The Role of Popular Science Literature in Shaping Estonians' World Outlook

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The paper gives an overview of the development of Estonian popular scientific literature in the field of life sciences from its beginning until the end of 19th century. A special attention has been given to the influence of the popular science onto the formation of new world outlook based on natural sciences. The appearance of early educative books was largely influenced by the spread of the ideas of the Enlightenment and Rationalism. Almost the whole 18th and early 19th century have been strongly influenced by the spread of ideas opposite to Rationalism, Pietist and Charismatic ideas of the Moravian brotherhood. However, the 1840s saw a development, which can be described as a "reading revolution". A great many Estonian peasants learned to read, and religious literature lost its previous significance. The following decades offered already a wide range of Rationalist non-fiction. The Lutheran tradition of a critical approach to the scriptures, the adopted reading patterns, as well as the popularity of Rationalist non-fiction contributed largely to the adoption of a scientific worldview. As a result of this development, Estonians have become one of the least religious nations in Europe in traditional sense (only 14% of Estonians admit that religion plays a certain role in their lives).

Keywords: popular science literature, reading, the scientific world outlook, religious patterns, natural sciences, cultural contacts, Estonia.

Introduction

One cannot say that the early history of Estonian popular science literature in field of natural sciences has been totally un-investigated are (see e.g. Võhandu, 1958; Mägi, 2007; Kalling, Tammiksaar, 2008, 2009). The last comprehensive overview of the Estonian popular science literature, however, dates back as early as 1940 (Annist, Roos, Käis, 1940). During the last couple of decades many studies have been published focusing on the specific issues of 19th century Estonian popular scientific literature written solely by Vello Paatsi (1985, 1986, 1989, 1990a, 1990b, 1998a, 1998b, 2006, 2008 etc). Vello Paatsi's doctoral thesis is the first profound analysis of the interconnections of the development of educational system and school literature from the viewpoint of shaping Estonians' world view based on natural sciences (Paatsi, 2003). In addition, recently Andres Kuperjanov has studied the change in the understanding of astronomy among Estonians from ancient to contemporary times (Kuperjanov, 2003). Raivo Kalle and Renata Sõukand have paid special attention on the history of Estonian ethnobotany (Kalle, Sõukand, 2011). With few exceptions, all of such publications are in Estonian.

The processes related to the cultural emancipation of Estonians into a modern nation have also obtained much interest by Estonian researchers. However, overwhelming majority of the publications in these areas concentrate on the societal developments (e.g. Jansen, 2007) and these works seldom concern the topics related to the obtaining contemporary scientific world outlook. In addition, the overwhelming majority of those publications have been published in Estonian, in some cases in Russian (e.g. Jansen, 2001) or in German (e.g. Jansen, 1992; Plath, 2004). The development of the very first Estonian intellectuals have been also studied thor-

oughly by Toomas Karjahärm and Väino Sirk (1997), but this solid book also focuses first of all on the societal developments and the social statistics of the emerging the first generation of Estonian university graduates. The reception of Darwinism has deserved attention of Estonian researchers (Kalling, Tammiksaar, 2008, 2009; Tammiksaar 2010), but the same topic has been more profoundly studied in the case of Finland (Leikola, 2008; Leikola, 2011, p. 127–138). Recently, some younger researchers (Maran, Tüür, 2001; Tüür, Maran, 2005) have paid special attention to the Estonian nature literature from interdisciplinary viewpoint (involving e. g. semiotics) that provide an interesting insight into the 'nature literature' as a specific genre and quite peculiar phenomenon. There's no doubt that all of those studies have made contribution to the better understanding of the role of popular science literature from the viewpoint of shaping the Estonian's world outlook.

The history of the early development of natural sciences, the formation of the world outlook based on natural sciences and the role of popular science literature has been studied more profoundly in the case of neighbouring countries (see e.g. Daija, 2010; Leikola, 2008, 2011; Pitkänen-Heikkilä, 2010, 2012 etc). Despite the fact that we know lot of the history of early development of popular science literature and natural sciences in Estonia we still lack of such comprehensive treatises as "Features of the history of zoology in Lithuania" by Stasys Biziulavižius (Biziulavižius, 1999) or "History of zoology in Finland 1828–1918" by Anto Leikola (2011).

The current paper, based on the presentation of the 24th Baltic Conference on the history of Sciences (Talts, 2010) intends to summarise the results of the previous research and propose a new hypothesis about how the popular science literature affected the consciousness of the Estonian reader, especially in the 19th century and contributed thus to the general shift from traditional to modern thinking. This theoretical proposition has been supported by the wide range of empirical data gathered from the memoires and historical writings of the first generation of Estonian intellectuals – Grünfeldt, 1923; Jans, 2008 (first published – 1940); Jürgenstein, 2011 (1926); Kärner, 1935; Kitzberg, 2010 (1924); Kõpp, 1991 (1953); Liiv, 1936; Prants, 2009 (1937); Raamot, 2010 (1937); Sepp, 1929; Tuglas, 1960; Semper, 1978; Vahtra, 1935; Veski, 1973; Wuolijoki, 1995 (1945) – as well as on some archival data. Although only very few Estonian authors dare to cast some light on the personal story of the altering of their personal religious outlook (Kärner, 1935; Liiv, 1936) there is still ample evidence to back the main hypothesis that popular science literature was key in changing the belief system among peoples living in the conditions of Lutheran culture. The fact that the developments related to the worldview formation of Estonians haven't been dealt in the literature in English deserves special attention.

The advent of Estonian printed word

The literary history of every nation begins with the religious literature. Estonians are not an exception in this respect. The first book in Estonian dates back as early as 1525 and according to the opinion of respected book historians it was most likely a translation of Martin Luther's *Eyn weyse Christlich Mess zu halten* (Johansen, 1959). The same barrel confiscated at Travemünde harbour by a catholic Lübeck magistrate contained also the first book in Latvian. In 1543 appeared the first book in Finnish (*ABC-kiria* by Michael Agricola) and 1547 the first book in Lithuanian (Martynas Mažvydas' catechism). The common denominator for all of these newly emerged publications was the Lutheran reformation (even the first book in Lithuanian appeared due to the

Lutheran reformation in the German-governed Lithuania Minor). The main principle of reformation was that a human being could be redeemed only through his or her personal faith. In order to strengthen the personal faith one must be able to read the Bible and other religious books independently. The Reformation greatly enhanced the importance of national ("vernacular") languages, challenged and influenced the education system (schools for peasant children were established), and also generally created a critical attitude towards the reading matter.

The cultural importance of Swedish reign is hard to overestimate. During the last years of Swedish rule a comprehensive network of rural schools for the children of Estonian peasants was built by local Lutheran church authorities. The first teacher-training seminar was established near Tartu in 1684 by an educator Bengt Gottfried Forselius (1660?–1688). Before the Great Northern War (1700–1721) at least 85 books (plus leaflets and pamphlets) were published containing, at least some, text in Estonian across the Swedish kingdom (Eestikeelne raamat 1525–1850 = Estonian book 1525–1850, 2000, 62–148). However, the translation of the Holy Bible took more than century due to language differences between South and North Estonia, quarrels over writing style, the source of translation etc.

The beginning of the history of secular non-fiction literature in Estonian

With the exception of the grammars and spelling books (ABC books)—being an "inevitable" secular literature for the development of local language skills, and an explosion of secular occasional ('bucolic') poetry in Estonian—the first modest representatives of secular literature appeared in late 17th century. These included legal translations like *Meye Koige armolisemba Kunninga Soddasäduset* (*The war time laws of our beloved King*, 1697) and historical works, such as *Jerusalemma Linna hirmsast Hukkasamissest* (*On the terrible destruction of the city of Jerusalem*, 1701, whch first appeared as a chapter in 1694–1695 church handbook). The systematic appearance of non-fiction literature in Estonian, however, can be dated back to the 1730s (Annist et al., 1940, p. 30–31). These were *Colloquia Esthonica* (*Estonian dialogues*) published in 1732 as a supplement (part 5) to Anton Thor Helle's (1683?–1748) grammar *Kurtzgefaszte Anweisung Zur Ehstnischen Sprache* or so-called story of Hans and Mart (a publication without a title page from 1739).

