous works. One can trace many German elements in Latvian grammar, collocation patterns and phrases, not characteristic of Latvian – and that apart from the undeniable German influence that must have already existed in the language (Zemzare, 1961). Lexicography thus followed the general development of Old Written Latvian, which, though lacking a strong normative code had emerged as a unified language with norms different from those of colloquial speech (Rūķe-Draviņa, 1977, p. 30). Generally, Latvian dictionaries from the beginning tended to be separate linguistic products, usually not published together with grammars.

Estonian

The Great Northern War and takeover by Russia in 1721 interrupted many Estonian-language projects – for example, full Bible translation was delayed until 1739. The Estonian Bible translator, grammarian and lexicographer Anton Thor Helle played a decisive role in working out and enriching Estonian. A grammar and dictionary had to be accomplished before the Bible. *Kurzgefaßte Anweisung zur Ehstnischen Sprache (1732)* was a collective work, edited by Thor Helle according to his normative principles, proceeding from the aim of translating the Bible. It had a 5,500 word Estonian–German word list (based on several unpublished manuscripts, e.g., that of Vestring's [c.1720s–1730s] and the new collection) as well as many appendices – 16 lists with German (sometimes Latin and Russian) correspondences and clarifications. It also carried Estonian proverbs and riddles with German counterparts. At the end of the book there are 10 dialogs trying to describe peculiarities of Estonian spoken language (similar to Mancelius – *author's note*).

Wilhelm August Hupel's book (Hupel, 1780) on both Estonian dialects contained in its dictionary section an Estonian–German (192 pages) and German–Estonian (216 pages) dictionaries amounting to 17,000 words with an appendix on South Estonian. The second edition, already in the 19th century (1818, published in Mitau/Jelgava), increased the word-stock to 21,000 words. As can be noted, the early Estonian dictionaries tended to be published more as part of Estonian language descriptions or grammars.

Lithuanian

Lithuanian–Polish Union in the 18th century was gradually falling apart, the central government losing its power. Only Sirvydas' fifth edition (Sirvydas, 1713) was republished in Lithuania proper. Most of Lithuanian language description was done in Prussia. Around this time native Germans started to dominate in the Lithuanian language study. The Bible was finally published in 1735.

Haack's *Vocabularium Lithuanico-Germanicum et Germanico-Lithuanicum* (Haack, 1730) is shorter in comparison with Sirvydas, though it boasted having all words of the Bible which explains its aim – it was meant for Halle seminary students and contained about 5,000 words.

Ruhig's dictionary (1747), published in Königsberg, was a more systematic book and in addition to religious terms had many vernacular words. It is symptomatic that the Lithuanian–German part had 192 pages (around 5,700 words) while the German–Lithuanian part covered 424 pages (around 20,000 words). This tendency – that foreign language–Lithuanian part is always larger than the other language direction – did not change for a long time. Based on Sirvydas and Haack and being well supplemented, it had many synonyms in the German–Lithuanian part, and derivatives were nested with the root word. The author tried discerning loans, for example, pointing out that Slavicisms were not Lithuanian words

The latter was further improved by Mielcke's (1800) *Littauisch-Deutsches und Deutsch-Littauisches Wörterbuch* which expanded the wordstock, including new words from various manuscripts, 300 proverbs (not all of Lithuanian origin) and materials from Donelaitis' *Metai* (The Seasons).

19th century

The 19th century for the Baltic nations is the time of emancipation, modernization and awakening. The Latvian national awakening was fast and radical in all aspects, the Estonian one was more gradual (language issues became more important towards the very end of the century), while Lithuanian developments were largely delayed until the beginning of the 20th century. The general thrust is to turn the local languages from spoken peasant idiom into a language of culture, with a developed writing system, literary language and literature going hand in hand with Western trends.

Latvian

After an early abolishing of serfdom, peasants in Estonia and Latvia were given surnames, were allowed to own property and migrate. From the forties the school system comprised most of the population. There was a fast growth in literacy, reading habits turned from intensive (a couple of religious texts at home [Apīnis, 1977, p. 77]) to extensive (various texts of secular character). The German elite established cultural societies with a task of looking into Latvian (1817, 1824).

In the first half of the 19th century the first Latvian–German dictionary aimed at Latvians by A. J. Stender (1820) (the son of G. Fr. Stender) appears, reflecting the developing opinion of the German elite that the local population perhaps should not be ignored, but instead educated and Germanized. The relatively small 3,000 word dictionary is mostly based on the dictionary by Stender senior, with small deviations.

There is also a novel and interesting book of supplements and amendments to G. Fr. Stender's dictionary (Wellig, 1828), which apart from the above provides suggestions to future lexicographers. These advise against indiscriminate copying of previous materials without checking them. There is also a call to involve larger numbers of people in collection work. The book was intensively used by later dictionary compilers.

Finally, there is a multilingual dictionary (Kurmin, 1858) that after almost two centuries represents the Latgallian variant again. The dictionary is based on Elger's and Sirvydas' fifth edition (Sirvydas, 1713), contains about 13,000 entries. Its task was to ease learning of Latvian for the Catholic priests. The author used Polish orthography; however, the dictionary has many mistakes and imprecisions.

The situation changed in the middle of the 19th century when the so-called Latvian national awakening started, lead by Neo-Latvians (nationally aware Latvians who refused to be Germanized, as former well-to-do and educated people tended to do). National literature and writing quickly passed from the German pastors into the hands of Latvians: for example, the percentage of works in Latvian authored by native Latvians rose from 3% in 1844 to 51% in 1869 (in just 25 years!) (Schmidt, 1992, p. 89). The same occurred in publishing houses and editorships – they passed into the hands of Latvians (Karulis, 1967, p. 85). Book publishing doubled every 10–15 years (Apīnis, 1977, p. 330). Latgale being territorially part of Russia proper, however, was subject to the same language restrictions as Lithuania in the second half of the century which delayed its development. Latvian nationalism in its struggle against German domination sought support from Russia and for a time succeeded. Yet in the last decades Russification policies (administration, schooling and religion) thwarted this trend. But the Latvian–Russian closer contact spilled over also into lexicography.

Most dictionaries of the second half of the 19th century were produced by the Latvian speakers and accordingly tended to reflect the spoken vernacular more. Valdemārs' Russian–Latvian–German dictionary (Valdemārs, 1872) was innovative in many ways. The concept was based on a Russian–Swedish–Finnish dictionary of 1851. Russian was selected from four to five Russian dictionaries. It was a practical dictionary aimed at Latvians learning Russian and Russians learning Latvian. His dictionary had a team of compilers who introduced much of the folk element, coined new words, as well as introduced many borrowings (preferring Greek and Latin) not only for new notions but also to substitute many German loans. German was used mainly to explain these Latvian neologisms. Three fonts were used – Cyrillic for Russian, Latin italics for Latvian and Gothic script for German. In the second edition (Valdemārs, 1890), the German part was dropped as many neologisms had taken root, some borrowings were removed as dictionaries of foreign words had appeared. This dictionary had several editions. In 1879, a reversed dictionary – Latvian–Russian–German (*Lettisch*, 1879) was produced with 13,000 Latvian entries, again improving and modernizing the language material.

The last serious work of Old Latvian tradition – Ulmann's *Lettisches Wörterbuch* (1872) (Latvian–German, with 20,000 words), was aimed mostly at German readers and had so far the most exhaustive number of entries in Latvian. It used Latin script for Latvian, was historical, contained no invented items, had few internationalisms, included many dialect words, with some etymological elements, phrasal examples, avoided some Germanisms (the letters 'f', 'h'), included the most widespread neologisms (supplied by Kronvalds), and all in all was a descriptive and traditional dictionary (though several Latvians were among its compilers, such as Neikens). In a way it crowned the German contribution and was its last major work, yet it served as a basis of the large iconic dictionary of Latvian in the 20th century. Published in the same year as Valdemārs', it was a competing, more academic, product. The national, social and professional strife between the German and Latvian editors and their dictionaries generally was beneficial, bringing together the Old Latvian and New Latvian and improving the end products.

The reverse German–Latvian dictionary started by Ulmann and others was finished by Brasche (Ulmann & Brasche, 1880). It contained 35,000 words and has a somewhat uncoordinated wealth of general words, dialect words (especially of Kurland), borrowings, archaisms. Brasche had some years before published a smaller dictionary, generally considered to be old-fashioned.

Other types of dictionaries started to appear, testifying to the growth of language contacts. The development of the national language, together with the spread of newspapers and international contacts created a need for books of foreign words (Mekons, 1878 [2,000 entries]; Dravnieks, 1886 [5,000 entries]). The opening of the wider world and the wish to demonstrate the national intellectual and linguistic potential of Latvia, as well as the Russification of schools, spelled a need for encyclopedias. Encyclopedias (according to the German pattern called *Konversationlexikon*) became popular at the end of the 19th century, e.g. Dravnieks' *Konversācijas vārdnīca* (1891–1898; unfinished, until letter 'K'), was patterned on Meyer's *Hand-Lexicon des allgemeinen Wissens* (Kleine Meyer), some entries were just translated, and another (*Konversācijas*, 1906–1921) both in the Gothic script. This culminated in the monumental *Latviešu Konversācijas vārdnīca* in 21 volumes in the 20th century. In all of these, despite the political anti-German drive, one can see the influence and pattern of German lexicographic ideas of the time, namely Brockhaus' dictionaries with their strong emphasis on personalities (differing from *Encyclopedia Britannica* with its more subject-oriented approach).

Valdemārs (1881) also produced also a multilingual pocket marine dictionary in Russian, English, French, German, Italian, Danish, Norwegian, Swedish, Latvian, with Dutch and Spanish supplements, based on one of the existing books, where his contribution was Russian and Latvian.

Estonian

The economic and political background was similar to Latvia. There was a rapid growth in population and literacy – reading skill reached 80% in the 1850s. The University of Dorpat (Tartu) was reopened in 1802 and in the middle of the century became a focal point of Estonian and Latvian nationalism. It became clear that the spelling system should be changed and Finnish served as an example. The national awakening in Estonia proceeded along similar lines as in Latvia, with a step behind (Hroch, 1985, p. 29); it was also less radical. Thus it spilled over into language reforms ideas (Aavik) only in the beginning of the 20th century. Tsarist Russification attempts hit the awakening radicals who, similarly to Latvians, had sought Russian support against Germans. At the end of the century, literacy rate was approaching 100%. A standard national language was being molded from a church language and peasant parlance with a consensus that there should be one written language and end of the century saw consolidation of the new spelling. Accordingly, in the 20th century Estonian lexicography paid much attention to language norms and orthography.

Ferdinand Johann Wiedemann, though of German-Swedish origins from Haapsalu, falls in line with Valdemārs and Juška as a representative of the native lexicographers in the Baltic. He had a broad outlook, was an outstanding expert of Finno-Ugric linguistics, member of Russian Academy of Sciences, author of Estonian grammar (1871). His comprehensive and descriptive Estonian–German dictionary (Wiedemann, 1869), covering all varieties of Estonian, amounted to 50,000 words. The vast scope of this dictionary lead to the absorption of South Estonian lexis in contemporary literary language. Unclear (spelling of) words are marked with a cross, neologisms with an asterisk. German equivalents are italicized and typographically the dictionary is clear and pleasant. The dictionary was very bulky, academic and not user-friendly, the spelling system, mostly vowels, is most complicated from the modern point of view, which makes finding the words an orthographic nightmare. The second supplemented edition (Wiedemann, 1893), edited by Jakob Hurt, increased the number of entries to 60,000. Besides the comprehensive projects by Wiedemann, also some insignificant attempts were made to publish popular Estonian–German dictionaries (Körber, 1866).

The end of the century, because of the Russification policies lead to several Estonian–Russian and Russian–Estonian dictionaries being published: a Russian–Estonian dictionary (Johanson-Pärna, 1885) had 16,000 words, was popular and had five editions before 1917, other Russian–Estonian dictionaries followed (Kõrv, 1889–1896; Jaanus, 1893). An Estonian–Russian dictionary (Salem, 1890), based on Wiedemann, had 25,000 words; the Estonian–German tradition was pursued by Nebokat (1887–1889) in a more user-friendly edition (see Vihma, 1996). A German–Estonian dictionary (Ploompuu & Kann, 1902) had 35,000 entries. Smaller specialized dictionaries also appeared, such as a dictionary of 1600 new and foreign words collected and with equivalents in Estonian explained (Grenzstein, 1884). Also, a German–Latvian–Russian-Estonian thematic dictionary (*Systematisches*, 1885) can be mentioned. Estonian encyclopedias, though, had to wait until the 20th century.

Lithuanian

From the beginning of the 19th century, Lithuania proper was split and divided administratively within the Russian Empire. Russians gradually suppressed the Vilnius University as a centre of Lithuanian education, started a Russification campaign and from 1864 to 1904 banned Lithuanian writing in education and publishing. This affected lexicography which largely stayed in manuscript form.

As Lithuanian looked likely to disappear in Prussia, an interest appeared in recording it. Thus, in 1879, Litauische literarische Gesellschaft was established by prominent linguists, which however, was interested mostly in recording its archaic character and place within Indo-European studies. This trend found reflection also in dictionaries. Nesselmann's (1851) Lithuanian–German dictionary seriously expanded its vernacular component. The dictionary had about 35,000 words excerpted from previous dictionaries and manuscripts, also new ones collected by Nesselmann's assistants. The dictionary had a strange nesting principle: first come vowels, then consonants according to Old Indian grammar traditions (Sanskrit alphabet) that were close to Nesselmann's heart.

A three-volume Kurschat's (1870–1874; 1883) German–Lithuanian (724 plus 392 pages) and Lithuanian–German dictionary (530 pages) was both a scientific and practical dictionary, compiled in about 30 years, having both written and spoken language material of the 19th century. It achieved precision also on Lithuanian intonations which had been a regular stumbling block in previous dictionaries. The words unknown to the author were provided in square brackets – among which there were many mistaken ones. Its German–Lithuanian part had many neologisms, also phraseology. The dictionary was most useful for the following lexicographers.

A multilingual Lithuanian–Latvian–German–Russian dictionary by Miežinis (1894), published in Prussia, contained about 15,000 words and testified to the main contact languages.

The living Lithuanian vernacular appeared in its full in a trilingual explanatory dictionary by Juška (1897–1922) which, however, partly remained in manuscript form (three volumes were published, the third after World War I, reaching letter 'K') and all posthumously (Juška died in 1880). The manuscript of the dictionary contained about 30,000 words and is a mirror of the Lithuanian spoken language of the second half of the 19th century, containing not only 'nice' words, but also vulgarisms and borrowings. The chief deficiency in the dictionary is the sometimes erroneous indication of the position of stress and the failure to establish vowel length. Juška had prepared several other manuscripts, among them that of a Latvian–Lithuanian–Polish dictionary.

Further developments

In the 20th century the three Baltic states had a similar historical background, they achieved independence after World War I, started active nation-building processes which involved iconic lexicography works – national projects associated with well-known names of lexicographers. These projects reflected the past tendencies and future challenges of the respective languages. A Latvian–German dictionary (Mühlenbachs, 1923–1932) with supplements (Endzelīns & Hauzenberga, 1934–1946) had a strong academic and purist drive. Estonian orthological dictionary by Veski (1925–1937) was perhaps less of an icon than the Latvian and Lithuanian projects, yet it was prescriptive and introduced many new words. The Lithuanian project under various editors spanned a century and came to 20 volumes (*Lietuvių*, 1941/1968–2002) encompassing citations from 1547 to 2001. Apart from these monumental works, Baltic lexicography carried on the traditional bilingual focus (Veisbergs, 2000), reflecting Russian, German and English as the major contact languages. The variety of lexicographical resources exploded in the 20th century but this is beyond the scope of this paper.

Conclusions

Latvian, Estonian and Lithuanian lexicography are characterized by a similar early development (despite a different language contact situation). There is a clear dominance of bilingual/multilingual dictionaries compiled to serve the needs of the clergy in the main contact language pairs and triples. While in Latvia and Estonia this was predominantly a German–Latvian, German–Estonian combination, in Lithuania it was Polish–Latin–Lithuanian (Catholic tradition) and German–Lithuanian (Protestant tradition) combination. The German contribution, thus, is dominant in all Baltic language lexicographies. Latvian had by far the largest number of early dictionaries, while Lithuania proper had to suffice with one for a long time (however of better quality). Latvian dictionaries, including the iconic one, also tend to have had a better absorption of previous works. Later, with the countries' incorporation into Russia, Russian gradually became another dominant language in the bilingual lexicography of all three countries. Lithuania's lexicographical development was seriously hindered by the language ban imposed by the tsarist authorities. End of the 19th century saw lexicography move into the hands of the native speakers in all three countries resulting in an influx of vernacular in dictionaries and concerted attempts to stabilize the language (writing, spelling, alphabet, variants). A variety of dictionaries appeared. After achieving independence, iconic projects of a different scope and timescale were started.

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On the Origin of the Ideas of Estonian Language Reformer Johannes Aavik

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Abstract: *In the 1880s, Russification became an officially sanctioned policy in the Governorates of Estonia and Livonia of the Russian Empire. This was a backlash against the Estonian national awakening movement and the Estonian language's right to exist was questioned. In such a socio-cultural situation in which Russian served as an administrative language, the language of education – both at lower and higher level – was Russian, and the only languages allowed for communication at school were Russian and German, the young Johannes Aavik developed his ideas of Estonian language reform. He was widely read in Latin, Greek, German, French, English, Finnish, and Russian; this is reflected in his diaries of 1897–1901. He had come to a firm conviction that the development of the Estonian language was hindered and the language was incapable of conveying new concepts or producing new terms. In his first programmatic article 'Eesti kirjakeele täiendamise abinõudest' (On the means to improve literary Estonian; 1905) he called for a systematic enrichment of Estonian and specified the ways of expanding its lexicon although at the time there was considerable doubt about the feasibility of the goal, and it was not even considered to be important. Gradually, Aavik's ideas on history, culture and language matured into an idea of a deliberate modernization of the language of the peasants so that it could serve as the official language of the Estonian state and would satisfy the needs of higher education. Putting into practice his ideas of vocabulary enrichment, including the free construction of new lexemes, Aavik managed to introduce changes into the morphological structure and syntax of the Estonian language, which is unique in the history of language planning.*

Keywords: *language reform, deliberate modernization and innovation, standard Estonian*

Introduction

The oldest known Estonian-language texts date from the 13th century; the first Estonian grammar and dictionary was published by Heinrich Stahl under the title *Anführung zu der estnischen Sprach* in 1637. In the 17th century, two literary languages (South-Estonian and North-Estonian) emerged. Eventually, thanks to the appearance of full Bible in North-Estonian the common literary language based on North-Estonian dialects took precedence. In this language, most of the newspapers, textbooks, and calendars were published. In the 19th century, Estonian peasants were mostly literate; however, the intellectuals were educated in a foreign language and the official language was not Estonian, but a foreign language. In 1803, the Estonian language began to be taught to future pastors in the German-language University of Dorpat (Tartu). In 1857–1861, the Estonian epic poem *Kalevipoeg* (The Son of Kalev) by F. R. Kreutzwald was published alongside a German translation and in 1862 it came out in a lower-cost edition. In the 1880s, Russification, as an officially sanctioned policy, was imposed on the literate Estonian people, which was a backlash against the Estonian national awakening movement and which questioned the Estonian language's right to exist.

The aim of the present article is the presentation and clarification of the origin of the ideas and the underlying motivation of Johannes Aavik, the reformer of the Estonian language, who was active in the province of the Russian Empire on the periphery of the high-culture area in Europe. The research concentrates on the description and analysis of the emergence and development of Aavik's ideas against the background of his individual development as well as the contemporary socio-cultural situation.

I Aavik's early years: education and development, 1894–1910

Social and cultural background, his interest in languages and history, the awakening of national identity

Johannes Aavik was born on 8 December, 1880, in the small village of Randvere, Kõiguste parish on the island of Saaremaa (Ösel), then part of the Governorate of Livonia of the Russian Empire. He first attended the German Preliminary School (1888–1889), then studied at the Elementary School (1890–1891 in Estonian, 1891–1894 in Russian) and was admitted into the Russian Gymnasium (1894–1902) of the Baltic-German dominated small town of Arensburg (Kuressaare).

Latin, Greek, German, French and Russian languages were taught at the Arensburg Gymnasium; in addition, the young Aavik independently learned Finnish and English. During his school years he translated the texts by Juhani Aho and Edgar Allan Poe into Estonian, a language which the students were not even permitted to use among each other; the only languages allowed for communication were Russian and German. The state university, then named Kaiserliche Universität zu Dorpat (in Tartu), was German- and Latin-speaking. Estonian intellectuals were educated in a foreign language (mostly German), and in several cases a foreign language was also spoken at home. The meetings of active young people of the snobbish Kuressaare were also held in the German language. German-Estonian bilingualism strengthened the German influence on the Estonian language. Russian served as an administrative language. Estonian peasants were baptised to become members of the Russian Orthodox Church and their children were given Russian names. Even the place names were Russianised – Tartu (Dorpat) became officially Yuriev in 1893. Johannes Aavik's father Mihkel Aavik, a parish clerk, was dismissed from work because of his inadequate Russian skills. The same happened to many other civil servants who were ethnic Estonians, including the headmaster of the Kuressaare Gymnasium; they were all replaced by monolingual Russians. It became more and more difficult to publish in the Estonian language, although Estonian-language books were still read in Estonian homes. Aavik realized that the purposeful Russification policy posed a deadly threat to the Estonian national identity (Vihma, 1993a, pp. 8–14).

