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Contacts in natural sciences between Riga and England in 1660–1710

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ABSTRACT

London became one of the most important centres for the natural sciences in the latter half of the seventeenth century. The sphere of influence of the Royal Society of London, as well as that of the first natural scientific periodical, the *Philosophical Transactions*, covered all of Europe through a network of fellows of the Society and of contributors to the periodical. This article examines the mutual contacts between persons interested in natural sciences in England as the centre of natural science and Riga as the centre of one of Europe's peripheral regions. The main characters under scrutiny are Nicolaus Witte von Lilienau (1618–88) and David Krieg (about 1669–1710). Riga's municipal physician Witte corresponded and exchanged books and objects with the treasurer of the Royal Society, Abraham Hill (1633–1721). Krieg, a doctor of German descent working in Riga, spent an entire year in England in the company of England's naturalists, and went to the American colonies in 1698 to collect specimens of natural history. In 1699 he was elected a fellow of the Royal Society and corresponded until 1708 with the secretary of the Royal Society Hans Sloane and the collectionnaire James Petiver. Also, several doctoral candidates from Riga who ventured out on academic peregrinations after completing their university studies visited London.

Keywords: History of natural sciences, Royal Society of London, *Philosophical Transactions*, David Krieg, Nicolaus Witte von Lilienau, Riga

In the latter half of the seventeenth century when Europe began recovering from the upheavals that came with the wars of the first half of the century, activity in the Republic of Letters suddenly picked up as well. Until that time, the universities (primarily in the Low Countries) had been the disseminators of new natural scientific ideas. After the stabilisation of political

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conditions, however, and especially in the 1660's, scholars began organising themselves in scientific societies. In addition to the primary means of communication in the Republic of Letters – correspondence – scientific periodicals emerged as a new forum.[1] The Royal Society of London was founded in 1660/62 as a centre where English scholars interested in the natural sciences could meet. The periodical *Philosophical Transactions*, started up 350 years ago in 1665 through the private initiative of Henry Oldenburg, the Royal Society's energetic secretary, and still published to this day, it soon became the place for many of Europe's renowned natural scientists to publish their articles. Alongside many European countries, the influence of the circle of scholars associated with the Royal Society also extended to England's colonial possessions in America. The influences of English natural scientists also extended to Europe's peripheral regions, including Sweden's Baltic Provinces and especially Riga as the centre of Livland, in the latter half of the seventeenth century by way of direct contacts as well as the spread of their writings. The indirect influence of English scholars in the Baltic lands was quite notable at the University of Tartu, which was reopened in 1690 and transferred to Pärnu in 1699. Professor of Mathematics Sven Dimberg, who had himself been to England, was one of the first in Europe to consider Isaac Newton's work *Philosophiae naturalis principia mathematica* (published in 1687), including the new theory of gravitation, in his lectures in 1693–97.[2] Dimberg ordered a telescope for the university from none other than England and demonstrated it in 1692.[3] Natural scientific literature by English authors was represented in the University of Tartu library, the primary readers of which were the above-mentioned Dimberg in the 1690's and Professor of Medicine Laurentius Braun during the university's Pärnu period. Thus Dimberg took out for his reading the issues of *Philosophical Transactions* from 1665 to 1669, and Boyle's *Chymista scepticus, Experimenta physico-mechanica de vi aeris*, and *Tentamina physiologica*. Braun, on the other hand, borrowed Boyle's *Apparatus ad historiam sanguinis humanis* and *Institutiones physicae*.[4] Works by Robert Boyle, Thomas Willis, Richard Lower, Robert

[1] Laine Kilk, "Vanimad teaduslikud ajakirjad Tartu Riikliku Ülikooli Teaduslikus raamatukogus", *Tartu Riikliku Ülikooli Toimetised*, 224 (1968), 62–79.

[2] Ülo Lumiste, Helmut Piirimäe, "Sven Dimberg – Newtoni õpetuse varane propageerija Tartu Ülikoolis 1690. aastail", *Tartu ülikooli ajaloo küsimusi*, XI (1981), 26–53.

[3] Georg von Rauch, *Die Universität Dorpat und das Eindringen der frühen Aufklärung in Livland 1690–1710* (Essen: Essener Verlagsanstalt, 1943), 385.

[4] Arvo Tering, „Ülikooli raamatukogu", *Tartu ülikooli ajalugu*, *1: 1632–1798*, koost. H. Piirimäe (Tallinn: Valgus, 1982), 243–254 (250, 253).

Hooke and other English natural scientists were referred to and quoted in the disputations and inaugural dissertations defended by physicians in the Baltic lands (including David Krieg) until 1710, which will be examined in a separate future article.