At first there was no clear distinction between non-fiction and practical literature or even between non-fiction and secular fiction. The 18th century "story books" by Johan Martin Hehn (1743–1793), Friedrich Gustav Arvelius (1753–1806), and Friedrich Wilhelm Willmann (1746–1819) contain passages (quite often in the form of dialogue) which give practical and didactic advice as well as some "utility free", positivist, knowledge about the surrounding world. For example, the book *Üks Kaunis Jutto – ja Öppetusse-Ramat* (*A lovely book of stories and teachings,* 1782) by Arvelius contains couple of dialogues, which deal with both the build-up of cosmic space and the existence of microscopic creatures. The appearance of those books was largely influenced by the spread of the ideas of the Enlightenment and Rationalistic approach to the Theology at that time. The first journal in Estonian (with exceptional long title), *Lühhike öppetus, mis sees monned head rohhud täeda antakse, ni hästi innimeste kui ka weiste haigusse ning wiggaduste wasto, et se kellel tarwis on, woib moista, kuida temma peab nou otsima ning mis tulleb tähhele panna igga haigusse jures* (*A brief teaching, in which some good remedies are pronounced, both for the diseases and injuries of the people and the cattle, so that anyone who needs it, could understand how he or she should search for the advice and what should be especially*

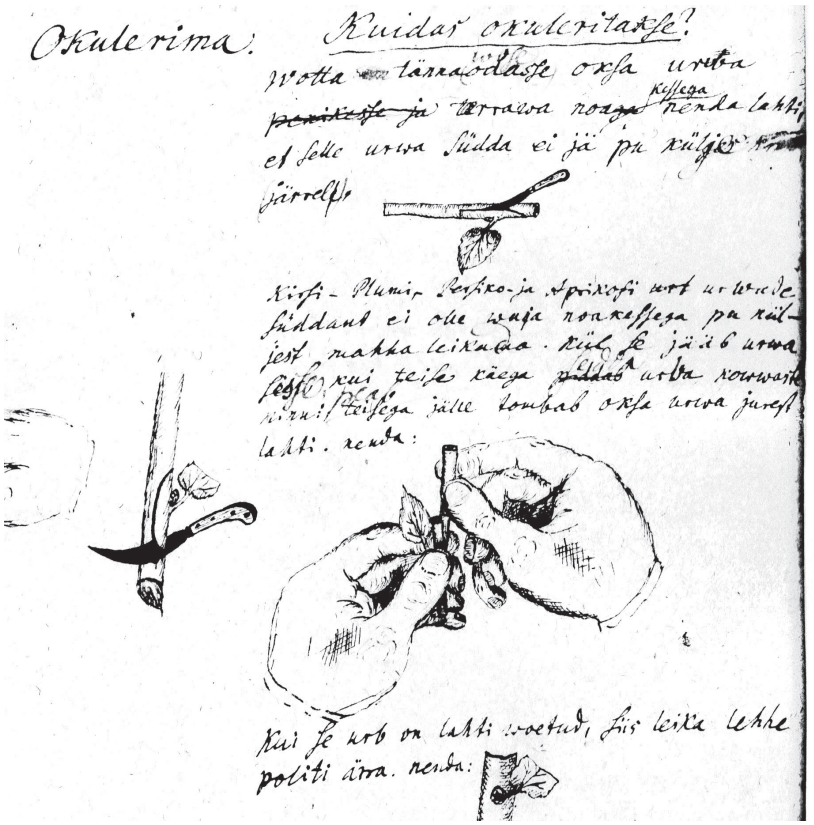

Fig. 1. Self-made illustrations from the manuscript on gardener book in Estonian by Johann Georg Eisen von Schwartzenberg, written in 1760s or 1770s (Estonian Literary Museum Estonian Cultural Historical Archives, ÕES M.B. 3.11)

noticed in the case of each disease, 1766–1767) published by the Rationalists Peter Ernst Wilde (1732–1785) and August Wilhelm Hupel (1737–1819) was also published under the influence of the same ideals. The journal was dedicated first and foremost to the spread of medical knowledge and produced altogether 41 issues. In 1768, 25 issues of the same edition were translated into Latvian by Jakob Lange (*Latveeschu Ahrste = Latvian doctor*). August Wilhelm Hupel is recognized for founding (with Jakob Benjamin Fischer) the research on Estonian invertebrates (see Vilbaste, 1983), as well as conducting the first botanical studies (see Kask 1983).

The very first applied books in Estonian are distinguished by the very weird *Köki ja Kokka Ramat* (*Book for kitchen and cooking,* 1781). It is a very large book (755 pages, comprising 986 recipes) containing recipes of delicacies obviously beyond the reach of the Estonian peasants, who were at that time living in the conditions of serfdom (Annist et al., 1940, p. 42). The first ever gardener book was written by Johann Georg Eisen von Schwartzenberg (1717–1779) either in 1760s or in 1770s. It remained in manuscript, however and is kept at the Cultural History Archives of the Estonian Literary Museum in Tartu[1]. The first printed gardener book in Esto-

[1] Estonian Cultural Historical Archives. ÕES M.B. 3.11.

nian *Aija-Kalender* (*Garden Calendar*) appeared in 1796 (Lenz 1796). It was a translation from Latvian made by Friedrich David Lenz (1745–1809), who was later the first lecturer of Estonian language at Dorpat (Tartu) University until his death. The only copy of that book is kept at Latvian National Library. The first instructional for potato growing was published anonymously in 1800 (in Tartu — *Ma-Rahwa Kalender*, 1801). Eight years later it was published as a spate book under the title *Õppetus, kuida Kartuhwlid peawad mahhatehtud ja kaswatud sama* (*Treatise, how the potatoes should be planted and cultivated*, 1808). The author of text was most likely Jakob Johann Sievers and it was financed by the famous German writer August von Kotzebue. In Latvia the literature on potato cultivation appeared even earlier (Daija, 2010).

The spread of literacy during the second half of 18th and the 19th century

After the Great Northern War, the former students of B.G. Forselius's 'Teachers Seminary' continued their work at local parish schools and greatly contributing to the spread of literacy (especially in South Estonia). In 1730, the Lutheran church adopted the church law that prohibited reverends to marry couples unless their ability to read was controlled by confirmation. These undertakings contributed to the spread of literacy among the Estonian peasant population. In the beginning of 18th century the literacy rate among Estonians was around 10%, by the end of century grew to 40–60 % (40 % in the Estonian governorate, 55 % in the Estonian parts of Livonian governorate, 62 % on the island of Saaremaa, 71 % in Tallinn) (Liivaku, 1995, p. 40). During the 19th century the school system developed further and the literacy rate rapidly increased. By the 1850s it had reached 70–80 %, and by the end of the century included 96 % of people above nine years old living in the Estonian governorate (according to the data of Russian all-empire census of 1897). With the exception of the autonomous Grand Duchy of Finland this was the highest number in the Russian empire up to that time (Lott, Möldre, 2000, p. 24).

The first university graduates among peasant Estonians appear during the first half of 19th century. These were well-known figures in Estonian culture such as Kristjan Jaak Peterson (1801–1822) the founder of modern Estonian poetry, Friedrich R. Faehlmann (1789–1850), physician and writer, Friedrich R. Kreutzwald (1803–1882), compiler of Estonian national epic. All Estonian intellectuals of that time were the graduates of Tartu University either from the faculty of theology or medicine. Internationally the most famous was Philipp Karell (1806–1886), the personal physician of the czars Nicolas I and Alexander II. Nevertheless, most of the leading figures on the Estonian "national awakening" (1860s–1880s) were graduates of a variety of teacher-training seminars, the most significant being the seminary run by a Latvian educator Janis Cimze (in Valmiera 1839–1849; in Valga/Valka 1849–1890). From the 1840–1860s the graduates of these teachers seminars, as well as the first ethnic Estonian university graduates, entirely took over the non-fiction writing and publishing from the local German Estophiles. This period has been described as a transition from estate society (where the ethnic Estonians constituted one quite specific estate) to contemporary civil society. The local German Estophiles formed a kind of a *Res Publica Litteratum*, which in fact opposed the estate society and contributed to the emergence of the first generation of educated Estonian (Jansen, 2007, p. 103). After the disintegration of estate society translating (in larger sense) became the central feature of cultural communication, both from Western cultures into Estonian and vice versa (Udam,

2001, p. 246). Some of the Estophiles (especially Johann Wilhelm Ludwig von Luce and J.H. Rosenplänter) made a substantial contribution the collection of Estonian ethnobotanical knowledge (see Kalle, Sõukand, 2011, p. 215–220).