Aavik was well-read already in his teen years: his thoughts on the history, culture and language of different nations were recorded in his diaries in which he used Latin, Greek, German, Estonian, Russian, French and Finnish languages. The part of the diary written in the period between 1897 and 1901 is of special interest (Aavik, 1897; 1897–1901). By 1897 he had developed a firm conviction that only full autonomy would prevent the loss of Estonian national identity; for him this meant that Estonian schools should establish Estonian as a medium of instruction, Estonians should have their own national Estonian-language university; Estonian should be the language of the government and of law courts – in short, Estonia should be more or less an independent country (Aavik, 1897). The ideas of an Estonian-language education and of Estonia as an independent country were promoted in the speeches by Aavik (1935), the ideological leader of young Estonians in Kuressaare. These speeches were delivered to the youth of Kuressaare in the Estonian language at the time when Russian had become the language of education, starting from the primary school, and an Estonian-language university had never existed. The Russification policy hindered the development of the Estonian language and it was therefore incapable of conveying new concepts or producing terms corresponding to contemporary European developments at the turn of the century. Aavik was deeply convinced that Estonia should gain national independence and that the Estonian language also had a right to exist. This became the main principle which guided him in his activities in which the understanding of a language as an indicator of the educational and cultural level of a people always dominated. When translating from the European languages he was fortified in his belief as it revealed the miserable state of the Estonian language. According to Aavik, the reason for that – in addition to the official Russification policy – was the fact that there was no local educated elite who would use the native language (Aavik, 1900). He clearly worded his ideas about the Estonian language: 1) the Estonian language and its vocabulary which would satisfy the needs of Estonian peasantry is not able to meet all the requirements of the modern world, and 2) new concepts call for linguistic expression, that is, for new words (Aavik, 1900; Vihma, 1993a).

Being especially fond of Latin, Aavik read in the original many books that his teachers had not read, such as those by Petronius, Gellius, and Apuleius, as well as the Bible and the literature of the Reformation. He was interested in French as a daughter language of Latin. Prior to his graduation from the gymnasium, Aavik's knowledge of the Latin, Greek and French languages had exceeded that of his teachers, as he admitted in an interview of May 1961 (Vihma & Salla, 1999). Aavik's first literary attempts were recorded in his diary in January 1897. His diary entries from 1901 deserve special attention – they reveal Aavik's plan to write a book based on Ancient Rome, in which Ovid would play a major role. He prepared thoroughly: read works by Ovid, such as *Amores*, *Epistulae ex Ponto*, *Ars Amatoria* and *Remedia Amoris*, as well as satires and odes by Horace; he studied the Roman environment and lifestyle of the time, including Roman customs and everyday life at home (Aavik, 1901c). However, Aavik never accomplished his belletristic intention; later, in 1957, he published an article in the *Mana* journal '*Yhe luuletaja suurjuubel: Publius Ovidius Naso*' (Celebrating the Anniversary of a Great Poet) to commemorate the 2000th anniversary of the birth of Ovid (Aavik, 1957).

The best student in his class, Johannes Aavik graduated from the Kuressaare Gymnasium in June 1902 and went on to study ancient languages in the University of Tartu, but because of financial hardship his studies in Tartu lasted for one year only (1902–1903). He distributed the journal *Nooreestlane* (A Young Estonian; Aavik, 1901a) in manuscript form, which he himself edited. The journal also included some of his translations and his article '*Eesti keel tulevikus*' (The Estonian language in the future; Aavik, 1901b, pp. 33–40). Aavik's article had a meaningful beginning: "*panta rhei* – 'everything flows' – said Heraclitus, the old Ionian philosopher who was called 'The Obscure', and he was right." Proceeding from this premise, Aavik concluded that language also changes, and his fantasy took him into the 25th century when Estonian words and forms will have shortened.

His knowledge of languages was the cause of admiration and bewilderment in Tartu. It was in Tartu where he translated three of Maupassant's short stories – 'The Horla', and others. Starting from 1902, Aavik's translations of Maupassant (1902), Daudet (1903), E. A. Poe (1903), Baudelaire (1905), Aho (1905) appeared and his articles were published (Vihma, 2000a).

The idea of a deliberate effort to modernise the language, 1902–1903

Johannes Aavik, being well-read, had understood that the story of nations and cultures in the world is a story of incessant struggle and destruction. The losers were mainly the ethnic groups who had no native language schools or full autonomy. With the graduation from the gymnasium, Aavik's ideas on the history, culture and language had matured into an idea of a deliberate modernisation of a language; in 1903 the idea was formulated in manuscript form in '*Eesti kirjakeele täiendamise abinõudest*' (On the means to improve literary Estonian) intended for publication in the first album by the *Noor-Eesti* (Young Estonia). However, the censor refused to license it (1904); the license was issued in 1905 when Aavik had already studied ancient languages free of charge in Nizhyn for two years, had escaped the massacre of Nizhyn rioters in 1905, and gone to Helsinki.

Call for the fast modernisation of literary Estonian and the methods of vocabulary enrichment, 1905

In his programmatic article '*Eesti kirjakeele täiendamise abinõudest*' (On the means to improve literary Estonian; Aavik, 1905a) Aavik gave a fair assessment of the state of the Estonian language and *called for a systematic enrichment of literary Estonian*. The idea of an intentional language change that was first put down by Aavik in his diary in his teens and then developed in a manuscript journal that he edited was now printed and reached a wider public. The young Aavik set a high goal to raise the status of the Estonian language so that it would compare with the great languages of culture. At the time there was considerable doubt about the feasibility of the goal, nor was it even considered to be important, as Ado Grenzstein, a journalist and teacher, the owner of the newspaper *Olevik* stated (Grenzstein, 1894; 1896; 1926; Kruusberg, 1921). Thus, in 1905, Aavik initiated a public campaign for the fast modernisation of literary Estonian and specified the ways of expanding its lexicon: firstly, by drawing on the language's own resources, and secondly, by drawing on other languages. The first was the use of language-internal processes to create new words: 1) by derivation, which is the simplest way (*kattuma*, *mattuma*, *käänduma*), and by combining the base words; 2) by integrating the dialectal words into standard Estonian, he himself introduced many such words or used the Estonian-German dictionary by Academician Ferdinand Johann Wiedemann (Wiedemann, 1869; 1893). Estonian dialects should be studied thoroughly and the most suitable words for incorporation should be published in newspapers, he wrote. The second suggestion was to make use of foreign languages. Aavik supported the incorporation of new words from foreign languages: their foreign-ness should not be a discouragement, he assured those who were opposed to modernising the language by introducing a foreign element. The orthography of loanwords should be adapted for the Estonian phonetic system, and later the loans would be modified in accordance with the structure of the language. Aavik made a deliberate effort to include many of such loanwords in his article on Charles Baudelaire and decadence, '*Charles Baudelaire ja dekadentismus*' (Aavik, 1905b). He drew special attention to the Finnish language, which, according to him, was "bone of our bones and flesh of our flesh". The objective, again, was to transform – as quickly as possible – the Estonian language, which had developed under unfavourable conditions into a language that would meet all the needs of the intellectuals, both in belles-lettres and science, in spite of there being no Estonian-language education. A special focus should be placed on creating new technical terms in Estonian. In addition, each fully developed language should be capable of expressing abstract concepts by forming abstract nouns. The process of derivation existed in Estonian, but it should be used more widely, as he demonstrated in the following words: *kalduv* > *kalduvus*; *pidulik* > *pidulikkus*; *vaene* > *vaesus*; *noorus* > *nooruslik* > *nooruslikkus*, etc. Two years later, Aavik published the article '*Abstraktlikud substantiwid Eesti keeles*' (Abstract nouns in the Estonian language; Aavik, 1907). The importance of terminology and abstract nouns was often the subject of Aavik's later writings.

The ideas put forward by Aavik had wide-ranging repercussions and provoked some angry responses from Jaan Jõgever, a Slavist, a teacher; the comparative philologist and teacher Kaarel Leetberg; the journalist Johannes Voldemar Veski, later a teacher and lexicographer. The controversy was caused by disagreement about the main ideas: language was viewed as an *organism* with its natural, spontaneous development, so there was opposition to deliberate, intentional modernisation and codification which rested on the principle that language as a *medium* was subject to selection. Incidentally, Veski, who had opposed the coinage of new words by derivation, afterwards successfully derived terminology and took advantage of the rich stock of dialect vocabulary.

The maximum programme of linguistic modernisation, 1906

Beginning in the autumn of 1906, Aavik attended the University of Helsinki as a part-time student; he took courses in the Estonian, Livonian, and Mordvinic languages, Finnish language and literature, and Finno-Ugric phonetics. Only on 7 February, 1908, was he able to enroll as a full-time student and took examinations in all the courses he had attended. Admittedly, there were some breaks in his studies, either due to a lack of money or intensive creative work; in addition, he had a wide range of interests. In order to manage without financial support from home he worked on the Finnish-Estonian dictionary, continued translating and reviewing. He also wrote a Finnish language textbook for the Estonians, and an Estonian language textbook for the Finns, without including too many new words (Vihma, 1993b; Õispuu, 2001). In 1908, he passed the examinations in French language teaching and got the qualifications of a senior teacher of French as a Foreign Language and was occupied with standardising the Estonian language, participated in the activities of the Language Committee of the Estonian Literary Society and attended the Tapa Language Conference.

In 1906, without his Helsinki friend and roommate Lauri Kettunen being aware, he translated Paul Bourget's novel *Le Disciple* into Estonian, hoping that the *Noor-Eesti* would publish it. He included his maximum programme of language modernisation in it. However, the publishers rejected the manuscript, afraid to take the risk of publishing such an extensive work. Neither could Aavik personally afford to publish it. Moreover, the Estonian Literary Society refused to support the publication. Since Aavik did not receive any royalties and could not finance his studies, he was expelled from the University of Helsinki. The manuscript remained unpublished for years until the Loodus publishers printed it in 1930 (Bourget, 1930). The book together with its Appendix gives a fairly good overview of the scope of Aavik's work as a commentator and an editor of translated literature (Vihma, 1971a, pp. 157–165). First Aavik gave an overview of the author's life and work, and then analysed the plot in a more detailed way. His commentaries shed light on the historical background, listed place names and personal names. Literary comments, which include Aavik's subjective opinion, are the most interesting. The chapter on new linguistic features, '*Tarvitet keeleuuendused*' specified the morphological and syntactic changes, such as the *i*-plural, the *i*-superlative, the *i*-past, *nd*- and *tet*-participles, word order, etc. The linguistic part ended with a glossary which contained 427 words with definitions. Before the translation of *Le Disciple* was published, Aavik succeeded in publishing a range of similarly structured translations and series of books of adventure and mystery, whereas he extensively used the modernised language and included a glossary (Vihma, 2000a, pp. 445–458).

While being a student of the University of Helsinki, Aavik had enjoyed studying Finnish literature, and Juhani Aho's style in particular, to which he had taken already in his schooldays. He continued reviewing, translating, and popularising French literature (Vihma, 2000a, pp. 21–32). The publication of Aavik's novella *Ruth* under a pseudonym of J. Randvere in Tartu in 1909 (Randvere, 1909), which had been written in a modernised language, generated heated literary polemics. In his letter to Friedebert Tuglas of 28 November 1909 (Aavik, 1909a) Aavik notified Tuglas about his intention to write a novel about the events which would take place in Helsinki, St Petersburg, Tallinn, and Kuressaare and on Saaremaa. A few extracts from that book, entitled *Tõelikkus ja unistus* (Reality and Dream), were published under J. Randvere's name (Randvere, 1910/1911). As he was passionately interested in style, he enjoyed the prose style of French authors, Paul Bourget's and Joris-Karl Huysmans' in particular (Aavik, 1909b; 1911).

In Helsinki he chose Paul Bourget's works as a topic for his thesis, which he wrote in French, and in May 1910 he took examinations in Romance literature, Romance philology, Russian language and literature, and Finnish language and literature. In 1910 he graduated from the University of Helsinki with a Cand. Phil. degree. The same year he attended a conference in Tallinn as a representative of the Estonian Literary Society together with the linguist and clergyman Harald Põld; at this conference Aavik's proposals were supported (one of the supporters being Villem Grünthal-Ridala) over Veski's opposition.

Thus it can be concluded that Aavik's Helsinki period suggests all the trends characteristic of his activities in the future.

II Devotion to language reform, 1911–1924

As a student, Aavik had prepared himself for implementing a large-scale language modernisation programme and, in 1911 he tried to put into practice the ideas initiated in 1905. Having arrived home in spring 1911, he was a frequent guest in the literary salon of the woman poet Marie Under, and wrote articles about language reform and orthography in his Kuressaare home. He was worried about the state of the Estonian language, he announced to the writer Eduard Hubel (Vihma, 1981). Strangely enough, that Jaan Jõgever, a Russophile, claimed that the Russian language had not heavily influenced the Estonian language and it had not impeded its development.

1912 was a prolific year for Aavik. His bibliography (Vihma, 2000) shows 30 articles in which he focused on the expansion of the lexicon, for example, in

'*Enam uusi sõnu*' (More new coinages; Aavik, 1912a); advocated the use of short forms for the singular illative in order to avoid longer *sse*-endings in '*Keele kaunima kõlavuse poole*' (Towards a more beautiful sound of the language; Aavik, 1912b); preferred shorter *i*-plural forms over *te*-plurals in '*Ilusa keele kõlaline inetus*' (The ugly sound of a beautiful language; Aavik, 1912c); attempted to do away with analytical constructions and change the German-influenced order of words, in '*Kõige suurem germanismus Eesti keeles*' (The biggest Germanicism in the Estonian language; Aavik, 1912d) and in '*Keelelised märkused*' (Linguistic notes'; Aavik, 1912e); and wrote a series of articles under the title of '*Väiksed keelelised märkused*' (Brief linguistic notes; Aavik, 1912f). He also published nine translations, including Aho's novel *Yksin* and Eino Leino's poem 'Ylermi' from Finnish, and Baudelaire's, Richepin's, J-H. Rosny's, and George Soulié de Morant's works from French. In his programmatic article '*Tuleviku Eesti-keel*' (The Estonian language in the future; Aavik, 1912g) Aavik addressed mostly young readership:

> *the best tool of human communication should be cultivated, organised and polished. There is no time to wait; therefore, the change process should be deliberately and intentionally accelerated. The task of modernising the Estonian language will be accomplished. To attain this objective the Estonian language should be purged of useless Germanicisms, excessive 'partitivism', and the anemia from which the language is suffering should be cured with healing juices from the dialects and with some 'healthy' Finnishisms.*

At the same time there were some people, for example, Anton Jürgenstein (1915), a journalist and a public figure, who did not believe that the Estonian language would ever be appropriate for the purposes of the modern age, let alone the purposes of modern science.

Aavik managed to introduce changes into the morphological structure of the Estonian language (Raag, 1998; 1999), which is exceptional in the history of language reform, to be exemplified by such features as the *i*-plural, the short singular illative, or the *i*-superlative, artificially made up by Aavik. He expanded the use of derivation in word formation, especially in forming abstract nouns (*us*-derivations) and reflexive verbs ending in -*uma* from transitives, expounded in a book *uma-lõpulised refleksiivid. Nende moodustamine. Nende esinemine. Nende sõnastik* (The *uma*-ending reflexives, their formation, their frequency and their glossary; Aavik, 1920). The extent of the changes induced in the syntax is also unique in the history of language planning. The professor of Estonian language Mati Erelt, who has analysed the syntax reform, has reached the following conclusion:

"The syntactic innovation suggested by Aavik concerns word order, the opposition of totality–partiality, infinitive constructions and relationship between analytic constructions and the corresponding synthetic forms" (Erelt, 2001, p. 86).

Introduction of Finnish words into the Estonian language, 1912

The idea that the Finnish language should be used to enrich Estonian vocabulary emerged during Aavik's studies: on the one hand, he developed a keen interest in the style of Juhani Aho; on the other hand, he translated and edited Finnish-Estonian dictionary and textbooks, which sharpened his attention and made him look for Estonian counterparts to Finnish words. He had also studied in a Finnish-language university. He could not but notice that there were words which resembled each other, were similar phonetically, that is, in their sound to the Estonian language, and so Aavik recommended that they should be used in Estonian. He proposed 85 Finnish words, in alphabetical order, which should be incorporated into the Estonian language (*Soome sõnad eesti kirjakeeles. Üks keele rikastamise abinõu*; Aavik, 1912h), which irritated Jõgever and Veski (1913). But Aavik was not put off by this attack against Finnishisms; he actually introduced 300 Finnish loanwords into standard Estonian (Rätsep, 1981, p. 296), and continued to propose new and new words (Vihma, 1995; 1996). In addition to his pedagogical activities he worked on the editorial staff of the newspaper *Postimees* (The courier), and on 20 November 1912 was elected a member of the Language Committee of the Estonian Literary Society and the editorial committee of the society's journal *Eesti Kirjandus* (Estonian literature). At the same time, new articles continued to be published.

Special focus on the dialectal words, 1913

The bibliography of Johannes Aavik and the Estonian language reform reveals an undiminished flow of publications in 1913: *Keele kaunima kõlavuse poole* (Towards a more beautiful sound of the language; Aavik, 1913a), *Mõned keele reeglid. Nõuded ja soovid* (Some rules of language. Requirements and wishes; Aavik, 1913b), '*Eesti õigekeelsuse ja keele ilu küsimus: Vastuseletuseks hra Jõgeverile*' (On the correct usage and beauty of the Estonian language: a response to Mr. Jõgever; Aavik, 1913c), '*Avalikud küsimused hra Leetbergile*' (A public letter addressed to Mr. Leetberg; Aavik, 1913d). Thanks to the Finnish professor and philologist Eemil Nestor Setälä he learned about the language planning process in Hungary and wrote an article '*Keele-uuendus Ungrias*' (Language innovation in Hungary; Aavik, 1913e).

In 1913, Aavik concentrated on drawing up instructions for collecting dialect words. His article '*Üleskutse ja juhatus Eesti murdesõnade korjamiseks*' (The call and instructions for collecting Estonian dialect words; Aavik, 1913f) and a book with the title *Üleskutse ja juhatus Eesti rahvakeele sõnade korjamiseks* (The call and instructions for collecting Estonian folk dialect *words*; Aavik, 1913g) are of special interest; he wrote them on behalf of the Estonian Literary Society. Aavik was one of the most passionate promoters of a systematic collection of dialectal material at the beginning of the 20th century and he was the first to develop and lay down a set of guidelines on how to collect dialects (Vihma, 1986, pp. 34–49; Pall, 1994, p. 13). In 1917, an Estonian-Finnish dictionary *Virolais–suomalainen sanakirja* (Kettunen, 1917), which contained many new Estonian words, was published in Helsinki. In the preface to the dictionary the author Lauri Kettunen (1917, pp. v–xv) defended the freedom of word coinage and analysed the principles of borrowing in "this season of language planning and enrichment". In his book *Uute sõnade ja vähem tuntud sõnade sõnastik* (Glossary of new and lesser known words; Aavik, 1919), Aavik clearly preferred dialect words, which, in the 1921 revised and expanded edition (Aavik, 1921), made up about half or even more of the glossary (Kõpp, 1983).

In the language creation and standardisation process, Aavik established three principles on which to base his activity:

1) utility – expressed in the richness, clarity and brevity of the language;
2) aesthetics – not only the beauty of the sound, pleasing sound / euphony, but also conceptual, psychological, stylistic beauty should be emphasised;
3) native quality – each native language possesses unique features, not only in its phonetics but also in its grammar – characteristic word order, usage of object cases, etc.

Aavik as publisher

In order to popularise and explain his linguistic innovations, Aavik delivered talks and lectures and organised language courses, and he also set up his own publishing house Reform (1914–1917), renamed Istandik in 1917 (Vihma, 1971b, pp. 119–123; 1990, pp. 163–194). He started a journal *Keeleline Kuukiri* (Linguistic monthly; 1914–1916) to which the Estonian writers Villem Ridala, Johannes Semper, Friedebert Tuglas, and the linguists Villem Ernits and the Finn Lauri Kettunen contributed. Johannes Aavik himself, however, was the main contributor. Fifteen people responded when Aavik posed four questions about language reform in the journal *Keeleline Kuukiri* in 1914. The answers were printed in the subsequent issues and in 1916, Aavik summarised them.

All the respondents were certain that one day the Estonian language would be a well-established language of culture, and some were positive about the future development of the Estonians as a nation and their ability to achieve a high cultural level (Anton Jürgenstein, Peeter Põld). Villem Ernits, Villem Ridala, Harald Põld, and the writers Marta Sillaots and Henrik Visnapuu supported the radical language reform movement**;** the folklorist Matthias Johann Eisen, the novelist and playwright August Kitzberg, the textbook writer and teacher Juhan Kurrik, Peeter Põld, Johannes Voldemar Veski and Anton Jürgenstein were strongly opposed to the radical linguistic innovations; Jaan Jõgever and Jaan Tõnisson did not respond to the questionnaire (Aavik, 1916).