Calendar literature as the predecessors of popular science literature

Serials were printed in Estonia over more than a century (from the beginning of the 18th century to the 1840s). The first calendar series was called *Eesti-Ma Rahwa Kalender, ehk Täht-Ramat* (*The calendar for the rural people of Estonia*), which appeared in Tallinn and was released by typographers Köhler, Lindfors and Minuth, Dullo, their heirs etc. 1719–1896. The first issue was published in 1719 and was the calendar for 1720 (Annus, 2000, p. 12–13). The oldest calendar in existence today was published in 1731 (for 1732). The calendar issued in 1730 (for 1731) was lost during the WWII. The issues for 1732–1741, 1743–1746, 1748–1749, 1751–1752, 1762–1763, 1766–1768, 1771–1790, 1792–1813, 1819–1896 of this calendar (first series published in Tallinn) still exist (Annus, 2000, p. 13). By 1741 this calendar was published altogether in 20,000 copies (Liivaku, 1995, p. 51; Lott, Möldre, 2000, p. 15).

The first Southern Estonian (Tartu) calendar appeared in 1796 (published by the printer Michael Gerhard Grenzius). This calendar occasionally appeared under the name *Eesti-Ma Rahwa Kalender or* occasionally *Tarto-Ma Rahwa Kalender* – it was printed both in South Estonian and North Estonian dialects. After 1805 the printer Johann Hermann Gressel published the second Tallinn calendar series, and during the early 19th century the number of different calendar series rapidly increased. The first Pärnu calendar appeared in 1845, first Kuressaare calendar in 1863, and the first calendar published in Viljandi in 1879. In late 1880s, the small village of Vändra became an Estonian calendar capital since Mats Tõnisson (whose calendars became very popular, publishing 100,000 copies by the end of the century) lived there (Annus, 2001, p. 136). The most popular and educating were *Marahwa Kalender* published by the Learned Estonian Society (*Gelehrte Estnische Gesellschaft; Õpetatud Eesti Selts*) in 1845–1860 and *Ma-rahwa Kasuline Kalender* published by Tartu printer Heinrich Laakmann in 1845–1860. In 1720–1850, 254 different issues of calendars were published (Eestikeelne raamat 1525–1850, 2000, p. 49), and in 1851–1900, 660 yearly issues, in total an extraordinary 6 million copies (Eestikeelne raamat 1851–1900, 1995, p. 25). The calendars were simultaneously the first periodicals'in Estonian and the predecessors of Estonian popular science literature (Talts, 2008).

In addition to the calendar tables (*calendarium*) other significant information (the exact dates of rural fairs and the birthdays of the members of Russian royal family) calendars began to publish "supplements" (*kalendrisabad*). The calendar of 1731 mentioned solar and lunar eclipses and gave medical advice. The calendar for 1749 explains for the first time explicitly the reasons of solar and lunar eclipses and therefore this writing has been considered the first popular science article in Estonian ever published as stated by Leo Võhandu (Võhandu, 1958, p. 166). The calendar for 1794 explains the build-up of planet Earth thus being the first geographical popular science article in Estonian (Annist et al. 1940, p. 44), but also closely examines geography as well as offering pedagogical advice. Grenzius' calendar for 1799 contains the first Estonian language popular article dedicated to biological matters (Võhandu, 1958, p. 166–167). The 1806 Grenzius calendar provides the first cosmological knowledge (written by Asverus), and the same calendar for 1842 explains this in depthly (written by N.D.H Mühlberg), providing the scheme of our Solar System and description of all the planets and asteroids known at that

time (Kuperjanov, 2003, p. 14). Dullo calendar for 1821 (published in 1820) contained the first geographic overview (sometimes called textbook) of the Russian empire in Estonian written by Abram Holter, a native peasant school master from Pärnu county (Paatsi, 1998; Laas, 2007). 1826 Gressel calendar publishes something that can be referred as the first philosophical essay in Estonian (Annus, 2000, p. 76–77). Calendar supplements have shaped also the Estonians understanding of their own history as well as history in general and enhanced understanding of history as a science (see Paatsi, 2009, p. 105).

The authors of the "calendar stories" were mostly local German Estophiles such as Joachim G. Schwabe, Gustav Adolf Oldekop, O.W. Masing, Franz Gotthilf Asverus, Carl Heinrich Constantin Gehewe, Arnold Friedrich Johann Knüpffer and Johann Heinrich Rosenplänter. From 1840s the most of the stories were already written by Estonian school teachers (such as Abram Holter, Johann Voldemar Jannsen etc.) or the first Estonian university graduates like Friedrich Robert Faehlmann and Friedrich Reinhold Kreutzwald. The latter became first famous as a 'calendar maker' and 'popular enlightener' for his attempts to publish the first ever popular science magazines in Estonian before he manage to compile the Estonian national epic poem "Kalevipoeg" in 1850–1860s. In Lithuania the calendar supplements also played an important role in dissemination of the knowledge about the nature. These kind of activities are mostly related to the name of Laurynas Ivinskis (see Arnastauskienė, Jakimavičius, 1997, p. 112–113).

Spiritual context of the time

The aftermath of Great Northern War (1700–1721) marked a period of the massive spread of the Pietist ideas among the clergy of Baltic provinces. Pietism (derived from word "piety") was a movement within the Lutheran church began to spread from Germany during the late 17th century. Its center was Halle where the movement's ideological leader August Hermann Francke arranged Christian schools for the children of the poor. Pietists opposed moderately to "official" Lutheran church, pursued purity, austereness, piety, 'pure' faith. Their attitude to the Holy Bible was quite fundamentalist if we use contemporary terminology, although their attitude towards the spread of literacy and education was favourable. By the middle of 18th the most of the reverends in Baltic provinces were more or less under the influence of Pietist ideas.

As Pietism was a movement within the church, the ideas of so-called Moravian brothers (*Hernnhuter Brüdergemeinde;* in Estonian *hernhuutlased* or *vennastekoguduslased, vennaksed*) appealed to the larger population, especially peasants. The centre of the movement was in Herrnhut, Saxony, where the "brothers" received refuge and were favoured by the local landlord Nicolaus Graf von Zinzendorf (1700–1760). The first "brothers" appeared in Baltic provinces already in 1726. The adoption of Pietist and Charismatic ideas of the Moravian brotherhood by many Estonian peasants during the 1730s–1740s caused serious unrest among clerical and secular authorities of that time. The ideas, which opposed to some extent to the 'official church' began to spread very rapidly and the movement fall into exaggerations. Therefore it was banned by Jelizaveta Petrovna in 1746, the ban was lifted partially in 1764 and finally in 1817 by czar Alexander I. The brothers promoted the literacy (wrote extensive manuscripts in Estonian, especially during the period when the publishing of their ideas was prohibited), choral music and temperance (Raun, 2001, p. 53). At the same time their attitude towards old folk culture (which they considered Pagan and sometimes even Satanic) was destructive and they opposed publically to the Rationalist ideology.

The second half of the 18th century, however, marked the spread of ideas in large extent opposite to Pietism. The ideas of Enlightenment took their origin from British philosophy (Locke, Hume), becomes influential in France (Voltaire, Diderot et al. = *le siècle de lumières*), and came to the Baltic provinces under the influence of German idealistic philosophy (Kant, Herder et al.). The ideas of Enlightenment favored the principles of rationality, which lead to the new paradigm within Lutheran theology. The so-called theological rationalism (initially presented in the works of the German theologist Christian Wolff) emphasizes the possibility to gain happiness in this world if one operates according to the reasoning and rational choice. The Rationalists saw some of the widespread beliefs of their time as superstition and prejudice, support education as a mean of becoming "become mentally adult" – "grow up from mental childhood". Some of the Rationalist reverends become emphatically practical, others began to educate local 'lower' classes (peasants) mostly by publishing enlightening literature. When Tartu University will be re-opened in 1802 the staff of the Faculty of Theology consists (with one exception) solely of the Rationalists (Tartu Ülikooli ajalugu... 1982, p. 181–182).

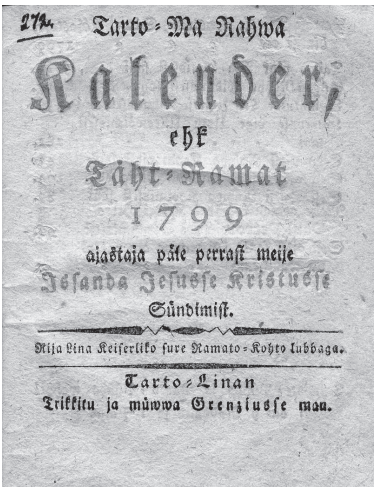
274.
Tarto-Ma Rahwa
Kalender,
ehk
Täht-Raamat
1799
ajastaja pääle perrast meije
Jesuse Jesuse Kristuse
Sündimist.
Nija Lina Keiserliko sure Ramato-Kohto kubbaga.
Tarto-Linan
Trikkitu ja mûwwa Grenziuse mau.

Fig. 2. The title page of 1799 calendar containing the first Estonian language popular article dedicated to biological matters

While in the beginning of 18th century the majority of local German reverends were influenced by the ideas close to Pietism, around the turn of 18th and 19th century the most of them shared Rationalist views. The vast majority of Rationalist thinkers opposed serfdom, which was abolished already as early as in 1816 in Estonian and in 1819 in Livonian province. In accordance with the ideas of Enlightenment and the Romantic cultural philosophy of Johann Gottfried Herder grown out under the influence of the ideas of Enlightenment some local educated Germans became benevolent towards peasant, poorly educated Estonians. The most active of them became so-called Estophiles, find the spread of education and knowledge among the oppressed Estonians one of their prime missions. The most significant of their undertakings were the first scholarly publication dealing with Estonian language *Beiträge zur genauern Kenntniss der ehstnischen Sprache* (33 volumes, 1813–1833) by Johann Heinrich Rosenplänter (1782–1846) and the foundation of Estonian Learned Society (*Gelehrte Estnische Gesellschaft*) in 1838 (Raun, 2001, p. 56). Thus they contributed largely to the development that finally enabled the Estonians to become a nation in contemporary sense.

The further development of popular science literature in the field of natural sciences

The first "purely" (utility free) non-fiction / popular science book in Estonian was *Könne, Jutto nink Jutustamise* (*Speeches, stories and narrations*, 1802) by a reverend working in South Estonia, George Gottfried Marpurg (1755–1835), which described the build-up of the world in a Rationalist manner. Unfortunately, not a single copy of that book has been preserved to our day, although the book was published in 1000 copies. His next book *Weikenne oppetusse nink*

luggemisse Ramat Tarto ma-rahwa kooli laste tarbis (*Small book of teaching for the children of rural people from Tartumaa*, 1805) was the first schoolbook for South-Estonia, written in Rationalist manner. It gives an overview of the universe, system of living organisms as well as first introduction to mathematics. Vahur Mägi mentions that this book can be considered as the first one to enfold the knowledge about chemistry in Estonian (Mägi, 2013, p. 79). Later Marpurg got disappointed in Rational reasoning, turned to Pietism and became a special trustee of the well-known female author of that time Barbara Juliane von Krüdener (1764–1824) who became also an ardent mystic and retreated to her Viitina manor in Southern Estonia (see Anvelt, 1979). *Uus ABD ja Luggemisse-Ramat* (*New ABD and Textbook*, 1811) written by the reverend of Halliste parish Karl Ernst Berg follows the same principles as Marpurg's *Weikenne oppetusse nink luggemisse Ramat,* but wrote his book in the North Estonia dialect, paying even more attention to the phenomena of living nature.

The emergence of the systematic publication of enlightening popular non-fiction, however, is usually associated with the name of Otto Wilhelm Masing (1763–1832), whose *Pühhapäwa Wahhe-luggemissed* (*Sunday interim readings*, 1818) has been called the first Estonian peasant encyclopaedia (Lott and Möldre 2000, p. 17) which provides a comprehensive knowledge of the different regions (Asia, Africa, Kamchatka etc.) and the animals and plants living there. One of the sources of information for Masing's book was the description of the circumnavigation journey of Adam Johann von Krusenstern (Vinkel, 1966, p. 117). There are even some evidence that the book was read in the last decades of 19th century when the language of the book was already obsolete (Liiv, 1936, p. 34). Moreover, there were plans to due to its obvious virtues republish the book, which actually never happened (Vinkel, 1966, p. 120). The tradition of acquainting the Estonian peasants with the fauna and flora of remote countries began with the activities of O.W. Masing. Nevertheless, almost the whole of the 18th century as well as the beginning of 19th century have been strongly influenced by the spread of ideas opposite to Rationalism. Pietist and Charismatic ideas of the Moravian (*Herrnhuter*) brothers experiences its new peak in the first decades of 19th century after the ban was lifted. The boycott the "brothers" declared against Rationalist writings compelled O.W. Masing to twice close his Rationalist newspaper *Marahwa Näddala-Leht* (*Rural people's weekly = Weekly for Estonians*), which was published in 1821–1823 and in 1825 (Noodla, 1986, p. 21). Masing tried to publish his own calendar series (*Marahwa Kalender*, 1823–1826), but had to give up pretty soon. He was a convinced Rationalist, fought against the superstition and beliefs related to different kind of omens among the peasant population, who expected the predictions and foretelling from calendar makers.

A book *Mötlemisse Jummala teggude päle* (*Thinking on the deeds of God*, 1822) written by the former reverend of Põlva congregation, a well-known author of calendar stories and editor of the first newspaper ever in Estonian (1806) Gustav Adolph Oldekop (1755–1838) on the motives of Christian Sturm's *Betrachtungen über die Werke Gottes auf alle Tage im Jahr 1772* tries to focuses on the 'natural phenomena' from the Rationalist theological viewpoint. The author sees Nature as a great system created by God, operating independently according to the natural laws also created by the God. As *Pühhapäwa Wahhe-luggemissed* by Masing it was intended to be read after the each Sunday sermon independently. *Lomisse ramat* (*The book of Creation*, 1851) by the vicar of Vändra congregation Carl Eduard Körber (1802–1883) admires also nature from the viewpoint of Creator's wisdom. *Lomisse Öppetusse-ramat* (*The Teaching book of Creation*, 1842) is the first book in Estonian entirely dedicated to the zoological matters. This anonymously published book is attributed to Aleksander Saksen (Paatsi, 1986, p. 615) and was obviously meant to be the first volume

of a larger 3–4 book series. It gives an overview of the world, the composition of Russian empire and the system of living organisms, the latter part of the book takes a closer look on the mammals (especially on the primates and carnivores of southern regions as well as Chiroptera) and ends with the notice that this was the end of volume one. Therefore, it is obvious that even the author's treatise on mammals remained incomplete.

Ethnic Estonians began to wrote for ethnic Estonians

Beginning in the 1840s, and especially after 1860s writing for Estonians is done by ethnic Estonians themselves. The first entirely original Estonian fiction books written by the ethnic Estonians appear also at the same time. The first consistent treatise of geography written by an ethnic Estonian was a geographic overview of the Russian empire (1820) written by the above-mentioned Abram Holter. This piece was published, however, as a calendar supplement. The first geography published as separate schoolbook was also written by an ethnic Estonian, the schoolmaster Berend Gildenmann *Mailma made öppetus: Isseärranis Ma rahwa koolmeistritte ja kolide tarwis* (*Teaching of the World's countries: Especially for schoolmasters and schools of rural people* = Estonians, 1849). There are, however, texts written earlier by ethic Estonian school teachers, which remained in manuscript, i.e. a translation of Adam Christian Gaspari's *Lehrbuch der Erdbeschribung* by Murro Andres and Tamme Jaagup (1816);[2] a manuscript on the natural history by Peeter Aun (1841–1842),[3] and others. The most interesting is an anonymous, undated, quite large manuscript on astronomy[4], which likely was written during the late 1840s or early 1850s. An interesting manuscript is an Estonian translation by Johan Heinrich Rosenplänter of G. F. Seiler's German textbook *Kleinen neuen Lesebuch für Schulen alle Confessionen* (1841) which gives an overview of living nature, human anatomy, the solar system, and European geography[5].

Ma-ilm ja mõnda, mis seal sees leida on: tullosaks ja öppetlikuks aeawiteks Ma-rahwale (*The world and this and that what could be found there...*), which appeared in five issues in 1848–1849 was the first attempt to publish an Estonian illustrated popular science journal. The idea came from the Tartu typographer Heinrich Laakman (1802–1891), who had received bookplates of the German *Das Pfennig-Magazin*. He made a proposal to the ethnic Estonian writer, a university graduate physician, Friedrich Reinhold Kreutzwald to translate and adapt stories from the magazine, and also write original stories of his own (Paatsi, 1990a, p. 330). The illustrations were taken from the German magazine as well as from the British *Penny-Magazine*, which was actually the predecessor and an example for the German magazine. Some of the illustrations were made by local xylographers (Schmid, Gern and Hagen). The journal focuses mainly on three topics: geography (remote countries and homeland), biology (animals inhabiting those countries), and technology (the latest inventions). *Ma-ilm ja mõnda* was popular among Estonian peasants (Kitzberg, 2010, p. 39; Sepp, 1929, p. 5) as well as its continuation, *Ma-ja Merepildid* (*Pictures from Land and* Sea, I 1850, II 1857, III 1861) compiled by Kreutzwald (Sepp,

[2] Estonian Literary Museum. Estonian Cultural Historical Archives. EÕS ma 157; see also Paatsi, 1998.