In the same year, Aavik's friend Lauri Kettunen (1916) published the article 'Viron kirjakielen uudistus' in volume 1 of the collection *Suomalainen Suomi*, dedicated to Johan Vilhelm Snellman's 110th birth anniversary in Finland. Dr. Lauri Kettunen, docent of Finno-Ugric languages at the University of Helsinki compared two reforms of literary Estonian: the reform of Estonian Germanised grammar and orthography in the 19th century (originated by Eduard Ahrens) and Aavik's language reform in the 20th century. There was fierce opposition to both of these reforms; both reforms were Finnish-influenced. In the 19th century, the supporters of the language reform won; what the result of the current language reform would be was too early to say, Kettunen (1916, p. 107) concluded. Kettunen agreed that new words were needed for new concepts, that the *i*-superlative created by Aavik was a 'fantastic' invention, and that it seemed to be quite a programmatic attempt at developing the Estonian language. At the same time he doubted the practicality of some new forms, for example the infinitive *kirjutada* > *kirjuta* or the 'sensational' use of *o*: *madu* > *mado, laduda* > *ladoda.* Incidentally, Aavik himself had already abandoned both of these ideas.

During the war the book prices in Estonia went up, but Aavik did not give up publishing. Between 1914 and 1933 Aavik's publishing house printed 70 books that used linguistic innovations, the majority of them were books of fiction translated, or edited, by Aavik. The series of books *Keelelise Uuenduse Kirjastik* published by Aavik contained linguistic works and the subseries included books of adventure, mystery and horror as well as humorous stories and novellas with such titles as *Hirmu ja õuduse jutud; Naljandid ja groteskid* and *Üldine novellikirjandus.* Aavik's works were also published by other publishers.

Free construction of new lexemes, 1913–1914

Aavik proceeded from the premise that language is a tool and as Man improves his other tools, he can and must improve language as well. He was convinced that the traditional methods and sources for the enrichment of Estonian would not suffice. During the process of compiling a glossary of new words in Tartu in 1913, he used his imagination to create a new method – artificial creation or free construction as Tauli (1977; 1984) called it. Proceeding from the thesis that a word is a phonetic symbol representing a concept Aavik came to an unprecedented conclusion: new roots can be formed artificially. It means that we can arbitrarily combine phonemes to make new roots. And after the idea of artificial creation of words had emerged, he immediately started to make experiments, to implement the idea in practice by using three methods: 1) transformation – *kaunis* > *jaunis*, *ujo* > *uje*, *esine* > *ese* (1913); 2) contraction – *selle asemel et* > *selmet*, *korda saatma* > *kaatma*; 3) combination – *veenma* (1914).

1914 should be regarded as the birth date of Aavik's philosophy of the language: he formulated the idea that, theoretically, 'the curve of language reform can be drawn to infinity' (Vihma, 2000b; 2001a; b). He summarised the tenets of his philosophy of language in a speech given at a meeting of the Estonian Literary Society in the Estonia Concert Hall in 1914. He also expressed his ideas in the book *Keeleuuenduse äärmised võimalused* (Extreme possibilities of language reform), which he completed in 1918. However, it remained in a manuscript form as he could not publish it in the wartime. Later it was published by the Istandik, his own publishing house, under the favourable conditions in the Republic of Estonia, with Estonian the official language.

On 9 August, 1919, Lauri Kettunen was invited to take up the post of Professor of the Baltic-Finnic languages at the University of Tartu. He was commissioned to write an overview of Estonian language reform, which he presented in a more succinct form at a meeting of the Estonian Literary Society on 5 October, 1919, and which was published under the title *Arvustavad märkused keeleuuendusnõuete puhul* (A critical overview of the Estonian language reform; Kettunen, 1919). Professor Lauri Kettunen honoured the traditions of the language and was therefore quite hesitant. The analysis, which has a strict structure, begins with some innovations which were deemed unsuitable, to be followed by more suitable ones. The author grouped the suggestions in the following way:

I Unacceptable: completely unacceptable, partly unacceptable;
II Acceptable: partly acceptable, completely acceptable.

The latter group was already in general usage: the innovations in morphology and syntax had been accepted. When he analysed the principles of language reform he seemed to like purposefulness and shortness, but he denounced vernacularism, the dominance of North-Estonian dialects, purism, etc. He joked about the principle of beauty and the anarchy caused by the innovations "just when the Republic of Estonia itself was overcoming anarchy and trying to recover" (Kettunen, 1948; Kettunen, 1999, p. 63). He became much freer in his discussion of new words in Finnish and in Estonian. Although he thought the controversy over the Estonian language reform was something that the Estonians had to settle themselves, he advised the Estonian language speakers to look closely at the neologisms in Aavik's dictionary of new words and admonished that criticism was not enough and was not of much help. After Jaan Jõgever, Professor of Estonian Language and Dean of the Faculty of Philosophy appointed Veski as lecturer of the Estonian Language in 1919, Kettunen commented that, in comparison with Aavik, Veski was but a dilettante (Kettunen, 1948; 1999, p. 63; cf. in this context Vihma, 2003).

In the Republic of Estonia, in the 1920s, Aavik published himself his theoretical works: *Rahvamurded ja kirjakeel* (Folk dialects and the standard language; Aavik, 1920). He analysed thoroughly and formulated his views in the book *Õigekeelsuse ja keeleuuenduse põhimõtted. Yhes keeleuuenduste astmelise liigitusega* (The principles of correct usage and language reform. Together with the graded classification of linguistic innovations; Aavik, 1924a), and *Keeleuuenduse äärmised võimalused* (Extreme possibilities of language reform (*Keeleuuenduse äärmised võimalused*; Aavik, 1924b). The three works constituted an entirety, that is, they formed the theoretical basis illustrated by a host of examples of grammatical innovations and new artificial lexemes.

Aavik's most important theoretical work is definitely *Keeleuuenduse äärmised võimalused* (Extreme possibilities of language reform). Here he analysed language reform as a phenomenon of applied linguistics in reference to an idea that language was not only a national and cultural treasure but *a means, a tool or a machine for human mental activity* (Aavik, 1924b, p. 8), which could and should be improved. The comparison with a machine was definitely shocking to both the general public and the community of linguists, but Aavik's analytical, exploratory and creative spirit and the independent nature of his dreams and opinions enabled him to withstand violent attacks that went on for decades.

Aavik's bold imagination led him to create a new revolutionary method, which has rarely been employed anywhere else in language planning. Aavik's belief that *the word is a phonetic symbol representing a concept* and as symbols are conventional, at least in principle, then it is possible to coin new lexemes which are arbitrary and historically unmotivated. This means that one can artificially combine the existing phonemes to make new words and grammatical morphemes (Vihma, 1992). The artificially-created new words by Johannes Aavik and their distribution have been investigated by the French scholar and translator Antoine Chalvin (2010a, b).

On 9 September 1942, Aavik wrote in his diary: "The idea and the activity of word creation grew from my own experience and it is unique and original in the development of all world's languages" (Aavik, 2010, p. 64).

Aavik was not a traditional linguist-researcher – he was a visionary (Hint, 2010, p. 6). His achievement in the field of Estonian language reform was considerable. An ideal language rang like a symphony inside him. His fantasy and inventiveness knew no limits when he began realising his imaginary model of an ideal language. Aavik modelled the language by using the principles of spatial composition. For him, language was comparable to a building that needed constant renovations and in that sense, "the curve of language reform can certainly be drawn to infinity" (Aavik, 1924b, *motto*).

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Vladimir (Woldemar Justus Konstantin) Malmberg (1860–1921), Professor of Dorpat and Moscow Universities

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Abstract: *The creative development of the well-known art historian, Professor Vladimir (Woldemar Justus Konstantin) Malmberg (1860–1921), was connected with several universities: the Kazan University, where he was a student (1879–1984) and began lecturing as Assistant Professor (1888–1889); the University of St Petersburg, where he prepared for professor's activity (1884–1887); the universities of Dorpat (now Tartu, 1890–1896) and Moscow (1907–1921), where he worked as professor during a significant period. Besides lecturing, he put a great deal of his strength and energy to archaeological investigations and museum work. The main part of Malmberg's works was devoted to the history of Ancient Greek culture, but he also wrote some articles on Ancient Egyptian art, the antiquities of southern Russia, and the painting of Albrecht Dürer. His creative contribution to art criticism was appreciated in Russia and abroad. He was a member of the Imperial Russian Archaeological Society in St Petersburg, the Society of History and Antiquities in Odessa, the Associate Member of the Imperial Archaeological Commission and the German Archaeological Institute in Berlin, Rome and Athens.*

Keywords: *ancient world, antiquities, archaeology, arts, history, universities*

At the end of the 18th and in the first half of the 19th century, the history of Ancient Greece gained importance in European historiography. The most intensive work in this area took place in Germany. The basics of the scientific history of ancient art were laid down by Johann Joachim Winckelmann, who created an outstanding work *History of Ancient Art* (1764) and "invented an aesthetic scheme which has deeply affected European attitudes to Greece ever since" (Davies, 1997, p. 96).

The work generalizing the study of many German historians was a three-volume monograph by Ernst Curtius, *Greek History* (1857–1867), in which he devoted much attention to archaeology and art history. Curtius compared the newest method for studying the ancient world with the experimental method, which was then already widely used in natural sciences: quite like natural scientists find answers to their questions with the aid of experience, archaeologists conduct methodical archaeology diggings in those places where, according to science, there are potential sources of solution to their issues. The last third of the 19th century was marked by a number of major archaeological discoveries in the history of Ancient Greece. The most outstanding results were obtained from excavations made by German researchers Heinrich Schliemann and Wilhelm Dörpfeld in Troy, Mycenae and Tiryns (1871–1894), as well as by Englishman Arthur Evans in Crete (1900).

During the same period there was a major breakthrough in the study of the history of Ancient Egypt. Much credit for this belongs to Adolf Erman, a prominent Egyptologist and lexicographer, founder of the Berlin School of Egyptology. The classical works of Erman and his school laid the foundation for modern Egyptology, affecting the development of this area of science in many countries. Among his disciples are known researchers such as Alan Gardiner in England, James Breasted in America, Gulio Farina in Italy, and Boris Turaev in Russia. In the late 19th century, major discoveries in the excavations in Egypt were made by French researchers Gaston Maspero (1881; 1889) and Victor Loret (1898), German Egyptologist Emil Brugsch (1881), and English archaeologist Flinders Petrie (1884).

Pioneering works in the field of Antique and Ancient Egyptian art disclosed, according to Ludwig Borchardt, “the most striking lines of the incredible dialogue of epochs”. However, the recreation of the fullest possible picture of the history of art of the Ancient World required the hard work of dozens of researchers from different countries, and one of them was the Russian scientist Vladimir Malmberg.

Vladimir K. Malmberg was born in Moscow on the 1st of December 1860 in a merchant’s family. In 1884, he completed a course of History and Philology at the Department of Classics of the Kazan University. In the autumn of that year, Malmberg was awarded the Candidate of Sciences degree and since March 1, 1885 worked at the University to prepare for a professorship at the Department of History and Theory of Fine Arts. In this capacity he was seconded to the University of St Petersburg to study under the guidance of Professor Adrian V. Prakhov (art historian, archaeologist), Ivan V. Pomialovskii (researcher of Roman literature, archaeologist) and Petr V. Nikitin (literary historian).

During the Christmas holidays in 1885, Malmberg visited Dorpat (now Tartu), where Professor Georg Löschcke acquainted him with the university museum. Over the period of three months in the summer of 1886 in Germany, he attended the lectures of professors of the University of Berlin, historians of Antiquity, and archaeologists Ernst Curtius, Johann Adolf Michael Furtwängler and Carl Robert, and participated in practical exercises conducted by them. In 1887, his St Petersburg coach Prakhov was sent abroad on a scientific mission, and to continue his internship, Malmberg was relocated to Dorpat to work with professor Löschcke. In the spring of 1887 he passed the exam for a master's degree in Art History and Theory at the University of St Petersburg, and after reading two trial lectures was awarded the title of assistant professor.

In early 1889, Malmberg was appointed to the position of assistant-professor in the Department of History and Theory of Fine Arts at the Kazan University. However, in late 1889 the Ministry of Education invited him to take the position of the acting extraordinary professor of Classical Philology and Archaeology at the University of Dorpat. He agreed on condition that he would be lecturing only on the history of ancient art, antiquities of life and cult, and the ancient authors related to these disciplines. On May 10, 1890 Malmberg entered the service at the University of Dorpat (*Biograficheskii slovar'* …, 1903).

History of Ancient Art was a compulsory subject for the students of the department of Classics, so Malmberg annually repeated the course of the History of Greek and Roman Art. Besides the main subject he lectured Mythology, Greek and Roman Antiquity, Introduction into Homeric Epics and the Homeric Antiquity, as well as the works of Greek and Roman authors: Pausanias, Pliny, Vitruvius and Lucian. As elective subjects he lectured the Overview of Art History for junior classes and Explanation of Plaster Casts open to all faculties. He carried out practical exercises in various fields of archaeology, including antiquities found in Russia, as a result of the Imperial Archaeological Commission activities (Malmberg, 1891). The university lacked funds to buy materials for demonstrations and workshops, but Malmberg managed to get for free 28 plastic groups, individual statues and busts from the Imperial Academy of Fine Arts.

In the summer of 1892, Malmberg was assigned to an expedition to southern Russia, where he participated in archaeological excavations. In 1894, he was given an assignment for six months, most of which he spent in Athens. While in Greece, he took part in the journey to the Greek islands, organized by the German Archaeological Institute under the guidance of Professor Wilhelm Dörpfeld, the famous German archaeologist, and visited various places in the Peloponnese and Delphi. From Greece via Venice, Nuremberg, Cologne and Antwerp, he went to

London and via Berlin returned to Russia. In 1897, he traveled to Stockholm and Copenhagen and in 1900 to Paris, Rome, Naples, Pompeii, Florence and Vienna.

Based on his own and other scientists' archaeological discoveries, Malmberg wrote several articles on the history of Ancient Greek culture. In 1889, he published his work 'Essays on Ancient Greek art. Some methods of pottery-painters' in *Memoirs of the Imperial Russian Architectural Society in St Petersburg*. In 1899, his article on the history of the study of military arms of the ancient Greeks was published in *Scientific Proceedings of the Imperial Kazan University*. He wrote that in 1838 the Englishman Charles Fellows found bas-relief images of the fourth-century warriors carrying round shields with pieces of cloth-like dense mats attached. Later these boards with mats made of cloth or leather were found in figures depicted on vases (5^{th} century) and on sarcophagi (6^{th} century). According to Malmberg (1890), these mats served to protect the soldiers' feet from the arrows of the attackers.

In 1892, Malmberg's work *Metopes of the Ancient Greek Temples. Research in the Field of Decorative Sculpture*, was published in Dorpat, and was defended by him as his master's thesis. In 1894, after conducting his own research during a stay in Greece, he amended this work, carried out by studying the publications of other scientists. After analyzing the relief decoration on all four sides of the Parthenon, he concluded that the sculptural groups on the pediment and friezes were created by talented artists based on the models of the famous artist Polignotus, and the sculpture metope on the north side represents a pattern borrowed from another, less-known master (Malmberg, 1894).

In 1904 Malmberg defended, in St Petersburg, his doctoral thesis on *Ancient Greek Pediment Compositions*, in which he noted that the marble figures of the pediments were painted in ancient times with a predominance of red color and stood out against a dark blue or light blue background. In 1907, he became professor at the Moscow University, and spent the rest of his life in Moscow. Vladimir Pavlov (1962, p. 45) recalled: "I had the good fortune to listen to his lectures on Egyptian Art. He not as much analyzed the monument, but mostly described it, and the statue came to life in these descriptions, became soulful". As in the University of Dorpat, professor Malmberg, during his lectures, showed photos and drawings, and during the sessions at the museum – original works of art, or plaster casts and copies. For larger audiences he insisted on using the magic lantern (image projector) during demonstration, as it was done by Hermann Grimm in Berlin and Adolf Furtwängler in Munich (Malmberg, 1896). In addition to teaching, he put a lot of effort and energy to the museum work.

In the early 20th century, the Moscow Museum of Art, now named the Pushkin State Museum of Fine Arts, was opened. It was based on the Munzkabinett, the later Cabinet of Fine Arts and Antiquities of the Moscow University, as educational support and public repository of casts and copies of classic works of world art, and it was first called the Museum of Plaster Copies Named after Emperor Alexander III at the Moscow University (Kharko, 1960). The initiative for its creation in 1893 came from Ivan V. Tsvetaev, professor of Moscow University, doctor of Literature and the Roman historian, who became the first director of the museum. The museum building was erected under the supervision of architect Roman I. Klein from 1899 to 1894. The construction was funded by sponsors. At the same time there were on-going activities on collection and ordering of the future exhibits, in which Malmberg took part. The opening of the museum was held on May 31, 1912, and in 1913 Malmberg was appointed to the position of the director of the museum.

The pride of the museum was a collection of Egyptian antiquities collected by the famous Russian Egyptologist Vladimir S. Golenishchev (1856–1947), a distant relative of Commander Mikhail Kutuzov. Golenishchev had been fascinated by Ancient Egypt from a young age, and when he was 14 years old he acquired his first item which laid the foundation for the future collection. Having made later more than sixty trips to Egypt, he collected over 6,000 valuable monuments of Egyptian art, purchased by the Russian state on the occasion of the opening of the Museum of Fine Arts (Golovina, 2006). Inspired by the study of Golenishchev's artifact collection, Malmberg seriously engaged himself in the study of ancient Egyptian art.

Interest in the Egyptian art, derived from the general state of the study of Arts, has experienced a new surge in the first quarter of the 20th century. Throughout this period, Art stood out as the object of independent study in various fields of cultural history. The first special researches into art history, including Egypt, appeared in Western Europe. The work by Gaston Maspero from 1887 highlighted important issues of the artistic culture of Egypt and was titled *L'archéologie égyptienne*; in 1912 he outlined the same problem in a more profound form in a book titled *Essais sur l'art égyptien*. The emancipation of the history of Egyptian art from the general Egyptian studies eventually prevailed; its focus was not only the general patterns of development, but also separate directions, schools and artists. A variety of tasks of the young discipline of Egyptian Art History could be accomplished with the help of original materials assembled in the Department of Egyptian Antiquities of the Museum of Fine Arts.

The result of Malmberg's creative exploration was a series of works devoted to the attribution of the exhibits of the museum, the largest of which was written jointly with Boris A. Turaev (Malmberg & Turaev, 1917). An article, published in 1915, and polemical in its nature, devoted to discussing the methods of composition of human body in the works of Ancient Egyptian art, holds a special place in his work. The human figure, shown with expanded shoulders and upper part of the body from the front, and legs in profile, first appeared in the painted figures and in reliefs during Dynasty I, and remained such throughout the period of Ancient Egyptian art (Pavlov, 1936). In the study of art this method was given various explanations and interpretations. In the late 19th and early 20th century the dominating opinion, the most important representative of which was Bissingen, insisted that Egyptian artists sought to portray the human body in all three dimensions. Erman was in agreement with such an interpretation:

> *The dominant style in the Egyptian painting affects us primarily with a strange interpretation of the human figure. In an effort to show every part of the body from the point of view which for us is the most characteristic, Egyptian artists painted such a body with the strange twists that are completely contrary to reality. In general, the figure is conceived in profile, as evidenced by the head, arms, legs and feet. But in this profile an eye is placed en face, and the main confusion is in the torso, namely, the shoulders are visible from the front, while the tibia put in the profile, and chest and stomach should serve as intermediate link between them. With regard to the chest, then this is reflected by the fact that the posterior contour shows the outline of it* [the torso] *en face, and the front – in profile, the lower abdomen should be thought about three-quarters, as it shows the position of the navel.* (Erman, 1923)

Malmberg was the first to dispute this view, which was present in all textbooks on the history of art, insisting that it is about using only two dimensions:

> *I am – convinced that just the opposite – in the Egyptian picture, with the unfolded shoulders we never have the torso in front, but always from the side, as proven through its contour: one is always contour of the chest and abdomen, the other – back and the bottom. Excessive expansion of the body is due to the image of both shoulders and the need to drive the external contours of the body to the armpits.* (Malmberg, 1915)

And then concludes, “So, you could not talk about the inability of Egyptian artists to draw person on the plane surface, but only the desire to express three dimensions using the two most characteristic ones: the profile image is combined with expanded shoulders and put en face eye" (Malmberg, 1915, p. 16). Although the position of Malmberg was also controversial, his ability to be critical of the conclusions of a recognized authority deserves respect. In terms of the particular issue it is interesting to understand the view of Borchardt, who believed that the artist, drawing a figure, did not intend to create a common track, but constructed it from separate body parts that is close to the principles of children's drawings. Such drawing should be read like a letter, not to be perceived as a whole. Its strange proportions were caused by the desire to most accurately portray the individual items in their reality (Gess, 1921).

Malmberg, professor of the Moscow University, also lectured at the Imperial Archaeological Institute Named after Nicholas II, the institution established by private funds for the "scientific development of archaeology, archaeography and Russian history, with the supporting disciplines". The institute, which was opened in Moscow in 1907, admitted students with higher education, others could audit the courses. The education was scheduled for three years; the third year was devoted to archaeological excavations and studies in the archives. Lectures were given by the best specialists: philologist Sergei I. Sobolewskii, archaeologist Vassili A. Gorodtsov, art historian Vladimir K. Malmberg, and others. Occasionally, prominent scientists read the special courses. For example, the Russian artist Nicholas Roerich had chosen the following topic for his lectures – Applying Artistic Techniques in Archaeology.