[3] Estonian Literary Museum, Estonian Cultural Historical Archives. F. 116. M 4.

[4] Ibid. F. 118. M. 25: 9.

[5] Ibid. F. 192 (ÕES). M.A. 115.

1929, p. 55). Both books were welcomed positively by the critics[6]. *Ma-ilm ja mõnda* compiled by Kreutzwald was soon translated into German and Latvian (Paatsi, 1990a, p. 329).

In 1852–1861, an entire series of schoolbooks was issued for the first time in Estonian by the reverend of the Põlva (South Estonia) congregation, Johan Georg Schwartz (1793–1874). The first school book dedicated solely to matters of natural history and used at parish schools was *Öppetus Jummala lomadest, mis Ma peäl on* (*Teaching on the God's creations on the Earth*, 1853, reprinted in 1860 and 1869) appeared in the same series and was written by the reverend of Võru congregation Eduard Friedrich Lossius (1811–1870). It was the first systematic and holistic treatise written in fluent language, very well illustrated (79 illustrations in woodcut). The author refers constantly to the Holy Bible (the respective biblical quotes describing one or another plant, animal or mineral have been provided throughout the whole book). The fourth book in series was dedicated to the healthcare and written by Friedrich Reinhold Kreutzwald, a university educated doctor. The series contained also the first Estonian book on physics (titled *Wisika, ehk öppetus lodud asjade issewisidest ja wäggedest*) written by Schwartz himself and translated from South Estonian to Northern dialect by Carl Reinthal (1855). This book also tries to relate nature to the Creator himself by referring to views similar to German classical idealism. There is some evidence that the book was read a half-century later (Semper, 1978, p. 68, 73).

The first Estonian non-fiction books were meant to be read at both the schools and independently at homes. The Estophile authors of those books relied on the pedagogical ideas of J.H. Pestalozzi (Paatsi, 2003, p. 15, 29–30) and Adolph Diesterweg (Paatsi, 2003, p. 37–38, 40, 46). It is quite interesting to point out that at the same time the authorities of Tartu University had negotiations with Pestalozzi on his possible professorship at the university (Paatsi, 2003, p. 29). However, these negotiations ended without positive result.

Reading revolution

The 1840s–1880s saw a development, however, which can be described as a "reading revolution". A great many Estonian peasants learned to read, and religious literature lost its previous significance. The beginning of 19th century can be described as the period of intensive reading–there were commonly 2–5 books (mostly religious) in the household, which were read repeatedly and thoroughly (until the reader knew the text by heart). Religious books were usually regarded as holy. This is followed by the period of extensive reading–people began to read many secular books, one after another, thus obtaining contemporary reading patterns (Engelsing, 1974). The turning point in Estonia occurred between 1840–1850 (at the advent of a national awakening), when cheap sentimental stories (so-called *jenowewas*, *hirlandas*, *griseldises*, *helenas* etc.) appear to the market (see Vinkel, 1966, p. 173–175). The first Estonian translation on the life of "Pious Jenowewa" appeared in 1839. Peasants began to consume sentimental and, later, adventure story-books (see Vinkel, 1966, p. 177–190). In 1843–1844, a new version of a standardized Estonian language proposed by Eduard Ahrens was adopted. This new Finnish-style system of spelling facilitated the spread of literary language, since it was considerably simpler and more natural compared to the previously used German-style spelling (old style).

[6] Ma-ilm ja mõnda... // Ma-rahwa Kalender ehk Tähtramat 1850. Tartu, 1849. Lk. 36–38; Head ued ramatud // Tallorahva Postimees. 1857. 22 Nov. № 21. Lk. 167–168; -ä- Maa ja Mere pildid // Eesti Postimees. 1883. 12 Jan. № 2. Lk. 4.

At the same time the books written in North-Estonian took the upper hand and printing in South-Estonian came gradually to its end. An artist and writer Jaan Vahtra recalled a conversation with the local reverend Georg Schwartz when he was a schoolteacher in Põlva (South-Estonia) in the beginning of 20th century. The reverend severely criticized new books written in the North-Estonian dialect as the ones disseminating secular worldview and referred to the older books written in South-Estonian dialect as the good examples of god-fearing literature (Vahtra, 1935, p. 134–136).

Here I make the case that non-fiction literature, at least some genres of it (popular science and applied literature, calendars and other periodicals) acquired the role previously played by religious literature in late 19th century. In the beginning of the century there were only few religious books in the Estonian peasant's household. Popular science and applied literature was continuously read repeatedly and thoroughly even though the attitude to fiction had already changed**.** During the period of intensive reading spiritual reading matter (religious books) became holy for most readers (Paatsi, 2006). This perceived, but naturally altered holiness was transferred to the new kind of reading matter (i.e. popular science books), which become the main reading matter in the second half of 19th century was read repeatedly and thoroughly.

The same applies specially to calendars, which were in some cases printed in great numbers, but not a single copy of them has preserved until today. August Kitzberg (1855–1927) has written that the calendars were very much waited in peasant households and he learned to read independently trying to figure out what was written in calendar supplements (Kitzberg, 2010, p. 39). Mari Raamot (2010, p. 28) mentions in her memoires that she had read C.R. Jakobson's textbook for the school so intensively that could produce the text almost entirely by heart. Although indirect, but obviously characteristic is also fact that some of the early non-fiction books have become extremely rare. For example, no copies of the first popular science book in Estonian Marpurg's was *Könne, Jutto nink Jutustamise* (1802) has be preserved until our days despite of the overall circulation of 1000 copies (Eesti keelne..., 2000, p. 275).

In addition to that, the 19th century Estonian newspapers were bound together and also retained for years, repeatedly read like "any other book" (Liivaku, 1995, p. 78; see also Kitzberg, 2010, p. 66; Kärner, 1935, p. 46). Together with Lutheran traditions, reading habits, and the evolving education system, it contributed eventually to the change of worldview of Estonians: from traditionally religious to contemporarily scientific. In some instances this kind of change may have been abrupt and dramatic. Anton Hansen Tammsaare (1878–1940) describes this upheaval in the second part of this novel *Truth and Justice* (first published 1929) basing on personal experience during his studies at Hugo Treffner's Gymnasium in the late 19th century. Some episodes (like a discussion with the director of the observatory of Tartu University Konstantin Pokrovski) have been confirmed by the memoires of his fellow students (i.e. Veski, 1974, p. 73–74). The contractions between the religious and rationalist views and the perplexity created by this have been described explicitly in the some memoires of this period (i.e. Jans, 2008, p. 26–27). Estonian author Friedebert Tuglas (1886–1971) has also written that in the beginning of 20th century some of the Estonian cultural societies were divided into "idealistic" and "materialistic" branches depending on their attitude towards religious values (Tuglas, 1960, p. 116).

Currently we have some indications that the early popular science books, and especially calendars and also some textbooks for parish schools containing popular science knowledge were read at the peasants' households repeatedly. The journalist and historian Hindrik Prants (1858–1932) describes in his memoires that his grandfather Andre from the village Tohkri (1775–1831) had almost all books by O.W. Masing and his *Marahwa Näddala-Leht* (Prants, 2010, p. 13-14) although he was born in devoted Pietist family. Hindrik Prants' father Peeter

read Kreutzwald's *Ma-ilm ja mõnda* (Prants, 2010, p. 24) and he himself was very found of Marpurg's *Weikenne oppetusse nink luggemisse Ramat Tarto ma-rahwa kooli laste tarbis*, which he calls "a book of general knowledge in miniature" (Prants, 2010, p. 57). August Kitzberg also reminded in his memoires that calendars were read so often that the peasant readers knew the texts already by heart (Kitzberg, 2010, p. 39).

There is some indication of the great impact the non-fiction books had on the Estonian reader of the late 19th century. Writer and politician, the member of Second Russian State Duma and the later member of Estonian parliament Anton Jürgenstein (1861–1933) writes that he had acquired literacy by reading Kreutzwald's *Ma-ja Mere-pildid* (Jürgenstein, 2011, p. 19–20). Finnish writer of Estonian origin Hella Wuolijoki (1886–1954) also remembers that she had read all the books from the storage of his father's book shop "from the jenowewas[7] to agricultural handbooks" by the age of fiftheen (Wuolijoki, 1995, p. 24). The most out-standing of the creators of the terminology in different fields of knowledge Johannes Voldemar Veski (1873–1968), who started his university studies in 1896 in the faculty of theology, then changed it for the faculty of natural sciences and mathematics and later became a well-known linguist also reminds us of the popular science literature he had read during his years of study (Veski, 1974, p. 115–116).

Non-fiction in the field of natural sciences during the period of Estonian national awakening 1860–1880

In June 1857, the first number of the newspaper *Perno Postimees* (*Pärnu Courier*) was issued. This marks the beginning of the area of continuous newspaper publishing in Estonian. The newspaper adopted the term "Estonian people" denoting ethnic Estonians for the first time. The editor of the new newspaper Johann Voldemar Jannsen (1819–1890) took a stand that a newspaper must be both instructive and enlightening (Aru, 2002, p. 93). From now on the Estonian newspapers began to publish both practical advices and enlightening popular science articles. The tradition continued until the emergence of the independent Republic of Estonia and beyond. The following decades, known as the period of national awakening in Estonia, offered already a wide range of Rationalist non-fiction by such prominent figures of the period as Friedrich Reinhold Kreutzwald, Carl Robert Jakobson, Mattias Johan Eisen, Ado Grenzstein, Juhan Kunder, Jakob Tülk, Juhan Kurrik and others. The vast majority of them (even openly 'anticlerical') C.R. Jakobson came from the families with *Herrnhuter* background. The Lutheran tradition of a critical approach to the scrip-

Fig. 3. Fig tree (Ficus sp.), an illustration from "*Öppetus Jummala lomadest*" (Lossius, 1853, p. 21)

[7] Sentimental story book.

tures, the adopted new critical reading patterns, as well as the popularity of Rationalist popular science and other non-fiction contributed largely to the adoption of a so-called scientific worldview (Veski, 1910) by the new generation of already educated Estonians. A "belief in science and rational thinking" became one of the driving forces of Estonian national awakening (Jansen, 1993, p. 354). According to the words of a leader of Estonian national movement Jakob Hurt (1839–1907), Estonians, in spite of their smallness, could attain "a different greatness" in the cultural realm and consequently the education was seen as the universal panacea by Estonian intellectuals (Raun, 1974, p. 139).

Due to the widely accepted scientific worldview based on natural science, there was almost no resistance to the ideas of Darwinism in late 19th and early 20th centuries in Estonia, although the local Baltic German 'scientific community' remained cautious by several different reasons (see Kalling, Tammiksaar, 2009, p. 24–26; Tammiksaar, p. 2010). The first articles on Darwinism in Estonian appeared as late as around 1880 and a real breakthrough took place at the very end of 19th century due to the activities of Richard Aavakivi (1874–1906), Johannes Leopold Jürgens (1870–1937) and Andres Alver (1869–1903) (Kalling, Tammiksaar, 2009, p. 26–27). Aavakivi and Jürgens together published two volumes of a collection called *Lõbu ja Teadus* (*Fun and Science*, 1898, 1899). The first was reissued in the beginning of 20th century for several occasions. The reception of Darwinist ideas in Estonia was considerably facilitated by the views of moderate nationalists who acknowledged the struggle for life as the main driving force in natural world, but the humans have obtained a new moral code through the teachings of New Testament (Kalling, Tammiksaar 2009, p. 27). Author Jaan Kärner also mentioned that his teacher generally was influenced by the new worldview, and replied that God lives only in human heart (Kärner, 1935, p. 113–114). Darwinism's influence on the social sciences in Estonia seems to be quite significant, but yet unexplored (Kalling, Tammiksaar, 2009). The adoption of Darwinism in Estonia was still less problematic, especially when compared to the catholic countries like Lithuania (Šveistytė et al. 2011).

The Society of Estonian Literati (Eesti Kirjameeste Selts, 1871–1893), founded in Tartu on the model of Finnish Literary Society, which was established in 1831 (Raun, 2001, p. 75) and consisted of Estonian intellectuals, advanced the Estonian written language, organized the gathering of folklore and ethnographic material, and published literature in their native tongue. The Society set its goal to publish new, high-level Estonian schoolbooks as well as popular science and practical handbooks based on the latest achievements of science. Because the members of that society were authors of non-fiction they were referred as "authors" or "literati" (in Estonian *kirjamehed*), not "writers" (in Estonian *kirjanikud*). The national awakening was also a period of publishing proliferation. By the middle of 19th century 30–40 Estonian books were published annually (average 38 titles in 1850s), by the end of the century this numbers grows to 300 each year (average 274 in 1890s) (Eestikeelne raamat 1851–1900 = Estonian Book 1995, p. 8, 21). Majority of the non-fiction books of 1872–1890 were published as the proceedings of Society of Estonian Literatii and were written by the best graduates of different local teachers seminaries (Ataste, Kuuda, Jädivere, Tartu Hollmann's seminaries, Seminary of Janis Cimze) as well as some university students and graduates, some of them being already graduates of German universities (like Mihkel Veske or Karl August Hermann). This was also a period when the growing attention was paid to the studies of one's own homeland. Gustav Blumberg (1834–1892) published in 1869 his *Heimathskunde* first in German and in 1871 *Juhataja Kodu – ja isamaa tundmisele* (*A guide to the knowledge of one's own home- and fatherland*). The Estonian version was eventually re-printed 6 times and used as an important schoolbook for couple of generations (Grünfeldt, 1923, p. 14; Kõpp, 1991, p. 105; Jürgenstein, 2011, p. 39–40).

Juhan Kunder, Carl Robert Jakobson and some other authors

When it comes to publications in the natural sciences, it is hard to overestimate the contribution of the Rakvere schoolteacher, Juhan Kunder (1852–1888). He was inspired by and actually did his great work under the supervision of Jakob Hurt, the grand figure of the Estonian national movement, reverend, and scholar (Paatsi, 1989, p. 586–587). He had spent some time in Kazan, improving his Russian and listening lectures at the local university (Vilbaste, 1938, p. 97). Kunder wrote both a comprehensive 3-volume book on natural sciences (*Looduse õpetus* = Teaching in natural science, 1–3, 1877–1885, published as the proceedings of Society of Estonian Literati) and a shorter version in one volume (*Weikene Looduse õpetus* = Short teaching in natural science, 1879). The first volume was dedicated to animal kingdom, the second one to the kingdom of plants and the third one to kingdom of minerals. During this giant work he had to create lot of new terms and adjust the system of terminology. Although Kunder used the German textbooks (for example *Die Naturgeschichte auf der Elementarstufe: Leitfaden für die Band der Schüler* by Hermann Lange, 1875) for his own compilation the result was in fact so remarkable that the shorter conclusive version of his '*Naturlehre'* (*Weikene Looduse õpetus*, 1879) was translated into German and Latvian and used as a schoolbook in other parts of the Russia's Baltic provinces (Paatsi, 2003, p. 97; Gorski, 2001). In addition to that Kunder has written the overview of geological past of the Earth (*Maakera elu ja olu: Õpetlik raamat Koolile ja kodule* = The life and the state of Earth. An educative book for school and home use, 1878), which gives also an overview of the history of life on Earth. However, this is not the first book on that issue since Johann Matthias Eisen (1857–1934) published his book *Loomise saladused: Mõni sõna maa saamisest ja loomisest* (*The secrets of creation: Couple of words on the origin and creation of Earth*) two years earlier (1876). Juhan Kunder also made an attempt to found a popular science journal in Estonian (*Mõnda Loodusest ja Täädusest = This and that about nature and science*, 1876) and was the first person appointed by the President of Estonian Society of Literati to compile the Estonian terminology in natural sciences (Vilbaste, 1938, p. 101). During the second half of the 19th century the system of Estonian terms in natural science was abjectly underdeveloped and needed significant standardization. The Finnish popular science literature of the same period, however, faced the same problems (Pitkänen-Heikkilä, 2012). Literary critics of the end of 19th century were emphatically benevolent towards Kunder's "natural histories'[8]. In the case of his *Maakera elu ja olu* the anonymous reviewer finds essential to emphasize that the author acquaints the Estonian reader with totally different scientific view compared to what he or she has been able to read from Bible so far[9].

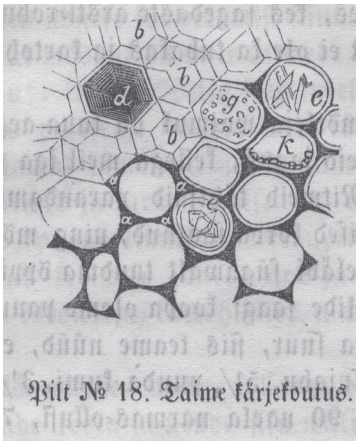

Fig. 4. The cellular structure of plant tissue, the illustration from „*Teadus ja seadus põllul*" (Jakobson, 1869, p. 142)

[8] G.R. Uuemad raamatud Eesti kirjavarast // Eesti Postimehe lisaleht. 1877. № 44. Lk. 276; Uued raamatud // Perno Postimees. 1879. 19 Jan. (№ 3). Lk. 2.