In the first years of its existence, the Nicholas II Archaeological Institute occupied leased premises but then, at the expense of sponsors, mostly S. P. Ryabushinskii, a special building was constructed to host the institute. The construction works started on May 24th, 1913, on the day of celebrating the 300 years of the Romanov's dynasty, and in 1914 lectures were already conducted in the new building. The institute has opened branches in other cities of Russia: Smolensk, Nizhny Novgorod, Vitebsk, Kaluga, Yaroslavl and Rostov. The journal *Notes of the Moscow Nicholas II Archaeological Institute*, as well as individual works of researchers were published periodically; scientific expeditions around Russia and abroad were conducted; opening of the Russian Archaeological Institute in Rome was planned. But in the Soviet times the activities of the institute, which existed on donations and fees, ended.

Malmberg's works were known both in Russia and abroad. Together with a group of Russian scientists he participated in many international congresses, making reports on various topics, in particular: 'Gold artifacts found in Hersonissos' (1st International Archaeological Congress in Athens, 7–13

April 1905), 'On Belvedere Torso' (International Archaeological Congress in Rome, 9–16 October 1912). In 1917, the Russian colleagues expressed their respect to Vladimir K. Malmberg, dedicating to him the Digest of the Moscow Society for the Exploration of Ancient Monuments named after A. I. Uspenski at the Moscow Archaeological Institute. The digest included articles by such prominent specialists as Boris A. Turaev, Mikhail I. Rostovtsev, Voldemar K. Shileiko, Alexey V. Nazarevsky, and others. Nikolay A. Shcherbakov presented a list of the works of professor Malmberg, consisting of more than 50 positions (*Sbornik Moskovskogo obshchestva…*, 1917). Several years later, Malmberg was gone. He died in Moscow on December 9, 1921.

The Pushkin State Museum of Fine Arts continues to be a place of interest – a treasury of world art, a research center in the field of culture and art, an educational institution. Since the time of the first publications of Vladimir K. Malmberg, many new discoveries have been made, and many original ideas and concepts have been generated. But it all highlights the contribution that he and his colleagues, the first Russian Egyptologists, have made in the course of creating the museum and studying its remarkable collections.

Besides his research and lecturing activities, professor Malmberg was known in the field of the organizational-scientific work. He was a member of the Imperial Russian Archaeological Society in St Petersburg, the Society of History and Antiquities in Odessa, the Moscow Society of the Exploration of Ancient Monuments named after A. I. Uspenski, and the Associate Member of the Imperial Archaeological Commission and the German Archaeological Institute in Berlin, Rome and Athens.

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Some New Aspects of Georges Frédéric Parrot's Visions about the Institutional and Architectural Establishment of the University of Tartu in the Early 19th Century

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Abstact: *High regard for the beneficial and transformational aspects of education with a modern curriculum where science would have a leading role constituted a major part of the Enlightenment ideology. The article observes several similarities in the visions of education and architecture of Georges Frédéric Parrot, the first rector of the University of Tartu (historically University of Dorpat), Estonia and those of Thomas Jefferson at the University of Virginia, U.S.*

Georges Frédéric Parrot worked out the principles of the University statute, essentially differing from those of other universities in the Russian Empire. The University statute demonstrated a radical change in the sphere of academic education with a goal of establishing modern university autonomy or so-called 'scholarly republic', non-existent in this part of Europe at that time.

It was the American Thomas Jefferson, who first worded a similar conception of academic freedom and for all strata of the population equal opportunities to receive education. Both, Thomas Jefferson and Georges Frédéric Parrot emphasized the importance of natural science and medicine in university programs as well as the method of raising of the students' morals through their academic environment. The architectural concept of the Universities of Tartu and Virginia, built during the same period, reflects the messages of the Enlightenment era, those of secularization, humanity and intellectual freedom. In both cases the idea to build the University Churches was abandoned, however the main buildings were erected as Temples of Humanity. Likewise, the universities of Virginia and Tartu were under *the protection of Minerva, this being also reflected in the symbols of the universities. Georges Frédéric Parrot's and Thomas Jefferson's activities serve as a splendid illustration of the potential power of Enlightenment educational ideas to yield similar results while widely separated by space.*

Keywords: *academic education, Enlightenment, Georges Frédéric Parrot, Republic of Letters, Statute of the University of Tartu, the Enlightenment, Thomas Jefferson, university architecture, University of Virginia*

High regard for the beneficial and transformational aspects of education with a modern curriculum where science would have a leading role constituted a major part of Enlightenmet ideology. The Baconian ideal of collective scientific research and its application to the useful purposes of life is another fundamental pillar of Enlightenment thought, and fits naturally into a programme of progressive education.

The initial idea to reopen the University of Tartu and to launch the building process dates back to 1799 during the rule of Russian Emperor Paul I. However, the Emperor soon changed his mind, influenced by the Curonian nobility, and decided in favour of *Academia Petrina* in Mitau (Jelgava in Latvia). But then Alexander I ascended to the throne and decided to open the University in Tartu. The two decades from the beginning of the 19th century were the period of active construction both in the downtown area as well as on Toome Hill. It is not accidental that this period also coincides with the rule of Emperor Alexander I during 1801–1825 because his first governing period from 1801 to the Patriotic War of 1812 is known as a liberal pre-reformation era. During this time modernized ministries commenced working, and several social reforms were adopted in the spirit of the Enlightenment, such as the new regulation on education institutions. In addition, the peasants of Livonia and Estonia were liberated from servitude, construction work based on model façades and designs was launched in the towns of the Russian Empire, etc. Based on the new school reform, the University of Tartu became the centre of the Tartu's "educational circuit", and, in addition to the university, two upper secondary schools – district and provincial – were set up here (*Polnoe Sobranie...*, 1802–1803; 1804–1805).

Georges Frédéric Parrot, a physics professor of French origin, was elected the first rector of the University of Tartu. He had arrived in Livonia in 1795 to work as a tutor and immediately joined the Common Welfare and Economic Society of

Livonia (*Livländische Gemeinnützige und Ökonomische Sozietät*). In 1800, during the troubled times in connection with the transfer of the University to Mitau, Parrot sent a circular letter to members of the Common Welfare and Economic Society of Livonia and the University Board of Trustees (*Curatorium*) with a proposal to move the Society from Riga to Tartu, where, together with the university, it would be expedient to establish a joint Livonian Academy (EAA 1185, p. 17). Parrot envisaged the merger of the Common Welfare and Economic Society of Livonia and the university as a new scientific centre, where studies and scientific work would complement each other and, in addition, the focus would also be on the application of scientific discoveries to social needs. In his circular letter, Parrot stressed that the establishment of the Livonian Academy in Tartu would advance this place as a centre of domestic learning to facilitate the consolidation of the free and independent scientific spirit. Scholars from every field of life would be represented here. Likewise, it could be possible to establish a joint scientific library in Tartu, obtain equipment for research in physics, chemistry and mechanics; and compile collections of natural sciences and arts (EAA 1185, p. 18).

In the 18th century, the Enlightenment movement paid special attention to the improvement of the living conditions of all social strata in towns as well as in the country. To promote the application of these ideas, the Chair of Economics, Technology, Forestry and Architecture was established at the Faculty of Philosophy of the University. Among the goals of this research is to present an overview of the programme and activity of the Chair, held initially by Professor Johann Wilhelm Krause.

The events preceding and following the reopening of the University of Tartu reflected a strenuous struggle between different worldviews and ideologies. The Baltic German nobility, on the one hand, forming the membership of the University Board of Trustees (*Curatorium*), had an aim of achieving the status of *Baltische Landesuniversität*. The first Rector, Professor Parrot, opposed the University Board of Trustees whose members denied peasants' sons admission to the university and wished to control the activities of the academic staff (Tamul, 1998, pp. 74–79).

Parrot's *habitus* developed in the context of the circle of French scientists. Parrot had graduated from the University of Stuttgart, a high-level institution during the second half of the 18th century, and had thereafter started to work as a home tutor in Normandy, France, in the family of a protestant Count d'Héricy in Fiquainville Castle. Prior to going to Normandy in spring 1786, Parrot spent several months in Paris. During this period, Parrot's patron was a leading member of the research lodge *Les Neuf Sœurs*, the astronomer Joseph Jerôme Lalande, who introduced Parrot to famous scientists working in Paris and in later years served as a source of inspiration for him (Bienemann, 1902, pp. 35–36).

Les Neuf Sœurs, referring to the nine Antique Muses, patrons of the sciences and arts, had a pyramid as its emblem, symbolizing moral perfection and harmoniously ordered nature. Inside the pyramid there were compasses, a square, and the motto, *Force, Vérité, Union*. During the period of existence of the *Loge Les Neuf Sœurs* (1776–1792), the membership comprised approximately 400 leading scientists, educational figures, and representatives of fine arts from European countries and North America. The most authoritative member of *Les Neuf Sœurs* lodge was Voltaire who agreed to join the lodge a few months prior to his death, with a reason that his famous name would facilitate the advancement of the lodge's intellectual endeavours. This unique fraternity of scholars involved a number of influential educational reformers: Benjamin Franklin and Thomas Jefferson in America; Claude-Adrien Helvétius and Marie Jean Antoine Nicolas Caritat Marquis de Condorcet, who had given a new direction to French education. From Russia, the membership of the lodge comprised Alexander Stroganov and Dmitri Golitsyn, who had already tried to reform the education system during the time of the Empress Catherine the Great. Hereby, it is worthwhile to specifically highlight the fact that all the tutors of the young Emperor Alexander I and his coterie were members of *Les Neuf Sœurs* lodge, the most influential among them being Frédéric-Césare de La Harpe, a Swiss and a citizen of the Republic of Geneva. Regarding the circle of the close friends, or the so-called Intimate Committee of Alexander I, the ones who belonged to *Les Neuf Sœurs* lodge were Adam Jerzy Czartoryski, Pavel Stroganov and Viktor Kotchubei (Hans, 2002, pp. 279–297).

The new school system, developed on the example of the educational concept in *Les Neuf Sœurs* lodge, was first launched in Poland. The Polish National Committee on Education, established in 1773, was headed by Adam Czartoryski senior who, together with other members thereof, also belonged to the *Les Neuf Sœurs*. Although in 1792, the Constituent Assembly of France did not pass the educational reform proposed by the democrat Condorcet, the relevant principles were taken over and implemented in the Russian Empire, by way of the public education reforms of 1803–1804. Thus, the beginning of the 19th century in the Russian Empire marked the building up of one of the most forward-looking educational systems in Europe, whose roots originate from the circle of French physiocrats and the reforms devised by members of *Les Neuf Sœurs* 3odge (Flynn, 1988, p. 43).

Georges Frédéric Parrot was definitely familiar with *Les Neuf Sœurs* lodge's educational ideas, but due to his young age he was not able to join the lodge. Arriving to the Baltic provinces, Parrot became involved in educational questions straight away. It is highly probable that Parrot became one of the intellectual leaders who started to build a new scientific centre in the Baltic provinces of the Russian Empire. During his Tartu period he preserved correspondence with his former schoolmate Georges Cuvier, a famous French naturalist, who held the post of the Secretary of the French Institute. In that correspondence Parrot also remembers his patron Lalande, sending him his regards through Cuvier (Langins, 2004, pp. 297–304).

Parrot's ideas served as a basis for the principles of the university statute, curricula as well as the university's architectural ensemble, developed in 1803–1809. Mainly in collaboration with Karl Simon Morgenstern, Georges Frédéric Parrot drew up the University Statute that was essentially different from those of other universities of the Russian Empire in Vilnius, Kharkov, Kazan and Moscow. Parrot claimed complete academic autonomy and juridical immunity for the university with a legal subordination to the university`s own court. We can characterize this statute as a radical change towards the establishment of a modern academic republic. The University Statute demonstrated a radical change in the sphere of academic education with a goal of establishing modern university autonomy or the so-called "scholarly republic", non-existent in this part of Europe at that time. Parrot sought complete academic autonomy for the university, free from the corporative autonomy, which ruled the German cultural space in commanding the universities. (Andreev, 2006, pp. 19–20)

According to Parrot, the University of Tartu was supposed to be directly subordinated to the central authorities of the state. In Parrot's vision, the university had to be open to all social ranks, and he wished to abolish serfdom in the Baltic provinces and emancipate peasants through education to launch a process in which the more gifted among peasants could become medical doctors, lawyers and statesmen (Parrot, 1803, p. 13).

Simultaneously, Parrot was active in the foundation of co-educational parish schools and girls' schools. In his words, Enlightenment reached this province through school reform creating an educational system on a ladder principle, which means that every step in education is a preparation for the next (Parrot, 1804, pp. 1–16). This idea was first suggested by Claude-Adrien Helvétius, Pierre-Samuel Dupont De Nemours and Marie Jean Antoine Nicolas Caritat Marquis de Condorcet (Bowen, 2003, p. 247). Parrot also had great administrative ability, liberal political views, and the support of Emperor Alexander I during his liberal reforming period. It is important to point out that Parrot was the man who worked out the Statute of the University of Tartu and protected his views at the Ministry of Education and Enlightenment of Empire.

Concerning the moulding of the intellectual atmosphere of the reopened university, a great role was to be played by a circle of liberally minded professors, who gathered around Parrot, forming a certain intellectual fraternity bearing the name *Ephesische Kirche* or Ephesus Church. As a model for his "Church", Parrot used Voltaire's "Church" that comprised a circle of French Enlightenment thinkers who had gathered around Voltaire, Helvétius and other philosophers, who were men of letters, scientists and other intellectuals to implement the radical ideas of the Enlightenment by way of joint efforts. On the one hand, Voltaire's "Church" was an aggregate of ideas, on the other hand – it symbolized endeavour, movement, correspondence and diffusion of ideas. (Darnton, 2003, pp. 19–21) The personal seal of Parrot depicts a compass, a measuring rod, and above this, the inscription '*VERITAS'*, which was also the symbol of the Ephesus Church (Krause, 1784–1842). This affirms, yet again, that Parrot's intellectual sources originate in the French Republic of Letters and the lodge of *Les Neuf Sœurs.*

The complex of the University of Tartu buildings includes edifices, characteristic of scientific institutions, expressing in addition to their architectural and aesthetical values, the ideas of science and education of their time. The actual process indicates that the man to devise the entire architectural concept of the university was Georges Frédéric Parrot, who wanted to build a new scientific research area on Toome Hill. Aiming at the realization of his visions, Parrot invited his acquaintance, Johann Wilhelm Krause, to be the architect of the university. According to Parrot's initial vision university as a "republic of scholars" it would be essential to create a park around the academic edifices, to achieve an integral whole. In Parrot's words, Toome Hill was a "Temple of Wisdom, with its exterior sides altered into a Temple of Nature" – this would favourably influence the young people's imagination and would also inspire future generations to seek education (EAA 402). Indeed, Toome Hill evolved into one of the first public urban parks in Estonia. Such a concept – a park open to the citizens – is evidence of the first signs of democratization in the Baltic provinces (Tohvri, 2009, pp. 171–172).

It was the American Thomas Jefferson, who first worded a similar conception of academic freedom and equal opportunities to receive education for all strata of the population. In 1779 Thomas Jefferson sent his proposals to the legislative assembly of Virginia titled *Bill for the More General Diffusion of Knowledge* and commenced preparations to establish the University of Virginia in Charlottesville. This bill was one of the two landmarks in Jefferson's career as an educational statesman. The key element in Jefferson's bill advocated a pyramid-shaped system of public education, with many elementary schools feeding into a more select level of grammar schools, and a single university at the top. The primary level was intended to teach basic literacy necessary for everyday business transactions and familiarize young Republican boys and girls with their political rights and obligations. Tuition rates were based on a sliding scale: poor students would be subsidized but those who could pay would. The university was intended to train future leaders and professionals in law and medicine (Addis, 2003, p. 12).

Despite his provincialism when it came to location, Jefferson still looked to Europe for ideas. When working overseas as Minister to France in 1785–1789, he introduced his ideas to the circles of intellectuals in Paris. It must be emphasized that Parrot had enjoyed the same atmosphere in the French capital before arriving in Livonia. Jefferson studied the universities in Paris, Italy, Switzerland, and Scotland. During Jefferson's first term of presidency of the U.S. he solicited advice from the National Institute of France and the Universities of Edinburgh and Geneva (Addis, 2003, p. 27).

In the 1790s and 1800s, Jefferson corresponded with intellectuals like Thomas Cooper, Joseph Priestley, and Pierre-Samuel Dupont de Nemours about education. Jefferson made his first reference to the University of Virginia in an 1800 letter to Priestley: "We wish to establish in the upper & healthier part of the state a University on a plan so broad & liberal & modern, as to be worth patronizing with the public support, and be a temptation to the youth of other states to come and drink of the cup of knowledge & fraternize with us." (Jefferson, 1984, p. 1070). Another Jefferson's letter to John Hollins in 1809 is entitled 'The Republic of Science'. Jefferson highly appreciated the nature of the correspondence which was carried on between societies instituted for the benevolent purpose of communicating to all parts of the world whatever useful is discovered in any one of them. These societies are always at peace, even if their nations may be at war. Like the Republic of Letters, they form a great fraternity spreading over the whole earth, and their correspondence is never interrupted by any civilized nation. (Jefferson, 1984, p. 1201)

As early as in 1804–1805 he had been considering buildings in the form of "an academic village rather than one large building". By 1810 his ideas had crystallized into a complex of buildings with "a small and separate lodge for each professorship". Jefferson's new University of Virginia conception planned as an academical campus located in the nature, which was brought to life in 1810. The pavilion-like 'academic village' became the new model for future university campuses. According to Jefferson's architectural concept, 'science' and 'virtues' had to be consolidated under the cupola of the Rotunda and be open to the Virginian landscape where studious youth could walk between the colonnades together with their professors. The new university had to be governed by absolute harmony and the intellectual freedom of the Seeker for Truth. This idea is very similar to Parrot's seal design. Jefferson had said, "This institution will be based on the illimitable freedom of the human mind. For here we are not afraid to follow truth wherever it may lead, nor tolerate any error so long as reason is left free to combat it." This private saying came to be regarded by later generations as a classic statement of the principle of academic freedom. (Malone, 1981, pp. 417–418).

Both Thomas Jefferson and Georges Frédéric Parrot emphasized the importance of natural science and medicine in the university programs, as well as the method of raising of students' morals through their academic environment. The architectural concept of the Universities of Tartu and Virginia, built during the same period, reflects the messages of the Enlightenment era, those of secularization, humanity and intellectual freedom. In both cases the idea to build the University Churches was abandoned, however the main buildings were erected as Temples of Humanity. Likewise, the universities of Virginia and Tartu were under the protection of Minerva, this being also reflected in the symbols of the university (Tohvri, 2009, p. 153).

To summarize briefly, the two themes of the Enlightenment, namely progressive education and a rationally constructed environment, were vividly expressed in the thoughts and deeds of Georges Frédéric Parrot and Thomas Jefferson. Their activities serve as a splendid illustration of the potential power of ideas to yield similar results in a widely separated space. The University of Tartu and the University of Virginia are the monuments to Enlightenment rationality.

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Pedagogy: A Discipline under Diverse Appellations

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Abstract: *The history of educational institutions is a widely studied issue, while the history of pedagogy as a scientific discipline has attracted researchers' attention only since the late 1990s, and it still remains an insufficiently studied issue both in the Baltic States and elsewhere in Europe. Thus, the purpose of the present article is to give an insight in the historical development of pedagogy as a scientific discipline and to characterise the current situation in the science of pedagogy as well.*

Germany has always been the leader among European countries with regard to the development of pedagogy as a scientific discipline. That is why the development of pedagogy in Latvia has been studied within the context of German experience, tracing a lot of analogies with the other Baltic States. The sources of the study included textbooks in pedagogy used by teacher training institutions in the territory of Latvia, pedagogical literature and the press. The theoretical framework for the understanding of the development of pedagogy was based on the criteria for the formation of pedagogy as a scientific discipline worked out by Rita Hofstetter and Bruno Schneuwly. The key idea used in the present article is the one concerning the creation of scientific knowledge which forms a theoretical model and which has been obtained by means of proper research methods as one of the criteria for the formation of a science.

In the beginning, the theory of pedagogy developed as part of theology and philosophy. During the Enlightenment in the 18th century, when universities focused on teacher education, their professors started paying increasing attention to the development of pedagogical theory – the definitions of key concepts and the formation of the structure of pedagogy. This process proceeded particularly fast in the second

part of the 19th century and in the first decades of the 20th century. At that time, pedagogy became an academic discipline in Latvia as well, since a course of studies in pedagogy was offered at the University of Latvia, founded in 1919.

The close link of pedagogy with philosophy and theology in the initial period of its development was determined by its research methodology – human education was studied theoretically. However, at the end of the 18th century there emerged an idea about empirical pedagogical research – namely, observations. The development of psychology and sociology in the late 19th century and the early 20th century enriched pedagogy with methods characteristic of these sciences (tests, surveys, interviews, etc.). Nevertheless, the discussion between the adherents of the humanities and social sciences in the field of pedagogy continued for a long time until the 1960s when pedagogy finally joined the camp of social sciences adopting such research methods as surveys, interviews, case studies, as well as statistical data processing methods as its own. Still, complete disregard of the research traditions of the humanities could discourage the further development of pedagogical theories.