[9] Uued raamatud // Perno Postimees. 1878. 28 Apr. (№ 17). Lk. 135.

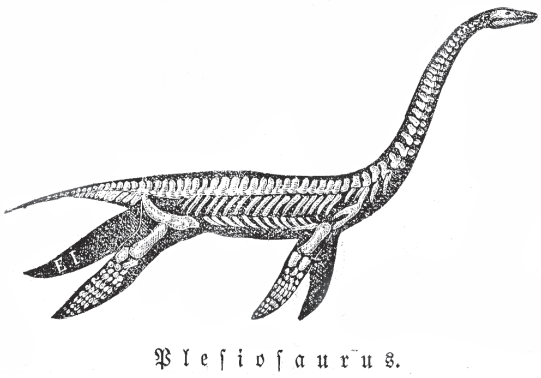

Fig. 5. Plesiosaurus, an illustration from the third volume of „*Kooli lugemise raamat*". A woodcut made by Carl Robert Jakobson's brother, the xylographer Eduard Magnus Jabobson (Jakobson, 1876, p. 69)

At the same time when Kunder's books were published he got a 'competitor' in the person of Jakob Permann (?–1881) who published his quite similar "natural history" in two volumes *Looduse lugu kahes jaus Eesti rahwa koolidelle ja igale looduse sõbrale. Esimene jagu, Küla ja walla koolilaste raamat* (*The Story of Nature in two volumes for village schools* 1878); *Looduse lugu kahes jaus Eesti rahwa koolidelle ja igale looduse sõbrale. Teine jagu, Kihelkonna koolilaste raamat* (*The Story of Nature in two volumes for parish schools,* 1879). These books were also positively reviewed by the press of that time[10]. An interesting author of that time was also Jakob Tülk (1830–1918), who published the second ever Estonian school book on physics (*Wiisika-õpetus*, 1880/1881), as well as books on geometry (1880) and geodesy (1879). Since he has studied in the universities of Strasbourg and Geneva as well as in Sorbonne his book of physics is very much based on French language books as the examples for his own compilations (Tork, 1935, p. 224). The contemporaries of Jakob Tülk valued his book on physics highly, although made some friendly critics of the terminology and the extensive use of mathematics[11]. There is some evidence, however, of the existence of manuscripts on physics from this period, e.g. the one written by teacher Jaan Jürgenstein mentioned in the memoires of Jakob Liiv (Liiv, 1936, p. 50). The second half of 19th century was a period when books became very valued, even admired among Estonians. The books were inherited from generation to generation, often bearing the names of owners and the date when a book was acquired (Noodla, 1986, p. 28)[12].

One of the indicators of the general popularity of natural sciences during the period of national awakening is the fact that the famous textbook *Kooli lugemise raamat* for elementary schools (*School Reading Book* I 1867, II 1875 and III 1876) by Carl Robert Jakobson (1841–1882) contains a significant amount of stories on nature and natural phenomena which exceeded the number of fictional and theological stories by double. The stories of his textbooks about Estonian flora, fauna and geography merge scientific fact with folklore for didactic purposes (Maran, Tüür, 2001, p. 7). This school reading book became extremely popular so that the first

[10] Uus raamat // Sakala lisaleht. 1878. № 47 (16 Dec.). Lk. 2.

[11] See e.g. J.K. Kirjandus // Sakala lisaleht. 1880. № 51 (20 Dec.). Lk. 2.

[12] For example, the book *Looduse õpetus. I: Elajate riik* (1877) by Juhan Kunder in personal possession of the author of the present article has the inscriptions *Mihkel Palu 1885* and *Jüri Palu 1926 XII 31.*

volume was re-printed 15 times. Johannes Voldemar Veski recalls in his memoires that he had learned to read solely on the basis of Jakobson's schoolbook (Veski, 1974, p. 35). Journalist and writer Peeter Grünfeldt (1865–1937) claims that he got inspiration for his first poem by reading stories by Jakobson and local German author Christian Böhm (Grünfeldt, 1923, p. 15). Jakobson's book *Teadus ja seadus põllul. 1. jagu* (*Science and law at the field*. Vol. I, 1869), which is ought to be in principle a handbook for an Estonian peasant, explains in-depth some aspects of soil physics and chemistry as well as the basics of plant physiology (and even the principles of the cellular structure) being thus more or less an educative popular science edition. Moreover, the critics called this book the first truly scientific Estonian book among the books dedicated to agriculture[13]. The planned second volume of the book, however, was never published due to bankruptcy of the printer. Jakobson became also famous for his polemic newspaper articles where he demanded that the number of lessons on natural sciences at Estonian elementary school should be increased at the expense of the lessons on religious education (Paatsi, 2003, p. 45, 61). Johannes Semper (1978, p. 36) mentions that Jakobson's newspaper *Sakala*, which represented radical views towards the church and religion, was the most popular newspaper in the area where he was born.

The same traditions of overrepresentation of the reading matter on natural sciences was proceeded by other similar textbooks for elementary schools published in the beginning of 20th century (such as the series of the textbooks by Mihkel Kampmaa, the first of which was published in 1905). Jakobson and some other literati of the period of national awakening started the remarkable tradition of Estonian nature writing on the crossroads of scientific, practical literature and fiction, which has something equal in Europe only in Norway (Maran and Tüür 2001, 5; Tüür and Maran 2005, 239–240). The central issue for the Estonian society during the second half of the 19th century and the beginning of 20th century was the buying out of their peasant households from the landowning German nobility. Therefore the first generation intellectuals could not get alienated from the land and nature even in the case they would like to wish so.

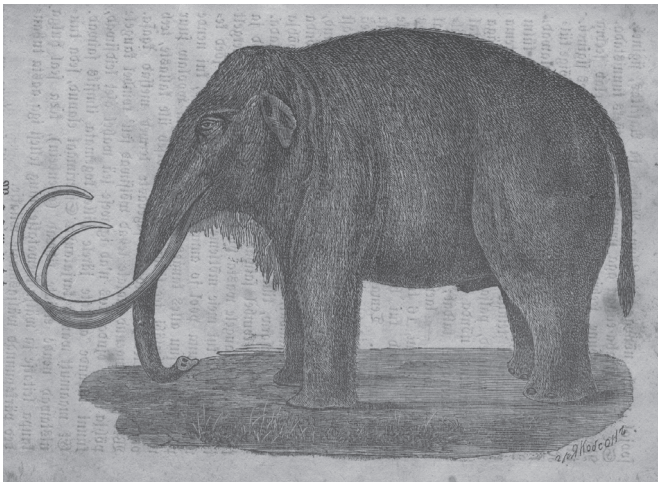

Fig. 6. Mammoth, an illustration from the third volume of "*Kooli lugemise raamat*". A woodcut made by Eduard Magnus Jabobson (Jakobson, 1876, p. 67)

[13] H.P. Põllutöö kirjandusest // Põllumees. 1895. № 1. Lk. 8–14.

The last decade of 19th century and the very beginning of 20th century

The period of Russification which began in Estonia in the middle of 1880s negatively influenced the publishing of Estonian (see *Russification in the Baltic...,* 1981). Nevertheless, the negative effects of Russification should be not overestimated. In fact, it somewhat liberated Estonian intellectuals from the Baltic German cultural world (Raun, 2001, p. 77) and some scholars argue that the Estonian national movement entered the phase of mass actions and obtain a clearly political agenda during the early years of Russification (Jansen 1992, 274). During these years the subjects related to mathematics and natural sciences were taught in Russian and the local schools used the textbooks issued in Russia. Only couple of very modest attempts were made to issue the local books in Russian (i.e. Янус, 1895; Кузик, 1896). Due to the Russification the first chemistry book in Estonian written by Jaan Kompus in 1887 remained in manuscript[14] (Deemant, 1971, p. 170–172; Mägi, 2007, p. 923). However, there are some indications that the Russian books on natural sciences were constantly read by young Estonians. Johan Jans (1880–1941) remembers that one of the books he read repeatedly Ivan Borodin's book of botany (Jans, 2008, p. 30). Nevertheless, during the first years of Russification appeared a large (almost 500 pages) work by

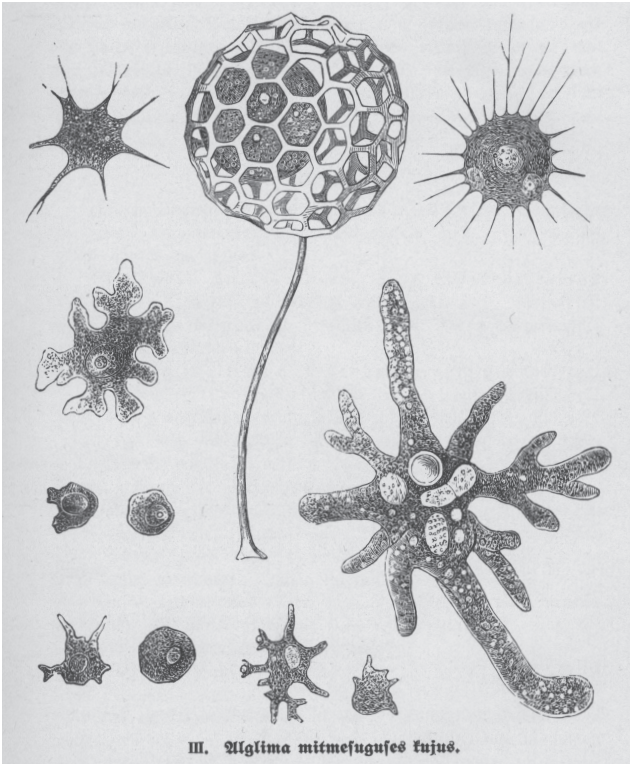

Fig. 7. Protists from Peeter Hellat's "*Terwise õpetus*" (1891–1894).
(Hellat, 1891, separate page between pp. 10 and 11)

[14] Manuscripts and rare books department, Library of Tartu University. Mcsr 1145.

an Estonian MD Peeter Hellat (1857–1912) *Tervise õpetus* (*A treatise on health*) printed in St. Petersburg and Tartu in 1891–1894). This comprehensive overview of medicine and medical problems includes also parts dedicated to questions of general biology in accordance to the latest achievements of late 19th century science. The last decade of 19th century also witnessed the appearance of the first book from the trilogy by Jaan Spuhl-Rotalia *Kodumaa kalad* (*Domestic fishes*, 1896). The manuscript of the book was reviewed by Ernst von Middendorff and addressed in addition to a systematic overview of domestic and foreign species, also the origin of fish, their natural enemies, overviews of both anatomy and physiology as well as a review of local fishing and pisciculture (see also Spuhl-Rotalia, 2010).

Fig. 8. "*Wee-alune riik*" (Underwater kingdom, 1910), Walerian Lunkewitsch. A typical popular science book from the beginning of 20th century

The real explosion of popular science literature in Estonian, however, took place in the early 20th century, especially after the 1905 revolution when the most of the previous censorship obstacles were lifted. This is a period of rapid publication of a large number of thin brochures on the topics of Darwinism, heredity, cytology and other latest developments in science. Some are translations from Russian or German, and others are original writings. The model for such publications seems to be the low-priced editions of high-quality literature of German publishing house Reclam (Lott, Möldre, 2000, p. 27).

It is important to note that the first and especially the second decade of the 20th century was a period of rapid development of scientific terminology in all fields, including biology (see Paatsi, 1985). Some first-generation educated ethnic Estonians had to confess that their mothertongue was German (e.g. Rosenthal 2010 = 1912, p. 24). The number of ethnic Estonian scientists also began to grow. According to Karl Martinson in 1851–1875 the ethnic Estonians comprised 8 % of the scientists living in Estonia. In 1876–1900 the same number was 17 % and in 1901–1917, 33.5 % (Martinson 1990, p. 382). The number of Estonian students also grew significantly. In 1896, Johannes Voldemar Veski attended Tartu University in order to study natural sciences, but a year later his majored to linguistics. Nevertheless, today we know him as a 'founding father' of Estonian scientific language and terminology in different fields of natural sciences including biology. During the second decade of the century the first native Estonians with degrees in biology graduated from other universities. These were Johannes Piiper (1882–1973; who studied at St. Petersburg University 1903–1913) and Heinrich Riikoja (1891–1988; who studied at the University of Yur'ev (Tartu) 1910–1918). Their contemporary, Gustav Vilbaste (1885–1967), an outstanding figure in botany and nature conservation, graduated from University of Vienna when he was 42 (Laasimer et al., 1994, p. 45). The difficult conditions of the time prevented him from graduating earlier.

Conclusions

According to Vello Paatsi (2003, p. 138, 176) more than 420 titles of non-fiction literature on natural sciences were published in Estonian in 1851–1917. Almost two thirds of these publications fell into the short period of the beginning of 20th century (169 of them appeared in 1851–1900, 258 during the relatively short period of 1901–1917, according to Paatsi, 2003). This was the period of a great proliferation of popular science literature in the field of natural

sciences as well as the period when scientific literature in the proper sense of the term emerges and the scientific terminology in most of the fields of science evolves extremely rapidly (Martinson, 1990; Möldre, 2010). Natural sciences and Estonian history became the most significant topics of popular science literature in late 19th and in early 20th century.

As a result of this development, Estonians have become one of the least religious nations in Europe. According to the well-known survey only 16 % of Estonians admit that there must be a God and the religion plays a certain role in their lives (Special Eurobarometer, 2005, p. 9). This conclusion has been conformed by subsequent surveys (European Values Survey. Survey, 2008; Vucheva, 2009). In my opinion Estonians are not as much as atheists, but rather agnostics since even 54 % of them tend to believe in some sort of 'spirit' or 'life force' according to the Special Eurobarometer survey. Some Estonian intellectuals (Kaplinski, 1998) and scientists (Parmasto, 2001) have pointed out the differences between the atheism and non-believing. Kaplinski has even draw out and interesting category of "believing non-believers" (see also Altnurme 2011, 2012). Unfortunately, this situation has not contributed to the development of a dialogue between religious and scientific worldviews, which is almost non-existent in present-day Estonia. The quite widespread interest towards astrology, parapsychology, New Age, ufology, etc. can also be interpreted as one of the side effects of losing 'natural' ties with religion. On the other hand one can argue that Estonians have obtained strong commitment to reasoning (or what they believe to be 'reason'). Since such "new beliefs" often operate with scientific reasoning and within certain seemingly scientific paradigms these view seem to be easy to adopt at least for the quite large number of Estonians

There can be no doubt that similar trends took place in the case of other nations (especially in the areas under the influence of Lutheran tradition), but it seems that in the case of Estonian this development was rapid, abrupt and engaged at once a larger number of population as they were growing out of peasantry and becoming the members of modern society. Sometimes the development like the one described here has been called a 'cultural split' or even 'cultural rupture', meaning a certain kind of development that is related to the rapid adoption of new cultural values with the clear-cut rejection of the old ones (see Mikita, 2012, p. 3). One can even say that science became a kind of a religion for the vast majority of the first generation of Estonian intellectuals, even for those who did not turn their back completely on religion., The new scientific world view, however, operates also with preconditions similar to religious beliefs (see Kasak, 2011). Nevertheless, the specific role of popular science literature together with the Lutheran traditions, specific emphasis on education, critical reasoning, set of values and critical attitude towards knowledge influenced the Estonians to become mentally a nation they currently know.

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Роль научно-популярной литературы в формировании мировоззрения эстонцев

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Настоящая статья представляет собой обзор эстонской научно-популярной литературы в области наук о жизни с момента её появления до конца XIX в. Особенное внимание уделяется влиянию научно-популярной литературы на формирование нового мировоззрения, основанного на естественнонаучных знаниях. Раннее появление образовательной литературы способствовало распространению идей Просвещения и рационализма. Практически весь XVIII и начало XIX в. развитие научно-популярной литературы шло под влиянием идей противоположного характера — пиетизма и харизматики Моравского братства. В 1840-х гг. начинается процесс, который может быть описан как «революция в чтении». Большинство эстонских крестьян становятся грамотными, и религиозная литература теряет свое первоначальное значение. В последующие десятилетия появляется большое количество книг научно-популярного характера в духе рационализма. Лютеранская традиция критического подхода к Писанию, адаптация текстов, равно как и популярность рационалистского подхода, существенно способствовали широкому принятию концепции научного мировоззрения. В результате этого развития эстонцы стали одной из наименее религиозных наций в Европе (только 14 % эстонцев признают, что религия играет хоть сколько-нибудь значительную роль в их жизни).

Ключевые слова: научно-популярная литература, чтение, научное мировоззрение, естествознание, религиозные образцы, культурные связи, Эстония.