Initially, the structure of pedagogy developed as practical tips for teachers, which were gradually arranged in a theoretical system traditionally comprising the history of pedagogy, the theory of upbringing, didactics, and school management. As the area of educators' activity gradually expanded and reached beyond school premises, the pedagogical theory had to embrace an increasingly wider field of research as well. Since the 1960s, there have appeared new directions of the pedagogical practice and research like adult education, environmental pedagogy, media pedagogy, etc.

The indistinct boarders of the field of pedagogy and the variability of research methodologies have also affected the denomination of the pedagogical discipline: in different countries different terms are used to refer to pedagogy. The terms used in the English language are 'education', 'educational science(s)', 'pedagogy'; two terms 'Pädagogik' and 'Erziehungswissenschaft' are used in the German language, while in French three different terms coexist with each other: 'pédagogie', 'science de l'éducation/sciences de l'éducation'. In Lithuanian the term 'edukologija' is used, 'pedagoogika' and 'kasvatusteadus', 'haridusteadus' in Estonian, and 'pedagoģija' and 'izglītības zinātnes' in the Latvian language.

Just like the discussions concerning the denomination of pedagogy, the debate about its structure and research methodologies is still ongoing. It should be noted, though, that nowadays when interdisciplinary research is in vogue, the amorphousness of the field of pedagogy is not a drawback; on the contrary, it enables us to use the achievements of other sciences in a flexible way in order to tackle pedagogical problems.

Keywords: *educational sciences, pedagogical research, pedagogy*

Introduction

The history of pedagogy can be examined in two ways: both as the history of education and upbringing and as the history of a particular scientific discipline (Kron, 2001, p. 25). Although different pedagogical guidelines and ideas can be found in literary, philosophical, political and religious texts created since the dawn of civilization, pedagogy has developed as a separate academic discipline comparatively recently. That is why the origins and the development of upbringing and education have been extensively studied, while the history of pedagogy as an academic discipline attracted researchers' attention only in the last decades of the 20th century, and it still remains an insufficiently studied issue both in the Baltic States and elsewhere in Europe. The purpose of the present article is to give an insight into the historical development of pedagogy as a scientific discipline and to characterise the current situation in the science of pedagogy as well.

As a result of an extensive study, the Swiss scientists Hofstetter and Schneuwly have worked out four criteria which characterize the formation of pedagogy as an academic discipline:

1) *Scientific production of knowledge, based on the elaboration and continuous renewal of concepts and theoretical models that constitute objects of knowledge, and of methods of data collection and analysis.*
2) *Institutional foundation that allows the professionalization of research through the existence of chairs, studies, researchers and specialized research groups, laboratories, institutes.*
3) *Communication networks constituted by means of publication (journals, series of specialized books, grey literature), of research associations on the different levels of the academic building, of scientific events (congresses, conferences, seminars, workshops, etc.).*

4) *Socialization by different modes of education and of recruitment for researchers and manifesting itself by the disciplinary affiliation by the biography of the researchers* (Hofstetter & Schneuwly, 2003, p. 56).

In the present article, we are mainly going to focus on the analysis of the first criterion since the knowledge obtained as a result of scientific cognition by means of scientific research methods and arranged in a certain system is the cornerstone for the foundation of any science (Vedins, 2008; Wahrig-Burfeind, 2006; Kron, 1999; Tschamler, 1983).

To illustrate the development of pedagogy as a scientific discipline, a Latvian example linked with the German context will be used, as this country has been a recognized leader in the field of pedagogy for centuries, and the genesis of pedagogy as a scientific discipline, which started in the German territory, has had a significant impact on the development of pedagogy elsewhere in Europe, including the Baltic States up to the year 1940 (Krūze *et al*., 2009).

The development of pedagogy as a scientific discipline was mainly studied in the period starting from the second half of the 19th century till the mid-1930s, which was the time when the processes concerning the development of pedagogy as a scientific discipline were particularly dynamic in Europe, and pedagogy formed as a separate scientific discipline in Latvia as well. The article does not examine pedagogy as a scientific discipline after the occupation of the Baltic States by the Soviet Union in 1940, as development of pedagogy was continued in the context of radically different paradigm and analysis of this complicated situation would significantly expand the scope of this article. It should be also pointed out that the present article will not address the legacy of particular educationalists as we have been mainly interested in the pedagogical discipline as a multidimensional phenomenon within the context of the respective epoch.

The sources used in the present research included the curricula in pedagogy used by teacher training institutions which were available in the Latvian State Historical Archives, textbooks in pedagogy, pedagogical literature and the press.

Although the term 'education' is more widely used in the English language, the word 'pedagogy' will be used in the present article in order to demonstrate changes in the pedagogical terminology more precisely.

The development of pedagogical research methodology as the basis for the formation of pedagogy as a scientific discipline

In order to be recognised as a separate scientific discipline, the knowledge concerning pedagogical issues has to be *scientific*, that is obtained as a result of scientific cognition by means of scientific research methods and arranged in a certain system; besides, separate elements of the system have to be logically related to each other (Vedins, 2008; Wahrig-Burfeind, 2006; Kron, 1999; Tschamler, 1983).

Initially, pedagogy as an academic discipline existed in the world as part of philosophy or theology, which also determined its research methodologies – they were theoretical reflections about education or practical tips for teachers and other educators based on personal experience. In the late 18th century, under the influence of the Enlightenment, the process concerning the disciplinary emancipation of pedagogy started gradually. At the end of the 18th century, as a result of the rapid development of natural sciences, the view that not only theoretical but also empirical study of the child was possible, mainly by means of observation, was voiced louder and louder. Nevertheless, the progress in this direction was slow as the views on the method of observation were different. The first researchers studying children tried to collect as much empirical material as possible in order to formulate the theory of the soul based on the analysis of observations (Schmid, 2006, pp. 29–30).

A new debate in the field of pedagogy was started by Wilhelm Dilthey (1833–1911), who criticised the attempts to transfer the worldview based on natural sciences and their methodological model to human sciences as too naïve. Dilthey, who was the founder of the humanities pedagogy (*geisteswissenschaftliche Pädagogik*), which is still popular in Germany, developed the theory of understanding – the theory concerning the understanding and interpretation of human activity in the context of a certain period and society. Dilthey believed that nature could be explained, but the life of the soul – *understood* (Löwisch, 2002).

At the end of the 19th century, the flourishing of psychology and sociology and the penetration of these sciences into the field of pedagogy gave new impetus for pedagogical research. Observation, measurements, tests, experiments and statistics were used both in Europe and the U.S.A. Experiential education founded by the American John Dewey, and experimental psychology and pedagogy proposed by the German Wilhelm Maximilian Wundt were well known all over the world. An interesting example in this respect is the work *Beobachtungen* *auf dem Gebiete der Pädagogik* (Observations in the field of pedagogy; 1870) by Hermann von Westermann, faculty member of the Riga Polytechnic (Riga Polytechnical Institute), where it was stated that in pedagogy it was possible to use the same research methods as in natural sciences and to conduct research in a similar way to that of observing the stars (Zigmunde, 2008, p. 73).

The variety of research tools for studying the child, his development and education resulted in the idea to use all of them together so as to achieve the best result. Obviously, this research arsenal required one common denomination. In 1893, the American scientist Oscar Chrisman came up with the term 'pedology'. Pedology was the study strongly based on positivism: it used the research methods of various sciences – observation, measurements, and psychological experiments – in order to clarify the biological, psychological and social laws determining child's behaviour. Pedology attempted to encompass various sciences, the leading ones being biology, psychology, and sociology. By means of these sciences, pedologists hoped to finally obtain perfect knowledge about the child which could be used in educational practices as well. Pedology experienced the peak of its popularity in Western Europe from 1890 to 1914: in 1909, a Pedological Society was organised; in 1911, the first and the last World Congress in Pedology was held in Brussels with participants from 22 countries. Unfortunately, this promising endeavour was a failure: it turned out that it was not possible to integrate the methods of various sciences together in one uniform model (Depaepe, 1987; 1992; 2002). The successfully developed educational psychology turned out to be the most valuable contribution of pedology to pedagogy.

It should be noted that pedology was popular in Soviet Russia until the mid-1930s, and the famous psychologist Lev Vygotsky was one of its most prominent supporters. However, soon Stalin declared pedology to be a pseudoscience which exaggerated the importance of inheritance and the environment, thus creating advantages for the children of intellectuals rather than the working class. Pedology was banned and severely criticised during the entire Soviet period (see, e.g., Iļ´ina, 1971, pp. 34–35).

In Latvia, pedology was recognised as one of the basic disciplines in pedagogy in the 1920s by the educators Kārlis Dēķens (1919, p. 4) and Krišs Melnalksnis (1920, pp. 193–195), both sharing left-wing political views, but their ideas did not gain wider popularity.

In 1919, pedagogical research methodologies became the focus of serious academic discussion for the first time in Latvia when professors of pedagogy were elected at the newly established University of Latvia. Although in the 1920s and 1930s extensive studies were carried out in the field of experimental psychology in Latvia, there were no reverberations from them in pedagogy inside the walls of the University of Latvia.

Following the German traditions of the humanities pedagogy (*geisteswissenschaftliche Pädagogik*), reflections on the ideas of ancient and modern thinkers concerning pedagogy, psychology and philosophy were considered to be the main research method in pedagogy. Even though empirical methods were also mentioned in research papers, professors did not give any convincing guidelines about their application. Professor Kauliņš, for instance, wrote that

> *the accuracy of statements and postulates clearly has to be proved, and it can be proved convincingly by analyzing, comparing, grouping, and generalizing different observations, facts and abilities both from the intentional and unintentional process of upbringing, i.e. by subjecting them to extensive, slow scientific research work* (*Kauliņa vēstule...*, 1938, p. 128).

According to Professor Dauge, it is easy to be objective in exact sciences where purely neutral things like 2 × 2 = 4 are studied; there "we can be bloodless creatures without any temperament", while "in the matters concerning human life, absolute objectivity is impossible" (Dauge, 1932, p. 2). Professor Jurevičs pointed out that pedagogy cannot be classified either in the category of purely empirical sciences or among purely philosophical studies; its position is in between them, "it is based on certain specific abilities in order to direct upbringing to certain ideals which have not been fully realized yet" (Jurevičs, 1937, p. 30351).

Along with the development of psychology and sociology in particular, the debate concerning pedagogical research methodologies continued in the world. Since the 1960s and 1970s, along with testing, experiments and observation, such research techniques as surveys, interviewing and case studies, as well as statistical data processing methods, became more widely used in pedagogy (see, e.g., Cohen *et al*., 2007). Nowadays, these techniques are widely used in pedagogical research in Latvia as well (see, e.g., Špona & Čehlova, 2004), discarding the traditions of the humanities almost completely.

The attractiveness of sociological methodologies in the eyes of educators has been explained by Depaepe (1987) with a certain grain of irony: experiments grant a higher status for psychologists and educationalists themselves – by means of statistical formulae and impressive tables, psychologists and educationalists surround themselves with the aura of science, thus enhancing their status and competitiveness in the labour market.

The structure and terminology of pedagogy

Just like research methodologies, the notions of pedagogy did not concentrate within the framework of a separate scientific discipline till the second half of the 18th century; they developed within the framework of philosophy and theology. Education practitioners and public figures expressed edifications concerning the upbringing of young people addressed to teachers and parents. A lot of illustrations to this can be found in the history of pedagogy, but one of the most well-known examples in the Baltic States is the speeches by Jānis Cimze (1814–1881), the head of Vidzeme Teacher Training Seminary addressed to prospective teachers and collected by his student Jānis Rinkužs (1938), which are full of pedagogical recommendations and edifications.

Only when pedagogy started disengaging from other sciences and developing into a separate academic discipline did pedagogy try to overcome the gap between the mere coexistence of various separate recommendations referring to educational practice and pedagogical ideas which could be regarded as theories binding everything together in a systematic interrelationship (Böhm, 2004, p. 750). According to several authors (e.g., Depaepe, 2002; Tenorth, 2004), Johann Friedrich Herbart (1776–1841), the professor of Königsberg and Göttingen universities, played an important role in granting pedagogy the status of a scientific discipline; he presented pedagogy as a structured science and pointed out that practising and prospective teachers needed a professional science of pedagogy. His book *Umriss pädagogischer Vorlesungen* (A summary of lectures on pedagogy; Herbart, 1835) is considered one of the first scientific publication in the field of pedagogy.

Universities started offering courses in pedagogy in the 18th century when the first department of pedagogy was established at the University of Halle in 1779. However, systematic courses in pedagogy, separate from those in theology and philosophy, were taught in European universities only starting from the early 20th century. This was closely connected with the expansion of secondary education and the development of teaching profession at a higher level: the determination of knowledge necessary for the teaching profession developed the teacher education and professionalisation, as well as pedagogy as an academic discipline. Pedagogical knowledge was systematised in a certain model, and the issues concerning terminology became increasingly important. The trivial words of everyday language could no longer express the essence of some issue in a comprehensive way; therefore, the development of new notions started within the framework of pedagogical theory. According to Kron (1999), the knowledge obtained in the process of cognition which is aggregated in a certain system is expressed in words, and these words become notions.

Like in Germany, the development of the structure of pedagogy in Latvia was connected with establishing of pedagogy as an academic discipline in the University of Latvia. The task of developing pedagogy into an academic discipline was undertaken by three professors mentioned above – Jānis Kauliņš (1863–1940), a philologist and educational historian, Aleksandrs Dauge (1868–1937), a historian and pedagogue, and Pauls Jurevičs (1891–1981), a philologist and philosopher, as well as Jūlijs Aleksandrs Students (1898–1964), a faculty member in various teacher training institutions, a philosopher and psychologist. Their views had mainly been formed under the influence of German pedagogical ideas, which can be seen from references in the curricula and publications: for instance, in the book *Vispārīgā paidagoģija. Zinātne un māksla sevis un citu audzināšanā* (General pedagogy. Science and art for developing oneself and others; Students, 1933), Students provides references to 944 works, 885 of which are in German, but only 59 in Latvian, Russian, English, and French. When explaining his pedagogical views in a letter to Professor Jurevičs, Professor Kauliņš admits that they have been formed under the influence of the German authors Ernst Krieck and Nicolai Hartmann, who can be considered as "the main supporters of the science of pedagogy" (*Kauliņa vēstule*..., 1938, p. 129). By the way, references to Krieck's work *Philosophie der Erziehung* (The philosophy of upbringing; Krieck, 1922) can be found in the works of all leading Latvian pedagogues in the 1920s and 1930s.

According to Latvian pedagogues, the field of pedagogy as a scientific discipline comprised the history of pedagogy, which makes it possible to identify relationships between the phenomena of upbringing and the theory of upbringing (Jurevičs, 1937, p. 30351). The theory of upbringing, in turn, included aesthetic education, social education, economic education, political education, and religious education (Dauge, 1934–1935). Jurevičs and Students added school management to the history of pedagogy and the theory of upbringing; Jurevičs also added didactics. Overall, the model of pedagogy comprising the history of pedagogy, the theory of upbringing, didactics and school management was traditional for Europe in the interwar period, and it constitutes the core of pedagogy as a scientific discipline nowadays as well.

After the Second World War, the borders of pedagogy expanded along with the expansion of pedagogues' scope of activity. The awareness of the fact that pedagogical knowledge was necessary not only in schools but also in the institutions of higher education, interest education, in the army, etc. resulted in the modification of the theoretical model of pedagogy. Along with general pedagogy, there started the development of various branches of pedagogy. Since the 1960s, discussions concerning environmental education, adult education, family education, health education, cross-cultural education, etc. were started in the world (see, e.g., Raithel *et al.*, 2009).

This versatility has also reached Latvia in the last twenty years. Nowadays in Latvia, the theoretical model of pedagogy comprises general pedagogy, including the theory of upbringing and general didactics, social pedagogy, developmental pedagogy, which includes preschool pedagogy, school pedagogy, pedagogy for the institutions of higher education, vocational pedagogy, as well as separate branches of pedagogy including music pedagogy, sport pedagogy, health pedagogy, and environmental pedagogy (Špona & Čehlova, 2004).

The denomination of pedagogy

When the word 'mathematics', 'biology', or 'history' is mentioned, everyone understands what branch of science it refers to. As to human education and upbringing, in contrast, there is no uniform opinion about the name of the science. The terms 'education', 'educational science(s)', 'pedagogy' are used in the English language; two different words '*Pädagogik*' and '*Erziehungswissenschaft*' are used in German; in the French language, three terms coexist with each other: '*pédagogie*', '*science de l'éducation*'/ '*sciences de l'éducation*' (educational science/sciences); the term '*pedagogika*' is used in Russian; '*pedagoogika*' and '*kasvatusteadus*', '*haridusteadus*' (educational sciences) in Estonian; '*pedagogika*' and '*edukologija*' in Lithuanian; '*pedagoģija*' and '*izglītības zinātne/zinātnes*' (educational science/sciences) in the Latvian language. According to Hofstetter and Schneuwly, this diversity of denominations reflects the diversity of views and lack of clarity with regard to the content of pedagogy: "This diversity is in itself an index for the fact that the field is characterised by unclear contours, by permeable boundaries, by a variable structure, by an uncertain continuity, by contrasted configuration" (Hofstetter & Schnewly, 2003, p. 55). This also relates to Kron's (1999) statement that by creating notions with the help of definitions a research object is revealed and made more exact.

Pedagogy, however, lacks such uniform definition; different terms referring to the field of educational science have developed separately depending on the cultural, geographical and historical context.

Already at the very beginnings of the development of pedagogy, two different domains could be distinguished: educational practice and theoretical reflections on this practice. The key role of theories was to help develop the educational practice and to improve it. One of the first attempts to reflect this dual situation and to find a proper name for educational theory can be found in Germany. In the second half of the 18th century, the term 'pedagogy' was used in the territory of Germany; the etymology of the term described in the literature written in English, German, Russian, and Latvian languages links it with the Greek word *paidagogós*, which originally referred to a slave who accompanied a child in his daily activities; for instance, he had to take him to school and back home. The original meaning of the word – "leading the child" – gradually transformed into a more general meaning 'child-instruction' (Hobmair, 2008; Drosdowski, 1989). Böhm (2004, p. 750) disagrees with this widely known etymology of the word 'pedagogy'; he believes that the foreign word 'pedagogy', which was used as a term referring to a new science, appeared in Germany only around the year 1770, and it has not been derived from the Ancient Greek word *paidagogós*, but has been created from the Greek word *paideia* – 'instruction, education'; thus, it refers to "instruction and the theory concerning human education and upbringing", and the word has nothing to do with slavery.

Along with the word 'pedagogy', the term 'the science of upbringing' (*Erziehungswissenschaft*) also appeared in Germany almost at the same time; the first evidence about it refers to the year 1766 (Tenorth, 2004, p. 341). Initially, the term 'pedagogy' was a common denomination for everything related to educational practices. However, when pedagogy developed into an independent scientific discipline, there appeared a need for a notion that would refer to the scientific interpretation of the reality of upbringing (Hobmair, 2008, pp. 12–13). Thus the term 'the science of upbringing' was introduced in Germany, which is also referred to as 'scientific pedagogy' by the pedagogy researcher Tenorth (2004, p. 341).

The diversity of views about the denomination of pedagogy existed in Germany both in the 19th century and at the beginning of the 20th century; frequently, the same author used both terms as synonyms referring to the educational science. It is difficult to find a common denominator in this diverse use of terminology, but there can be observed a trend that the term 'the science of upbringing' was preferred by the representatives of teachers' movement; it was also used in the pedagogy guided by the Catholic Church and by the theoreticians of National Socialism in the 1930s. The term 'pedagogy', on the other hand, was more often used referring to philosophy or the humanities, as well as referring to the whole field in general as part of the system of sciences. The functional equivalence of both terms was often emphasised in lexicons giving the reference "see 'pedagogy'" at the entry of the term 'the science of upbringing' or not isolating the term 'the science of upbringing' as a separate entry at all, but explaining it together with the term 'pedagogy' (Tenorth, 2004). Discussions concerning both terms continued in Germany also in the second half of the 20th century. In the professional literature written in the German language, both terms – 'pedagogy' and 'the science of upbringing' – are still used as synonyms quite often.

In the territory of Latvia, the term 'pedagogy' started to be used along with the beginnings of the professional education of teachers. As this field was the intersection between the interests of German landed gentry and Russian civil servants, the influence of both German and Russian cultures in the choice of terminology can be traced. For instance, in the year 1879, the syllabus of the Vidzeme Teacher Training Seminary, where instruction was offered in German, contained the term '*Die Schulkunde*' (*Lehrplan*..., 1879, p. 15), which could be translated as 'Studies about school'. On the other hand, the curricula of the Baltic Teacher Training Seminary and women's gymnasiums, where instruction was offered in Russian, included the subject Pedagogy (*Pedagogika*) in the early 20th century (*Otchet*..., 1874, p. 5; Tomāss, 1940, p. 100). At the beginning of the 20th century, the term 'pedagogy' was used both in the curriculum of the Jelgava German Teacher Training Seminary (*Deutsches*..., p. 12) and in the curricula and syllabi of teacher training seminaries where instruction was offered in Russian (Fal'bork & Charnoluskii, 1901, p. 42). The words '*Pedagoģija*', '*paidagoģija*', '*paidagoģika*' or '*pedagoģika*' found their stable place in the Latvian language in the following decades, while the term 'the science of upbringing' (*audzināšanas zinātne*), so widespread in Germany, was used as a direct translation into Latvian in only few publications (e.g., Dauge, 1925).

At the same time, in the 1920s and the 1930s, the idea about two different terms referring to pedagogy arose in Latvia in order to distinguish its practical and theoretical aspects. One of the proponents of this idea was the abovementioned Professor Kauliņš (1924, pp. 42–78) at the University of Latvia. He believed that '*pedagoģika*' and '*pedagoģija*' would be the appropriate terms in the Latvian language. The former would refer to educational theory, the latter – to practical activity. Kauliņš used a comparison with surgery, which is based on anatomy and physiology, with farming, which is based on chemistry, and with judge's practice, which is based on law. According to Kauliņš, pedagogy as an aggregate of practical knowledge originated at the dawn of civilisation, but it is still new as a scientific discipline, and it has to make itself free from the bondage of religion and philosophy. Kauliņš's view about the use of two different terms was supported by his colleague Professor Jurevičs: "pedagogy as theory and reflection has to be separated from upbringing as the action which this reflection is focused on" (Jurevičs, 1937, pp. 30348–30349); however, further in the text Jurevičs doubted himself whether it would be possible to set apart theory and practice so strictly. Nevertheless, neither Kauliņš's nor Jurevičs' view gained wider support, so Latvian pedagogues continued using the term *'pedagoģija'*, including different content into it at different times.

As it was mentioned above, during the decades various practical and research directions developed within the framework of the field of pedagogy (adult education, environmental education, etc.). Most of the countries, including Latvia, have decided to put all this diversity under the umbrella term 'pedagogical/educational sciences'. Nevertheless, the term 'pedagogy' still remains to be popular in Europe, and, according to the university study programmes published on the Internet, it is used in German, French, Spanish, Dutch, Polish, Estonian, Lithuanian, Latvian and other languages. A question still remains: what is understood by this term in each country? It still remains a topic for discussion just like the structure of pedagogy and its research methodologies.

A few conclusions

Although pedagogy as a scientific discipline – a "child" of the Enlightenment – is still considered to be one of the newest branches of science, it has taken it almost 300 hundred years to continue its difficult journey aimed at developing theoretical models and valid research methodologies.

As this study has shown, pedagogy has been emancipated from theology and philosophy, its "mother sciences", and it has been regarded as an independent scientific discipline since the end of the 18th century: it is taught at universities, and it has its own system of creating scientific knowledge. On the other hand, nowadays with the expansion of the field of pedagogy beyond the family and school and encompassing the life of the entire human society, pedagogy finds itself in close interrelationship with other branches of science once again – with psychology, sociology, and history, in particular. The debate of its position among other sciences is still ongoing, and the borders of the field are quite blurred, which, according to Hofstetter and Schneuwly (2003), is also reflected in the diversity of the terms referring to pedagogy. A valid question to be raised is whether nowadays, with interdisciplinary studies becoming increasingly popular, are there many scientific disciplines with a strict and definite field left? Possibly, the amorphousness of the field of pedagogy is not a drawback; on the contrary, it gives an opportunity to use the achievements of other sciences in order to tackle pedagogical problems.

Pedagogy originated as part of the humanities, but it continued its development both within the paradigm of the humanities and natural sciences. Nowadays, it is developing as a social science using research methodologies characteristic of social sciences, which are attractive and offer a certain guarantee that research would be objective. At the same time it should be taken into account that a complete renunciation of the research traditions of the humanities can impoverish the further development of pedagogical theory.

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Estonian Technology Education in Exile after the Second World War

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Abstract: *This paper surveys the educational pursuit of Estonian refugees during the years following the Second World War. Among the preferred countries of destination for Estonian refugees were the U.S.A., Canada, Australia, New-Zealand, where they continued to pursue their studies. The adaptation of refugees to local life in Sweden proceeded rather smoothly; the process was facilitated by the eager attitude of the refugees themselves as well as the situation in the labour market and likewise the friendliness and compassionate disposition of the Swedes. A correspondence institute was started for development of qualifications through extramural studies. The conditions in Germany were quite dissimilar, as the country was devastated and exhausted by the war. The first refugee camps were formed after capitulation. Then schools were started and various courses, including in technical training, were launched. The foremost position in vocational retraining was given to the acquisition of practical professions. In Geislingen, which was the largest centre of Estonian refugees, a technical school commenced with four departments: Building, Electrical Engineering, Mechanical Engineering and Architecture. Technology courses could also be taken at the Baltic University in Hamburg-Pinneberg, which was operating as a collective venture of Estonian–Latvian–Lithuanian refugees. With the emergence of emigration opportunities in 1949, refugee camps in Germany were gradually abandoned.*

Keywords: *professional skills, schools in refugee camps, technical courses, vocational training, vocational retraining, workshops of vocational schools*

In the autumn of 1944, about seventy-five to ninety thousand people left Estonia for western countries to flee from the new Russian occupation. They were mainly headed to Germany and Sweden. According to different authors, as many as forty to fifty thousand Estonians reached Germany and its neighbouring regions within the wave of refugees. Thirty thousand Estonian refugees arrived in Sweden either by boat straight across the Baltic Sea or through Finland (Kumer-Haukanõmm, 2006). The majority of refugees to arrive in Sweden were compelled to settle in camps. As they did not have command of the Swedish language, finding a job was difficult for them at the start. As a rule seeking a solution for their language problem remained a concern of the camp inhabitants themselves, whereas courses for learning the Swedish language were arranged only in few places (Andræ, 2005, pp. 183–184).

The study of language was supported by expeditiously issued dictionaries, among which the great Swedish–Estonian dictionary by Per Wieselgren, Paul Ariste and Gustav Suits had already been completed during the prewar period in Estonia. Sweden had succeeded in getting out of the war in a better condition than other states – the country was not destroyed, human resources were intact, a few difficulties with raw materials and energy were however encountered. The lack of workers impeded procurement of wood from forests, while quite a number of men were drawn away from work in the interest of territorial defense. Thus forestry appeared as the first field of activity to provide employment for the Estonians. Lumbermen teams were formed and training courses for timber harvesting conducted in the camps. A great number of Estonians moved to manufacturing towns. The first position in terms of refugee employment was held by the textile industry, which was followed by the metallurgical industry.

With the improvement of their linguistic and vocational skills Estonians could more frequently be encountered at construction sites as well. Large centres of Estonians sprang up in Eskilstuna, Gothenburg, Södertälje and Uddevalla. They could not depend upon the knowledge and expertise brought along from the home country. Practical skills were evidently more appreciated and hereby preparation for real work was specifically put to the foremost position in the vocational retraining of refugees. Finding some kind of a job was easy for skilled workers. Engineers, doctors, pharmacists and veterinarians were also doing well. Other educated people had to earn their daily bread with poorly paid archival work (*Rootsi…*, 1946). The first Estonian schools in refugee camps commenced their activities as early as in September of 1944. An Estonian-language newspaper *Teataja*, issued in Sweden, informed its readers that more than two thousand elementary school students, close to eight hundred high school students and approximately four hundred teachers had arrived in the country. Over fifty schools in various camps had commenced their activities by next spring, with a thousand or so students acquiring Estonian-language education. The number of teachers working in the schools of various camps was somewhere around a hundred. Estonian-language schools were opened outside refugee camps as well.

The conditions in Germany were somewhat more complicated for refugees. They had to move around in search of a place to live and work while the war was still on. The first refugee camps were formed no earlier than after the capitulation in the spring of 1945. Even there the refugees led their lives under constant fear of being extradited to the Russians. The situation was easier for skilled laborers, among them the greatest need was for metalworkers, electricians, lumbermen, builders, textile workers, miners, shipbuilders, as well as workers at paper mills and glassworks. The gazettes of refugee camps complained that educated people did not have much chance to succeed and advised to grasp even the slightest opportunities to obtain practical skills (*Intelligents…*, 1947). Forming of the Estonian Committees was started in the spring of 1945, the earliest among them were assembled in Gotha and Detmold. The activities of the United Nations Relief and Rehabilitation Administration (UNRRA) towards organizing DP (displaced person) camps were helpful. The UNRRA plans did not include a provision on educating the children as it was assumed that the refugees would return to their home country before long. When it became evident that repatriation of the people from the Baltic States was not possible, their attitude towards schools became more understanding, even to the extent that the establishment of quite a few schools progressed smoothly namely thanks to the assistance of the UNRRA officers.

Establishment of schools was first started in the British zone. Six Estonian elementary schools were operating there as early as in June 1945, where of the earliest was opened in Schwarzenbek. As the number of Estonians in the British zone was smaller than in the American zone, it comprised multiple minor camps, on account of which schools also remained quite small. 24 Estonian schools with 620 students and seven high schools with 260 students had been registered by the following autumn and the number of students showed slight growth later on.

Schools in the American zone commenced their activities from the autumn of 1945. Earlier than elsewhere, educational activities were started in Hanau and Memmingen. One of the best-known Estonian schools in Germany – the Augsburg High School – was started in the Estonian DP camp Augsburg-Hochfeld at the beginning of August. More than anything else the schoolwork was hampered by lack of textbooks. A proposal was made to the UNRRA for publishing mathematics textbooks. Schoolbooks, which had been published in Estonia were widely used as textbooks and reproduced according to need (Kool, 1999, p. 716). However, this could not remain the only thing to rely on. Textbooks for reproduction were lacking in a number of specialties. Teachers therefore undertook to compile required teaching materials by themselves. Thus, several mathematics textbooks were composed by Leo Ruumet, a former faculty member of the Tallinn Technical School, who was currently working in Augsburg.

Teaching at schools was based on the curricula from the period of Estonian nationhood that were reproduced from memory. On the first Teachers' Days held in Augsburg in November of 1945, it was recommended to use the curricula reproduced from memory as the basis for teaching in all Estonian schools. On account of various reasons it was not possible to follow the recommendation everywhere, due to the lack of either applicable teaching materials or teachers. The curricula implemented in the British zone differed from those in the American zone. This was due to the fact that communication between the zones remained relatively scanty as moving around was not tolerated regarding the DPs. Later the curricula became more equable. The scarcity of textbooks in the British zone was at first even more acute than on the American occupational territories. With the emergence of an opportunity to receive textbooks from Sweden the situation rapidly improved. Only few Estonians were living in the French zone, most of them had settled in the Balinge county, where men could find employment in oil shale industry. The very first Estonian school to commence its activities in the postwar Germany was an elementary school in Dormettingen on the territory of the French zone, which was opened in May 1945. Nevertheless, the school did not stay in that region for long. For fear that the French were going to extradite the Estonians to the Russians, the greatest part of the ethnic group passed over to the American zone. By the beginning of 1946 the network of Estonian schools was more or less established in the American zone, whereas Estonian schools in the French zone likewise took orders from the school superintendent of this locality.

The progress of refugees with regard to organizing the affairs of their lives in exile may be accounted for their independent initiative and generally high educational level. A questionnaire conducted in the American zone in 1946, which was addressed to fifteen thousand Estonian refugees, revealed, that every other of them had obtained secondary education. Quite many had graduated from universities. In Germany, Geislingen became the place where the greatest number of Estonians had settled. Close to five thousand Estonians have been living there at one time or another. Various courses, folk high schools as well as an Estonian theater were organized in that town, in the same way Estonian-language newspapers, journals and books were published, whereas several companies were owned by Estonians. A great number of Estonian-educated people had assembled in that place, one of the greatest and the most important educational establishments throughout the time of exile – the Geislingen Estonian High School (operated during 1945–1950) – was initiated right there (Saarlas, 2009). Among its 38 teachers as many as 25 had obtained higher education and at that, three of them were actually university professors. A duplicating bureau was started, which made reproductions of textbooks for other Estonian schools in Germany as well. Among the several dozens of textbooks published in Geislingen, the greatest part was constituted by reproductions of textbooks that had been issued during the prewar period in Estonia. The production comprised numerous textbooks for mathematics, physics and chemistry.

The Geislingen High School grew into the best known Estonian educational centre in Germany, the list of its students included 519 young people. A great number of the distinguished expatriate Estonian scholars and engineers of the future pursued their education here, among them Professor of Electrical Engineering and consultant for *Bell Telephone Laboratories* and *Boeing Aerospace Company* Endrik Nõges, astronautical engineers Jyri Kork and Maido Saarlas, an authority on biopolymers Anatole Särko (2009), an environmental chemist and researcher of alternative energy Lembit Lilleleht, a co-worker of NASA specializing in rocket construction Rein Grabbi (2011), a physicist Henn Soonpää. The Geislingen Estonian High School was prior to its closure in 1950 accepted into the network of German schools, owing to which the end-of-year school reports and school-leaving certificates of this school became valid everywhere.

Half a thousand Estonian refugees with higher education were living in Geislingen. Technical courses were initiated by the local Association of Estonian Engineers (Kool, 1999, pp. 264–265). A civil engineer Feliks Luhaväli was invited to lead the courses. Before the war he had been employed by the Land Board of the Viru County, during the period of war teaching the principles for preparing land plans and projects at the Tallinn Technical School. The courses offered training to become a high rise and underground builder, electrician and draftsman. The last-mentioned specialty was especially appreciated by the womenfolk. Actual training herein was divided into four branches – architectural, civil engineering, mechanical engineering and land plans drawing. The greatest number of graduates was provided by the branch of architectural draftsmen. Classes for photography and geodesy were commenced afterwards.

Graduates of the technical drawing, photography and geodesy courses were in a comparatively better situation than others, as additionally to necessary theoretical knowledge these courses offered a practical training. All the others had to seek a practical training opportunity by themselves, either in private or the UNRRA establishments. Although the Association of Engineers sought to assist according to their powers, it was still far from easy (*Saksamaa*…, 1947). Starting a metallurgical workshop in addition to the existing electrical engineering and precision mechanics workshops somewhat facilitated the situation. Fortunately enough, it was possible to publish parts of materials for lectures delivered in the technical courses. For instance, Adolf Edenberg's lecture notes on dwelling houses, a compendium of lectures on photography appeared as a collective work by lecturers of the photography class. The publications of Geislingen were used as textbooks in other camps as well.

The high brain potential accumulated in the Geislingen camp caused the International Refugee Organization (IRO) to take action. As the foremost position in vocational retraining was given to preparation for practical work, the IRO started in Geislingen a vocational school serving the entire region of Ulm (*Uus*…, 1947). Estonian engineers were employed as lecturers, tuition was provided free of charge and in the German language. Feliks Luhaväli, once again, was appointed as principal to that educational institution. Courses were offered in concrete work and bricklaying, paintwork and interior decoration, technical drawing and auto mechanics. The course of concrete work and bricklaying was given by Ralf Adams, a former civil engineer in Tallinn. The audience was introduced to building materials and the respective applicable quality requirements, studied the methods for bricklaying, concreting, fixture making, reinforcement tying and gained command of the construction equipment. Much attention was dedicated to the development of practical skills. The paintwork and interior decoration course was led by an applied artist Aarne Mõtus. The first grade was conceived for providing the painter's qualifications. Drawers of greater talent advanced to the second grade, where they were taken through the basics of interior decoration and familiarized with furniture design. The technical drawing course led by an architect G. Saar, was aimed at preparing engineering drafters for construction companies and the mechanical industry. Students received training in mechanical drawing, handwriting techniques and engineering measurement. Those Estonians who had difficulties with the German language or were engaged in daytime work had an opportunity to attend evening classes, similarly held at the technical school.

Various courses were arranged elsewhere in Germany, too. The UNNRA organized professional training courses in Mannheim offering an opportunity to learn the trade of metal working and carpentry, welding and a few other things as well. The audience was in greatest majority constituted by Ukrainians, while Estonians, Latvians, Lithuanians and Poles were represented at a more or less equal level. A scale model of crankshaft executed by an Estonian Oskar Tabur was acknowledged as the best work accomplished by a student of the earliest course, which was completed in 1946. The author received eight packs of cigarettes as a prize, whereas the scale model of crankshaft was given as a gift to E. N. Pugh, head of the UNNRA Stuttgart Regional Employment Board. Later the school was transferred to Ludwigsburg, where conditions for its operation were more favourable.

In the British zone an Estonian-language agricultural school was functioning in Schleswig-Holstein, a school of navigation in Flensburg, and a school of forestry in Lübeck. The official name of the latter was Eesti Metsatehnikum and it was headed by Professor Kaarel Veerpalu, a member of Tartu research community. Afterwards he returned to Estonia and proceeded with lecturing at the University of Tartu and the Estonian Agricultural Academy. The Estonians' forestry school turned out to be the very first vocational school in the British zone to produce graduates (*Eesti*…, 1947). The first group graduating from the school in the winter of 1947 included 24 students, among them a young lady.

Approximately half a hundred junior and senior year students of Tallinn and Tartu technical schools, whose studies had been interrupted by the war, were presumed to be living within various occupational zones in Germany. In order to afford them an opportunity to proceed with their studies and similarly offer other technology-oriented fellow countrymen a possibility to develop themselves in technology, the Estonian Associations of Engineers suggested an idea to establish a technical school. The initiative was approved by both the Estonian National Association and the UNRRA. The name chosen for the school was Eesti Tehnikum and the aforementioned F. Luhaväli was invited to become the head of school. Full, all around assistance and support to the technical school was pledged by participators of the Estonian Engineers' Days held in Geislingen. The curricula that were used at the Tallinn Technical School in the prewar period were drawn on when preparing the curricula. Retrieval of them was undertaken by the wartime Head of School Leo Ruumet. Requirements set for German curricula were likewise to be reckoned with. The total duration of programmes was determined at 4,600 hours, to be further increased by the fieldwork hours. Four departments were opened: civil engineering, electrical engineering, mechanical engineering and architecture and the period of study lasted three years (*Tehnikumi*…, 1946). Those entering the school were required to have attained education at the minimal level equivalent to three grades in high school. 110 students were accepted, although the number of applicants was much higher. The main obstacle for not a few turned out to be insufficiency of prior education. The greatest part of architecture students was constituted by the young people, who had attended the recently completed technical courses. Additional classes of one year's duration were started at the school to offer the car mechanic's and drafter's qualifications. The public opening ceremony was held at the end of summer, 1946. Most of the school's study materials have become available in Estonia by now, among them mention should be made of a timber structures textbook by Harald Sööt. The published works also comprised a survey course on zincography by Adalbert Raba.

The overwhelming attitude towards studies was resolute and earnest. The urge for higher education was similarly powerful. Over eight hundred Estonian students were studying at various German higher educational institutions in 1947, in the American, British and French zones alike. Larger communities of Estonian university students had been formed in Göttingen, Hamburg, Heidelberg, Karlsruhe and Munich.

The Baltic University in Hamburg-Pinneberg was jointly operated by Estonian–Latvian–Lithuanian refugees through 1946–1949. It had eight faculties: Philosophy and Philology, Economics and Law, Mathematics and Natural Sciences, Chemistry, Agriculture, Medicine, Architecture and Civil Engineering, Mechanical Engineering (with departments for Technology, Mechanics and Electrical Engineering). Of the two thousand plus matriculated students nearly three hundred were Estonians (Järvesoo, 1991, p. 163). The number of faculty members extended to a couple of hundred, among them 58 Estonians practically invariably former faculty members of either the University of Tartu or the Tallinn University of Technology. Professor Ernst Öpik, an Estonian regarded as one of the great astronomers to achieve the most fundamental discoveries in the 20th-century world, was Rector of the Baltic University (Einasto, 2009). Several Estonians were employed as faculty members, among them Professor of Colloidal Chemistry Nikolai King, Professor of Meteorology and Applied Mathematics Kaarel Kirde, Professor of Hydraulic Construction Vladimir Paavel (former vice rector of the Tallinn University of Technology), Professor of Road Building Alfred Toss, Professor of Electrical Engineering Sergei Uusna, Professor of Forest Science and Forest Technology Kaarel Veermets and Professor of Geology Armin Öpik. In the set of 66 issues published within the series of Contributions of the Baltic University, 22 articles were authored by Estonians. The number of reproduced lecture materials for study purposes amounted to 80 titles. An educational institution under ordinary conditions is explicitly characterized by its graduate numbers, but the Baltic University transferred its greatest talents to German universities. For technology studies they first and foremost headed for the universities of technology in Braunschweig and Hannover. Therefore, the number of Estonians among graduates of the Baltic University stayed at a dozen or so, whereas a few of them graduated as external students. More than fifty Estonian students were transferred to German universities. The total number was slightly enlarged by those few who, on their own initiative, proceeded to complete their studies at other universities after the activities of the Baltic University had been terminated. In 1948 the Refugees Defense Committee (RDC) proposed an idea to transfer the Baltic University to North America, either the U.S.A. or Canada in order to guarantee more favourable working conditions (*Balti*…, 1948; Järvesoo, 1991, pp. 124–126). Although the thought received favorable encouragement from the local universities and the general public, the undertaking nevertheless passed off with no result. The pervading attitude of the authorities toward studying was radically divergent in different zones. The British authorities covered the tuition fees of Estonians and even managed to find resources for grants as well. The Americans, on the contrary, shortly discontinued any kind of financial support, among other things terminating food provisioning for Estonian students, which was a really hard fallback in the postwar Germany. In 1949, Leo Allas, one of the founders of modern engineering science in Brazil, continued with the British government scholarship at Hannover University of Technology his studies, which had been interrupted in Tallinn by the war (Allas, 2011). Hydroelectric power-plants designed under his direction (over 10,000 MW in total) and other constructions may be found on five continents.

The number of university faculty members and researchers who reached Sweden amounted to around fifty. Most of them found employment in their specialty. The Estonian Learned Society in Sweden (ETSR) was established in 1945 and shortly afterwards its South-Swedish division commenced its activities with central office in Lund (Anderson, 2009). At the beginning of the 1950s the educational and research institution Estonian Scientific Institute retreated from the ETSR. The Swedish government opened an Estonian high school in Sigtuna. In Stockholm Estonian educational community started evening courses, which also gradually developed into a high school. Vocational education was furthered by a correspondence institute, established by the Estonian Committee. The earliest scientific school course was afterwards gradually complemented by several special courses. Training was provided in civil engineering drawing, mechanical engineering drawing, accounting. A school of navigation was established for inshore navigators and ship engineers (Mägi, 2011). Technology at higher educational institution level could be studied at the Royal Institute of Technology in Stockholm and the Chalmers University of Technology in Gothenburg. Both of them have produced renowned engineers and architects of Estonian nationality. Among them mention should be made of the electronic physicist, afterwards Rector of Chalmers and President of the Royal Swedish Academy of Engineering Sciences Sven Olving, leading electrician of NASA Alfred Ots, the first Professor of Building Utility Systems in Sweden Enno Abel, an architect whose work made a significant impact on the 20th-century medical building construction throughout the world, Doctor of Technology Ervin Pütsep, and others. Quite a few of them – Sven Kinnunen, Hans Kivisild, Ivar Paljak and Enno Penno – entered themselves in research activities related to civil engineering. The first civil engineer to defend a licentiate's degree in technology (1950) was Uko Müllersdorf, afterwards assistant of bridge engineering at the Royal Institute of Technology in Stockholm.

Following the opening of emigration gates in 1949, the population of the DP camps in Germany started to wane swiftly, the number of refugees to depart from Sweden was also growing. Estonians moved to the U.S.A., Canada, Australia, New-Zealand, but also to more exotic counties such as Bolivia, the Philippines, Paraguay, Tanganyika, Tunisia and Venezuela. A great number of leavers had obtained Estonian education and Estonian professional certificates they could take with them. Those, who had not managed to finish their studies, continued to pursue their education in the new countries of residence. According to the Estonian Student Body Abroad as many as 600 Estonian young people living in the free world had succeeded in obtaining a higher education diploma by the end of 1955. Whereas engineering disciplines were in the lead in Sweden, the U.S.A., Canada and Australia, the topmost position in Germany and Switzerland was held by medicine. A few university graduates could also be encountered in England and the Republic of South Africa. The majority of young Estonian scientists with a doctorate degree were employed as faculty members at colleges and universities, especially in the U.S.A.

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SHORT COMMUNICATIONS:

BALTGRAF: Engineering Graphics in the Baltic States

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On 5 November 1991, after revolutionary political events (the collapse of the Soviet Union), representatives of engineering graphics departments in the three Baltic States summoned at the Vilnius Technical University. They declared the following:

Considering

- the changed political status of our states,
- the necessity to coordinate our efforts in engineering education,
- the necessity to assure concordance of diplomas (bachelor's and master's degree) of our states,
- we have decided to found the International Association BALTGRAF of engineering graphics departments in Estonia, Latvia and Lithuania.

The aims of BALTGRAF are

- to coordinate our efforts in methodical and program equipment of departments of engineering graphics,
- to coordinate research in our departments in the sphere of engineering and computer graphics,
- to coordinate our efforts in adaptation of international standards of technical drawings,
- to organize international conferences that refer to problems of engineering graphics departments,
- to consolidate our efforts in the sphere of named problems with other universities in the Baltic region.

Professor Petras Audzijonis from the Vilnius Technical University was elected the first president of BALTGRAF.

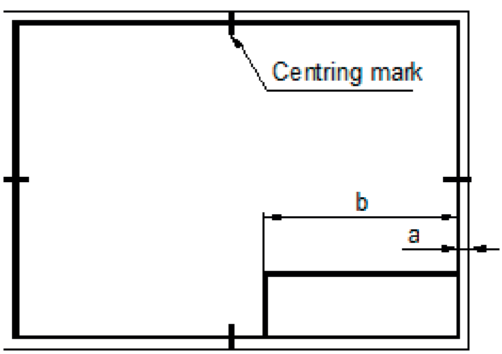
Founders of the association decided to regularly (every two years) organize international conferences on engineering graphics.

The first conference of BALTGRAF took place in 1992 at the Vilnius Gediminas Technical University (BALTGRAF, 1992). At the conference, 17 papers on descriptive geometry, technical drawing and computer drawing were presented. It is pointed out in the introductory note to the volume of the conference proceedings that the main goal of engineering graphics is *graphic literacy* – the ability to create and understand technical drawing. This ability is indispensable for hand-drawing and also for computer-drawing. The serious problem for all the conference participants was the increasingly tenuous grasp of subjects of graphics among students at technological universities and secondary schools.

The second BALTGRAF conference took place in 1994, also at the Vilnius Gediminas Technical University (BALTGRAF, 1994). 18 papers were presented. One of the conference topics was the transition from GOST standards (technical standards of the Soviet Union) to international ISO standards. Adoption of all GOST standards was absolutely obligatory and refusal to adopt them was sanctioned (*Nesobliudenie standarta presleduetsia po zakonu*). ISO standards are, in principle, voluntary to use, but they are obligatory for developing European and national standards.

Although not all standards contain detailed argumentations, every requirement should, nevertheless, be reasoned. But the conception of any argument may change due to the fast technological progress. For example, according to the ISO 5457 standard, a technical drawing must have borders and a frame, a title block and centring marks. At the same time, the distance of the frame line from the edge of the sheet must be at least 10mm for sizes A4, A3 and A2, but at least 20mm for sizes A1 and A0 (Fig. 1).

Figure 1. Comparison of title block's dimensions according to different standards.



Standard, norm	Format A4, A3, A2		Format A1, A0	
	Dimension, mm			
	a	b	a	b
ANSI (USA)	10-19	159	13-25	193
DIN (Germany)	5	187	5	187
GOST (Russia)	5	185	5	185
JIS (Japan)	10	130	20	130
ISO	10	170	20	170
RT (Finland)	7	178	7	178

Such a large distance is motivated by better fixing the sheet when plotting. In this connection, the maximum horizontal dimension of a title block is 170mm. Centring marks facilitate better cropping in microcopying. Nowadays these arguments, and therefore also requirements, have lost their practical importance. Some comparative dimensions (a, b) of different standards or norms are shown in Figure 1. Some of these variants are offered in AutoCAD template files. Which of them to use? There is no single answer. In design practice, the agreement has to be achieved with the client of the project. According to the draftsmen's opinion the title block should contain the scale and format of the drawing due to their connected character in printing or copying.

The 3rd BALTGRAF conference was organized in 1996 by the Tallinn Technical University (BALTGRAF, 1996). 18 presentations discussed didactic research, international standards and also the present and future of computer graphics. Rein Mägi from the Tallinn Technical University was elected the second president of BALTGRAF.

The next, 4th BALTGRAF conference took place in 1998, traditionally at the Vilnius Gediminas Technical University (BALTGRAF, 1998). 22 papers were presented at this conference. The aim of some papers was to study specific features of CAD (Computer Aided Design) for making CAD-process not only a modern but also a comfortable, quick and economic one.

At the 5th BALTGRAF conference (2000) at the Tallinn Technical University, 22 papers were presented: 14 from Lithuania, 7 from Estonia and 1 from Latvia (BALTGRAF, 2000). The majority of presentations (80%) were connected with computer graphics. Lithuanian technical drawing standards based on ISO were developed.

At BALTGRAF-5 the conference participants arrived at the general resolution:

> *Resolution of the International Conference on Engineering Graphics BALTGRAF-5*
>
> *The Conference BALTGRAF-5 took place on 15–16 June 2000 at the Tallinn Technical University and consisted of 22 reports by authors from the Kaunas University of Technology, the Vilnius Gediminas Technical University, the Riga Technical University, the Tallinn Pedagogical University (now Tallinn University) and the Tallinn Technical University (now Tallinn University of Technology). The collection of reports was published (BALTGRAF, 2000). The reports tackled the actual issues in teaching several fields of engineering*

graphics: descriptive geometry, technical drawing and computer graphics. The problems were, in principle, the same for all the conference participants. While the role of engineering graphics in modern technology (for instance in CAD/CAM systems) is increasing, the number of lessons in technological universities has been dramatically reduced. Furthermore, about one-third of secondary school-leavers have never studied drawing disciplines. As a consequence, engineering graphics lecturers at technical universities have to waste the already limited teaching time to explain elementary projection principles. Instead, it would be more rational to devote the study time for teaching more contemporary subjects, particularly new trends in computer graphics.

The International Association BALTGRAF (founded in 1991) decided

- *to contribute to enhancing the teaching level of engineering graphics disciplines in secondary schools,*
- *to stop the catastrophic decrease of the number of engineering graphics lessons in technical universities,*
- *to develop the effective trends of more contemporary information technology. In this case it is necessary to regularly update computer graphics software and hardware,*
- *to continue and expand the present successful activities of the International Association BALTGRAF,*
- *to organize the next conference BALTGRAF-6 in the summer of 2002 at the Riga Technical University.*

June 16, 2000, Tallinn

As decided, the next conference, BALTGRAF-6, took place in 2002 at the Riga Technical University (BALTGRAF, 2002). It was the most prolific conference with 44 presentations. The papers were divided into four subsections: 1) CAD in Engineering (14 papers); 2) Graphics Education (20 papers); 3) Descriptive Geometry and Engineering Drawing (6 papers); and 4) Standards of Technical Graphics (4 papers). Professor Modris Dobelis from the Riga Technical University was elected the third president of BALTGRAF. The new logo of BALTGRAF was chosen (see Fig. 2) and the BALTGRAF homepage (available at http://bf.rtu.lv/%7Egrafika/BALTGRAF) was set up.

The 7th BALTGRAF conference was organized by the Vilnius Gediminas Technical University in 2004 (BALTGRAF, 2004). 41 presentations were divided into four subsections: 1) Theoretical Aspects (8 papers); 2) CAD and CAD Applications

(12 papers); 3) Graphics Education (16 papers); 4) Standards in Engineering Graphics (5 papers). The new trend was the application of e-learning tools in teaching graphics subjects. E-learning will open up new opportunities for lecturers and students due to wide applications of Internet today.

Figure 2. The logo of BALTGRAF.

The 8th BALTGRAF conference took place in June 2006 at the Tallinn University of Technology (BALTGRAF, 2006). 37 presentations were divided into five subsections:

1) Descriptive Geometry (6 papers);
2) Technical Drawing (6 papers);
3) Engineering Computer Graphics (15 papers);
4) Standards of Technical Graphics (3 papers);
5) Graphics Education (7 papers).

Quite a topical theme was visualization. Visualization in engineering graphics can better help to understand the taught subject. Speakers demonstrated PowerPoint presentations (Mägi, 2005a), screen videos (Mägi, 2005b), educational videos (Mägi, 2006b) and animating possibilities of AutoCAD (Mägi, 2006a). Command '3D-ORBIT' can move only camera but not objects in relation to each other (see Fig. 3). For moving objects on screen the AutoLISP program could help (see Fig. 4).

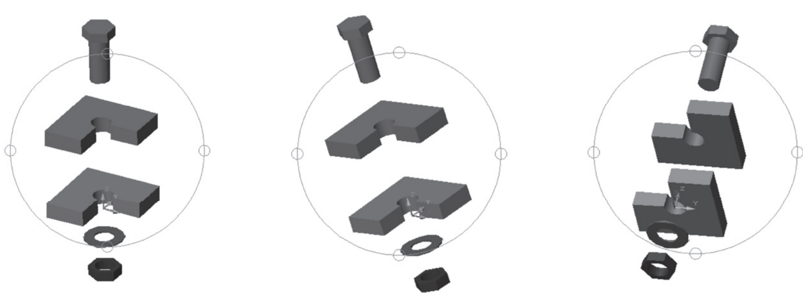


Figure 3. Visualization of the spatial situation with 3D-ORBIT in AutoCAD.

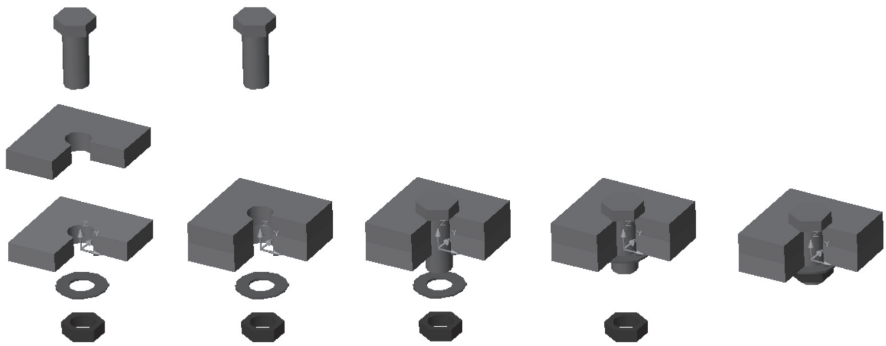


Figure 4. Animation of assembling process of two plates, a bolt, a disk and a nut.

At the 9th BALTGRAF conference at the Riga Technical University (BALTGRAF, 2008), 43 papers were presented: twenty-one by speakers from Lithuania, eight from Estonia, six from Latvia, six from Poland, one from Slovakia and one from Germany. The range of subject matter was quite broad, covering teaching methodology of fundamental engineering graphics subjects, various graphics programs as well as technical drawing standards. Professor Daiva Makutėnienė from the Vilnius Gediminas Technical University was elected the fourth president of BALTGRAF.

The 10th BALTGRAF conference was organized extraordinarily in 2009 in Vilnius, the 2009 European Capital of Culture (BALTGRAF, 2009). Perhaps due to the economic crisis, only 31 papers were presented: sixteen by speakers from Lithuania, five from Latvia, five from Poland, four from Estonia and one from Slovakia. The conference participants held an undivided view that the "superstructure" of future engineers must be supported in the knowledge of the subject of basic graphics. Unfortunately, due to poor preparation in secondary school, the dropout rate of university students reaches nearly 40% by the end of the first academic semester.

The next, 11th BALTGRAF conference will take place in 2011 in Tallinn, this year's European Capital of Culture. All participants are welcome to celebrate the 20th anniversary of BALTGRAF!

The International Association BALTGRAF, which was founded twenty years ago, is seen as a symbol of the re-establishment of independence in Lithuania, Latvia and Estonia. Regularly organized conferences are a meeting point for lecturers and specialists of engineering graphics to review the present situation and plan new developments for future.

Long live the 20-year BALTGRAF!

Figure 5. The dynamic development of BALTGRAF.

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Encyclopedic Dictionary *Biology in St Petersburg. 1703–2008*

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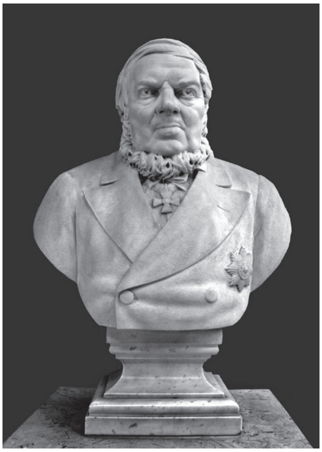
In 2011, a large team of authors completed work on the encyclopedic dictionary *Biology in St Petersburg. 1703–2008* (*Biologiia v Sankt-Peterburge*, 2011). The dictionary contains more than 1,650 articles, primarily on prominent biologists who had worked in St Petersburg since the beginning of the 18th century and have made a real contribution to the development of Russian and international biology. To this category we assign specialists not just in "pure" biology, but also in applied biology and the related disciplines – soil science, paleontology, geology, medicine, agriculture, forestry, veterinary medicine, and others. So it would be more accurate to call it the dictionary of 'Life Sciences in St Petersburg'. The dictionary also contains articles on biological research and educational centers, museums, scientific societies, periodicals, administrative structures, public figures and statesman, and so on – about different kinds of people and institutions who have, directly or indirectly, influenced the life sciences in St Petersburg. The encyclopedia was part of a bigger project, the preliminary results of which were published already in 2007 and 2008 (*Nauchnyi Sankt-Peterburg*..., 2007; *Nauchnyi Sankt-Peterburg*..., 2008).

The dictionary was compiled by a large group of authors – 156 historians and biologists. The editor-in-chief (and the author of many articles) Professor Eduard I. Kolchinski is the head of the St Petersburg Branch of the Institute for the History of Science and Technology. Anastasia A. Fedotova was involved as a co-editor–



Johann Friedrich von Brandt (sculpture of Léopold Bernstamm),1882 – property of Zoological Institute. The author has been indentified by N.V. Slepkova

compiler. The final academic editing was carried out by Irina Yu. Sumerina, who is very well known among Russian botanists for her editorial experience. The articles were written by biologists and historians from various institutions in St Petersburg,[1] but also in other cities and, on several occasions, from institutions abroad. For some articles, the author has remained unspecified, which means that the articles were written on the basis of a single published source. Of course, most articles are just a compilation of previously published research; for a considerable part of them, however, authors have checked dates and facts working with archive sources, and also there are quite a number of articles that can be considered highly original research.[2] The authors supplemented their articles with portraits and other illustrations; most of these pictures have never been published.

When discussing the encyclopedic dictionary, I would like to stress several points:

1) The persons and institutions which had been previously excluded from the history of Russian biology became objects of special interest for our collective. Sometimes they had been "forgotten" because of ideological reasons, sometimes just because collective memory is very selective. We tried to trace people via

[1] K.V. Manoilenko, Yu.A. Laius, M.B. Konashev, A.I. Ermolaev, V.A. Polevoi, T.I. Yusupova, N.Ye. Beregoi – S.I. Vavilov St Petersburg Branch of the Institute for the History of Science and Technology, RAS; A.K. Sitin, A.N. Titov, D.V. Geltman, V.I. Vasilevich, R.V. Kamelin – Komarov Botanical Institute, RAS; N.V. Slepkova, A.V. Smirnov, O.N. Pugachev, L.Ya. Borkin – Zoological Institute, RAS; S.V. Retunskaia, M.G. Baturina, G.I. Pankratova, V.P. Leonov – Library of the Russian Academy of Sciences; S.I. Fokin, B.F. Aparin, N.N. Matinyan – St Petersburg State University; Yu.P. Golikov, Yu. A. Mazing – Museum for the History of the Institute for Experimental Medicine; D.A. Zhuravlev, A.A. Boudko – Museum of Military Medicine, V.A. Dragavtsev, I.V. Kotelnikova – All Russian Institute of Plant Breeding; Yu.V. Natochin, V.N. Shipilov – Sechenov Institute of the Evolutionary Physiology and Biochemistry, RAS; V.O. Samoilov – Military Medical Academy; N.P. Kopaneva, I.V. Tunkina – St. Petersburg Archive of the Russian Academy of Sciences, and others.

[2] For example, the article 'Central'noe buro kraevedeia' ('Central bureau of regional studies') by M.V. Loskutova, article on K.M. Zavadski and A.M. Ugolev by E.I. Kolchinski, 'Ekskursionnye biologicheskie stancii' ('Excursion biological stations') by A.V. Samokish, Lesnoi zhurnal ('Journal of Forestry') by A.A. Fedotova, 'Obschestvo veterinarnikh vrachei' ('Veterinarians' Society') by N.Ye. Beregoi, etc.

institutions and institutions via people, and it helped us to rediscover a number of researchers and even whole institutions that even specialists have forgotten about: such as, for example, the Institute of Applied Zoology and Phytopathology, the Agricultural Museum, or the Pomological Garden.

Georgii D. Karpechenko – Archive of Institute for the History of Science and Technology, St. Petersburg Branch

We tried to put together information on the victims of political repressions – and we should say that a massive number of scientists was subjected to repressions from the very autumn of 1917. This fact impressed, and depressed, us. But political repressions occurred in Russia also at times other than the Soviet period. A considerable part of scientists was involved in political movements already before the October Revolution – especially students, but also professors – for example, Professor Andrei S. Famintsyn was imprisoned in 1879.

2) The dictionary revealed that the history of science in Russia had been very poorly studied. Historical literature usually describes just the development of a very few scientific institutions: the system of the Academy of Sciences, the Military Medical Academy, the St Petersburg State University, and a few more. But even superficial research on the early history of many institutions which were allegedly established in the Soviet period reveals that many of them had influential predecessors. Most ministries in the Russian Empire established their own scientific committees, bureaus and councils: Medical and Mining Departments, the Ministry of Home Affairs, the Ministry of Public Education, the Agricultural Administration of the Empire, and so on. Without knowledge about these structures it is absolutely impossible to have an objective overview of the development of biological disciplines in St Petersburg and in the Empire. For example, the system of the VASKhNIL, the Lenin All-Union Academy of Agricultural Sciences of the Soviet Union, did not emerge in a vacuum. It had influential predecessors such as the bureaus of the Scientific Council of the Agricultural Administration: the Bureau for Applied Botany, the Bureau for Soil Science, the Bureau for Meteorology, etc.

Andrey A. Fedorov, 1944 – private archive ot Tatiana Vel'gorskaya

3) Writing the dictionary articles as if set off a chain reaction. While working on one article we came to realize the importance of another figure, or another institution, and had to write an article on that. For example, the article on botanist Robert E. Regel prompted K.V. Manoilenko to write an article on his father, Eduard A. Regel, and the latter forced me to write articles on the Pomological Garden (*Pomologicheski Sad*) and on the *Journal of Horticulture* (*Vestnik sadovodstva*).

We found that most of St Petersburg's naturalists had graduated from only a few secondary schools. So we had to write articles about these secondary schools, and also about some influential secondary school teachers. Also, when writing articles about scientific societies we also had to write articles about some students' clubs – for example, the Little Botanists (*Malen´kie botaniki*, A.A. Fedotova) and the Little Zoologists (*Malen´kie zoologi*, S.I. Fokin). Naturalists were connected with only a few publishing houses, and so on. The more articles we wrote, the more gaps we found. So, at one moment we just had to stop writing new articles, put them together, and take the volume to the publishing house.

We hope that our dictionary will be useful not only for historians and biologists in St Petersburg and elsewhere in Russia. Mobility among scientists has always been high, and it would be impossible to imagine life sciences in St Petersburg without Baltic naturalists and Baltic research and educational centers. To name only a few, scholars such as Otto Abich, Nikolai Andrusov, Sergei Anichkov, Nikolai Bush, Alexander von Bunge, Gregor von Helmersen, Nikolai Kuznetsov, Nikolai Pirogov, Ludvig Puusepp, and many others have studied or worked at the University of Tartu (Dorpat, Yuriev).

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Exhibition Dedicated to the Bicentenary of Professor Nikolay Ivanovich Pirogov (1810–1881) in the Pauls Stradins Museum of the History of Medicine in Riga

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In 2010, we celebrated the 200th anniversary of the birth of Nikolay Pirogov. He was a distinguished Russian surgeon who created the foundations for the concept of topography anatomy in surgery. He was also the founder of battlefield surgery in Russia, and introduced many new innovations. Later he was elected a corresponding member of the St Petersburg Academy of Sciences (1847) and was widely known as an educator and public activist. To commemorate this date, Pauls Stradins Museum of the History of Medicine in Riga organised an exhibition about the life and work of Nikolay Pirogov. The official opening of the exhibition took place during the international conference of oral surgeons and dentists held on May 21, 2011 in Riga and the exhibition remained open until December 1, 2010. The total number of the exhibits was 184, of which 146 came from the basic collections of Pauls Stradins Museum, 36 from other ancillary collections. The curators of the exhibition were Valda Pundure and Ņina Drača; the design was made by Zigurds Galūns.

Pirogov was born on November 25, 1810 in Moscow. His father was a wealthy civil servant and Nikolay was the 13th and the youngest child in the family. At first he was taught at home, after which he attended a private school. It was there that he decided that medicine would be his life. In this, a great deal of influence was wielded by Professor Efrem Mukhin, who worked for the Faculty of Medicine at the Moscow University and was a friend of the Pirogov family. Mukhin helped Nikolay to deal with the only problem that he had when he wanted to enter the university – he was only 14 years old.

Upon completing his medical studies in 1828, Pirogov was sent to the Institute of Professors at the University of Dorpat (Tartu), where he wrote and defended his doctoral thesis on the litigation of ventral aorta (1832). From there on, he spent several years abroad, continuing his education. From 1836 to 1840

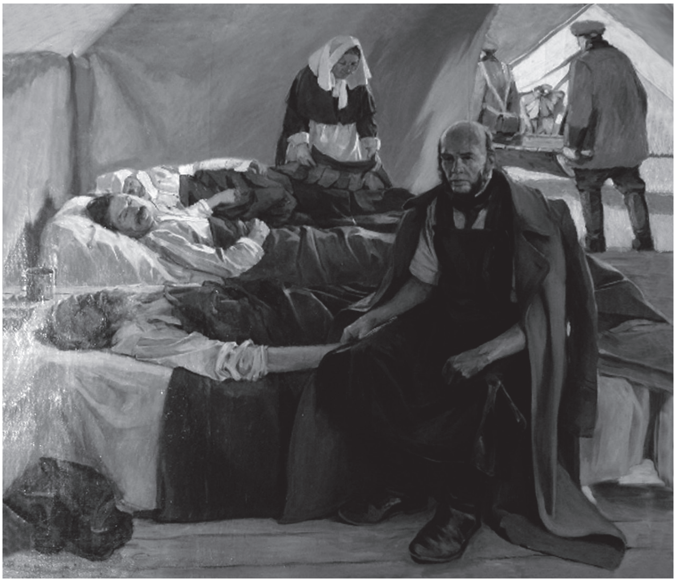


Figure 1. Oil painting "Pirogov in Sevastopol". Artist: Irēna Stradiņa (1949). From the collections of Pauls Stradiņs Museum of the History of Medicine in Riga.

Pirogov worked at the University of Dorpat, after which, until 1856, he taught at the St Petersburg Academy of Medicine and Surgery. Then he was appointed as curator of the education in the Odessa and Kyiv districts.

Pirogov did have links to Latvia. He visited Riga for the first time on his return from Germany in 1835, when he was treated at a local field hospital. While working as a professor at the University of Dorpat, he visited Riga on several occasions to conduct complicated surgeries, provide consultations to patients and help in the training of doctors. He would later call that one of the most important periods of his professional life.

During the course of his life, Pirogov experienced several major wars. He praised the work of nurses who worked on the front line. The professor was highly decorated for his work and his achievements in medicine. Late in life, professor Pirogov lived at his estate at the village of Vishnya in Ukraine. It was there that he passed away on December 5, 1881.

This anniversary exhibition presented the life and work history of Professor Nikolay Pirogov. Materials from the Pauls Stradins Museum of the History of Medicine collection regarding professor Pirogov have been brought to bear for this purpose.

The special Nikolay Pirogov collection of the museum itself contains more than 200 items. It is the third largest collection of items related to professor Pirogov, larger ones being found only at the National Pirogov Estate Museum in Vishnya

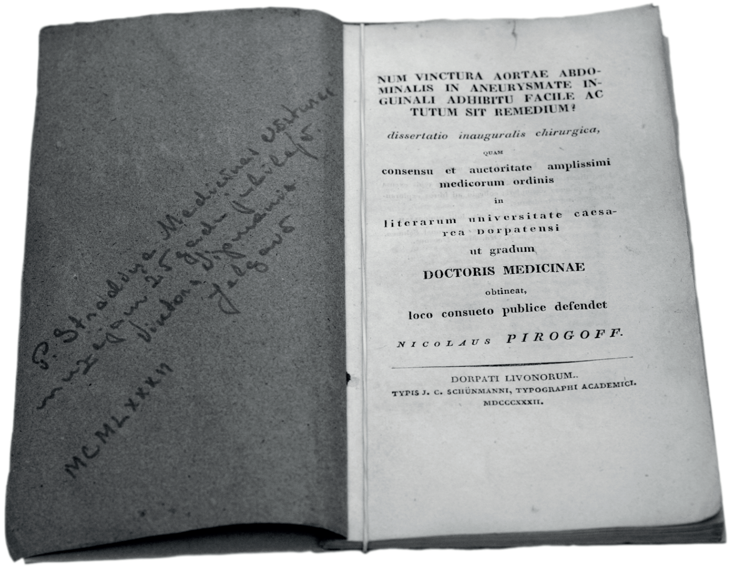


Figure 2. Dissertation. Pirogov's thesis on whether litigation of the ventral aorta is an easy and safe treatment of aneurism in the groin, Dorpat, 1832 (in Latin). From the collections of Pauls Stradiņs Museum of the History of Medicine in Riga.

in Ukraine and the Military Medical Museum in St Petersburg. The collection features objects related to pathological anatomy and nineteenth-century medical instruments. Most of these items are presented in artworks – paintings, engravings, drawings, lithographs, drawings from anatomy books, posters, bookplates, photo reproductions, postcards, stamps, sculptures, and medals. Of particular value are archival documents, manuscripts, and rare printed editions of Pirogov's books.

Besides, many items are on display in the permanent exhibition of the museum. Professor Pauls Stradiņš (1896–1958), the founder of the Museum of the History of Medicine in Riga, planned the museum so as to demonstrate the development of the history of medicine from prehistoric times, right up to modern medical advances focussing on the development of medicine in the Baltic region and Russia.

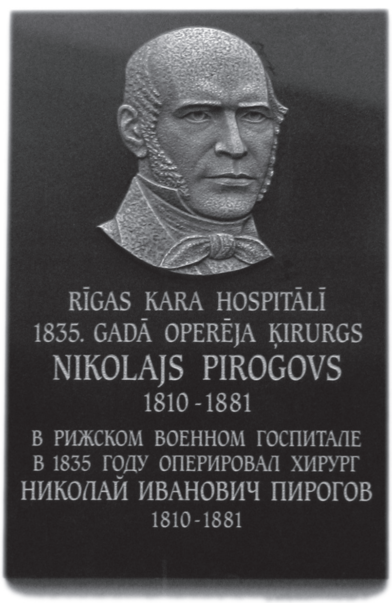
Unsurprisingly, Professor Nikolay Pirogov also played an important role in developing the original concept for the museum's main exhibition. A key element in the museum's permanent exhibition is a portrait painted by the artist Irēna Stradiņa (1925–1972), the daughter of Professor Pauls Stradiņš. It is called *Pirogov in Sevastopol* (1949). (Fig. 1) The painting was Irēna's diploma work in preparation for her graduation from the Latvian Academy of Art. Subject to the story of the picture was inspired by professor Stradiņš and he, despite his busyness, posed as Pirogov for her. The portrait was immediately recognised as a balanced, compelling, challenging and promising work by the young artist. It became a symbol of professor Stradiņš' family traditions, and of his deep understanding of and respect for the history of medicine.

Figure 3. Pathological anatomy preparation from Pirogov's collection. 19th century. Sequesters of the tibia. From the collections of Pauls Stradiņs Museum of the History of Medicine in Riga.

The exhibition displayed a wide array of documents, objects, books, brochures, postcards, photos and some artworks (engravings, paintings and sculptures) related to the life and activities of Nikolay Pirogov. Even the stamps issued in honour of his 150th anniversary of his birth and some feature film posters were on exhibit. Among the most important items displayed were Pirogov's thesis on "Whether litigation of the ventral aorta is an easy and safe treatment in the case of aneurism of the groin" (Dorpat, 1832; in Latin and Russian) (Fig. 2), Pirogov's diploma from the Russian Association of Surgeons (1894), documents related to the acceptance of Pirogov at the Moscow University (1824), photos of prescriptions written by Pirogov (originals at the Pirogov Museum in Vishnya), as well as some objects of pathological anatomy from the 19th century (Fig. 3), medical and surgical instruments of the 19th century, lithographs of the battlefields of the Crimean War (Fig. 4), etc. Some of the anatomical drawings were made by Pirogov himself. Some of the items displayed on the exhibition were dedicated to his teachers Johann Gotthelf Fischer von Waldheim, Johann Christian Moyer, Efrem Mukhin, Justus Christian von Loder, etc.

The first editions of some books by Pirogov were also on display, such as *The Surgical Anatomy of Arterial Trunks and Fascia* (Dorpat, 1840); *Use of Alabaster Casts in the Treatment of Simple and Complex Fractures and the Transportation of Injured Troops from the Battlefield* (Moscow, 1852); *The Surgical Anatomy of Arterial Trunks and Fascia* (Leipzig and Heidelberg, 1860); *Fundamentals of General Field Surgery* (Leipzig, 1864); *Fundamental of General Field Surgery* (Dresden, 1865); *Report on a Visit to Battlefield Sanitary Institutions in Germany* (St Petersburg, 1871); *Life Questions: Diary of an Old Doctor* (Stuttgart, 1894).

Figure 4. Lithograph: The first group of nurses who worked under Pirogov's leadership in Sevastopol during the Crimean War, 1854 – 1855. From the collections of Pauls Stradiņs Museum of the History of Medicine in Riga.



Another remarkable fact is that the restored memorial plate dedicated to Professor Nikolay Pirogov was re-opened on the exact date (November 24, 2010) of the professor's 200th anniversary on the territory of the former Riga Military Hospital. (Fig. 5)

Figure 5. Memorial plate dedicated to Professor Nikolay Pirogov. Artist: Jānis Strupulis. Opened November 24, 2010 on the territory of former Riga Military hospital.

The Follow-up Seminar of the 24th International Baltic Conference on the History of Science

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The 24th International Baltic Conference on the History of Science, held on 8–9 October 2010, was a special event in many respects. It was the first conference that was organized in Tallinn, as well as the first one hosted by the Tallinn University of Technology (TUT) (Talts & Kulasalu, 2011, p. 114). Immediately after the conference it was decided to give the participants a chance to submit their articles that were based on the conference talks actually delivered at the 24th Baltic Conference on the History of Science for a special issue of the peer-reviewed scientific journal *Baltic Journal of European Studies* (formerly known as *Proceedings of the Institute for European Studies*) published by TUT Department of International Relations. But last but not least, in addition to above-mentioned, the conference was the first one which ever had a follow-up seminar approximately two months later (on 17 December 2010). The topic of the seminar was plain and simple – 'Some aspects of the history of natural sciences in Russia, Finland and the Baltics', since the organizers strived to keep it accessible to as many researchers as possible.

There were two major incentives to arrange such an event. On the one hand, some guests of the main conference who did not present a paper at the main conference, presumably representing the younger generation of researchers, expressed their wish to be given an opportunity to make such presentations in the nearest future as well as to get acquainted with researchers working in the similar field. On the other hand, the Department of International Relations of the Tallinn School of Economics and Business Administration, as the main organizer of the conference, also decided to do something in turn to revive the activities of the Baltic and Estonian Associations of the History and Philosophy of Science (BAHPS and EAHPS) between the larger international conferences usually held in every two or three years. In early November 2010, the webpage of the BAHPS[1] was created for this reason on the initiative of the TUT Department of International Relations.

1 See further at http://www.bahps.org/

Figure 1. Marina Loskutova reading her paper at the seminar (Photo by Nadezha Slepkova – St Petersburg)

The main idea behind that was at least to try to give new impetus to the activities of the Estonian Association of the History and Philosophy of Science, to increase the frequency of contacts between actual researchers, create new cooperation initiatives, as well as to give a kind of positive example for our Latvian and Lithuanian colleagues. Since some of the first volunteers who were willing to speak at the seminar discussed the issues related to the history of scientific organizations working in the field of natural sciences it was decided to dedicate this event to issues of the history of natural sciences. However, surprisingly it turned out to be an event on the conjunction of the natural sciences and the humanities or even the social sciences, since most of the presentations focused also on the social aspects of scientific cooperation in the research of natural sciences (i.e. the buildup and functioning of scientific organizations).

The seminar took place on 17 December 2010 at the Tallinn School of Economics and Business Administration (Akadeemia tee 3, Tallinn, Estonia) and was attended by researchers from Russia (St Petersburg), Finland (Helsinki) and Estonia (Tallinn and Tartu). The very next day, the guests from St Petersburg had an opportunity to meet some younger researchers from Tartu who had not been able to take part of the seminar on the previous day due to their obligations in lecturing.

The seminar opened with the presentation of the senior researcher **Marina Loskutova** (Fig. 1) from the St Petersburg branch of the S. I. Vavilov Institute for the History of Science and Technology at the Russian Academy of Sciences (St Petersburg, Russia). She discussed an interesting topic 'Congresses of

Figure 2. Johanna Lilja (Photo by Nadezha Slepkova – St Petersburg)

Russian naturalists and physicians as a means to explore the academic community in its making' (Loskutova, 2011). The congresses of Russian naturalists and physicians were organized from 1867 to 1913 in different parts of the Russian Empire: the first in December 1867–January 1868 in St Petersburg, the last, 13th in Tiflis (now Tbilisi), and were intended first and foremost for establishing contacts between scientists and enthusiast laymen researchers (such as school teachers, physicians, etc.). The presenter made some statistical conclusions on the geography of people attending the congresses, whilst giving also an analysis of the participation of the researchers from Russia's Western provinces of that time (Finland, the Baltics, Poland, and the Ukraine, etc.). Characteristically of these times the congresses of Russia's naturalists were male-dominated: for example, at the 10th congress (held in 1898 in Kiev) there were 55 women among the 1,089 participants and at the 12th congress (held in 1909/1910 in Moscow) the women delivered 10 speeches out of the 476 actually held during the conference.

The secretary of the Finnish Society for the History of Science and Learning (Helsinki, Finland) and doctoral student of Tampere University **Johanna Lilja** (Fig. 2) delivered a paper on the topic 'The exchange of publications of the Finnish learned societies in 1821–1939 with a special emphasis on relations between Finland and Russia.' She focused on three older Finnish scientific societies: *Societas pro Fauna et Flora Fennica* (established in 1821), the Finnish Literary Society (est. 1831) and the Finnish Antiquarian Society (est. 1870). Analyzing their foreign exchange relations with other scientific societies in Europe and beyond, she indicated that the scientific network was based on an ethos inherited from the dawn of modern science, which is often described by the phrase 'the Republic of Letters'. This ethos alleviated the so-called St Matthew's effect – i.e. the accumulation of scientific resources ("For unto every one that hath shall be given, and he shall have abundance" [Matt 25:29], see also Lilja, 2010). Ethical principles of neutrality and mutual aid were sustained also in the politically difficult years and they made the learned communication possible despite the political upheavals.

Figure 3. Adam Johann von Krusenstern (Atlas de l'ocean Pacifique 1823)

Renata Sõukand and Raivo Kalle, researchers at the Estonian Literary Museum (Tartu, Estonia) gave a comprehensive overview on the topic 'Formation of Estonian ethnobotanical collections'. The history of ethnobotanical research in Estonia can be divided into two periods: the Baltic German and the Estonian period (see Kalle & Sõukand, 2011). The most unexpected was the fact that half of the folk botanical knowledge of the 'Estonian period' has been gathered by people involved in the humanities and the other half by a single person – the botanist Gustav Vilbaste (Vilberg, 1885–1967), a remarkable figure in Estonian science. The following discussion revealed an interesting tendency – while some species of plants have an enormous number of vernacular names (e.g., *Primula veris* has more than one hundred names!), there are also recorded cases that some vernacular names have been used to denote several different species, which of course have created confusion among the collectors of folk botanical knowledge.

Tarmo Kiik, doctoral student at the University of Tartu (Estonia) gave an interesting report entitled 'Adam Johann von Krusenstern's contacts with various seafarers and scientists' based on von Krusenstern's correspondence found in the collections of the Estonian Historical Archives (Tartu). Kiik found that von Krusenstern (1770–1846, Fig. 3) was not only a famous Baltic-German seafarer, but also a person skilled in many languages with a vast circle of contacts. Next to his Russian and German friends, he had correspondence with English, American, French, Belgian and Danish scientists, seafarers and high officials on a wide range of topics from

Figure 4. Maria Feodorovna (Oil painting by Jean-Louis Voille).

the natural sciences to historical matters. The correspondence was active, reciprocal and enabled Krustenstern to complement and revise his cartographic collections.

Senior researcher at the Estonian University of Life Sciences (Tartu, Estonia), **Heldur Sander** focused on 'The contribution of Russia's botanists to the development of the Botanical Garden of the University of Tartu in the first half of the 19th century' (Sander & Meikar, 2011). The presenter concentrated on the establishment of the Botanical Garden of the University of Tartu (Dorpat) in 1803 and the early development of its collections. Fortunately for us, the manuscript of plants and seeds that the botanical garden received during 1823–1832, 1839–1841 and 1846–1852 still exists. Among the contributors there were many botanists of international acclaim, but also some interesting persons such as Grand Duchess Maria Fedorovna of Russia (Sophie Dorothea of Württemberg, 1759–1828, Fig. 4), mother of tsars Alexander I and Nicholas I.

The paper 'The kinship of the famous nature explorers and the founders of parks from Baltic region' by the botanist and the researcher of the history of botany **Mati Laane** (Tallinn, Estonia) revealed fascinating facts, among these the claim that a large number of the founders of Estonian manor parks are related to each other and were closer relatives of some famous nature explorers. The same tendency (that specific talents seem to be hereditary, at least to some extent) can be observed among the famous Baltic-German artists as well.

And, finally, the researcher of the St Petersburg branch of the S.I. Vavilov Institute for the History of Science and Technology of the Russian Academy of

Sciences (St Petersburg, Russia), and one of the editors of the bilingual journal *Studies in the History of Biology/Историко-биологические исследования*, **Anastasia Fedotova** introduced the journal to the seminar participants. The bilingual quarterly journal, published in English and Russian, was founded in 2009 and accepts contributions from scholars in the entire Baltic region.

Already during the seminar it was decided that a proposal will be made to the participants of the seminar to submit their articles for a special issue of the peer-reviewed scientific journal *Baltic Journal of European Studies*, the opportunity which was used by approximately half of the participants (see Kalle & Sõukand, 2011; Loskutova, 2011; Sander & Meikar, 2011).

During the seminar many new contacts between the researchers from different countries were created. In order to make these contacts more frequent, the Finnish Society for the History of Science and Learning together with the Institute for the History of Science and Technology of the Russian Academy of Sciences, the Tallinn School of Economics and Business Administration, as well as the Estonian Association of the History and Philosophy of Science decided that a one-day seminar 'Sciences in Russia, Finland and the Baltics in the early 20th century' will be held in Helsinki, Finland on 27 June 2011. This is an indication of enduring fruitful cooperation between the abovementioned institutions, which has been noticed already by the researchers from other Baltic countries.

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