Below, however, I shall consider direct contacts between English and Riga natural scientists. The primary focus is on two physicians and natural scientists who worked in Riga. The first of these – Nicolaus Witte von Lilienau, the municipal physician of Riga with his educational background in Holland who favoured Harvey's theory of blood circulation[5] – corresponded in 1663–69 with Abraham Hill, who was a founding fellow of the Royal Society and served as its treasurer.[6] The second is David Krieg, a naturalist from Germany and a Royal Society fellow, whose activity is marked by his work as a naturalist and doctor in Riga in 1694 – 1710 (with interruptions), and his voyage to the colony of Maryland in America in 1698 to collect specimens of natural history.[7] Incidentally, Krieg's name is perpetuated in the name of a genus of dwarf dandelion: *Krigia virginica*. The City of Riga is the backdrop for the English contacts of both scholars and economic downturn is their background: when Witte was corresponding with Abraham Hill, Riga had not yet recovered from the effects of the Swedish-Russian and Swedish-Polish wars and the plague of 1657. The more active period of Krieg's work in Riga came during the Great Northern War, marked by the blockades of the city by Saxon forces in 1700–01 and by Russian forces in 1709–10, and by the outbreak of the plague in the city. Even during the intervening years of the Great Northern War, the war taxes and economic uncertainty that burdened the city's citizens provided Krieg with plenty of work as a doctor to the point where he did not have any time to devote to his work as a naturalist. Possible scientific contacts between Riga and England during the city's economic and educational upturn in the 1670's–90's have yet to be discovered. In addition to Witte and

[5] Arvo Tering, "Riga municipal physician Nicolaus Witte von Lilienau (1618–1688): his medical views at the crossroads of tradition and changes in medical teaching during his student years at Dutch universities in the 1640s", *Acta baltica historiae et philosophiae scientiae*, 2 (2014), 70–116.

[6] Abraham Hill, *Familiar letters which passed between Abraham Hill Esq. ... and several eminent and ingenious persons* (Gale ECCO, Print Editions 2010; facsimile from: ed. L. Astley (London, 1767)), 207–249.

[7] Raymond Phineas Spineas, "James Petiver: promoter of natural science, c. 1663–1718", *The Proceedings of the American Antiquarian Society* (Oct. 1953), 243–365 (306–310); George F. Frick, James L. Reveal, C. Rose Broome, Melvin L. Brown, "Botanical explorations and discoveries in colonial Maryland, 1688 to 1753", *Huntia: A Journal of Botanical History* , 7 (1987), 5–59 (23–29).

Krieg, several medical students from Riga were also interested in England, and after completing their university studies, they made the *peregrinatio academica* to England as well and became acquainted with scholars there.

Interaction between scholars in Riga and England would not have been possible without functioning channels of communication. Functioning postal service connected Riga to Western Europe: Riga couriers transported mail to Memel twice a week from where it was in turn conveyed via Königsberg and Danzig to Hamburg,[8] and from there to Western Europe, including England. During the shipping season, however, the communication channels of merchants and mariners were also used. The merchant shipping connection between Riga and the ports of England was apparently sufficient for maintaining contact: 443 ships sailed from Riga to England in 1670–79, 427 ships in 1690–99, and 80 ships in 1699–1700,[9] thus an average of around 40 ships per year. Admittedly, London was not the destination port of all these ships. Even though the number of ships in the 1660's and during the Great Northern War had to be considerably smaller than at the highpoint of the economic upturn, even then Riga scholars were certainly not without opportunities to send and receive despatches to and from London.

The first 50 years of operation of the Royal Society of London[10]

In order to better understand contacts between Riga and English scientists, a brief overview is in order of the activity of the Royal Society and its place as a coordinator of natural scientists during its first fifty years. In doing so, primarily those viewpoints that help to shed light on the communication between English scholars and the Riga scholars Nicolaus Witte and David Krieg are borne in mind in selecting the points of emphasis.

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[8] Pārsla Pētersone, „Riga als ein Knotenpunkt im schwedischen Post- und Verkehrssystem um die Ostsee im 17. Jahrhundert", *Der Westfälische Frieden von 1648 – Wende in der Geschichte des Ostseeraums: für Prof. Dr. Dr. H. C. Herbert Ewe zum 80. Geburtstag*, hrsg. von Horst Wernicke und Hans-Jürgen Hacker (Greifswalder Historische Studien, 3) (Hamburg: Dr. Kovač, 2001), 404.

[9] Sven-Erik Åström, *From cloth to iron: the Anglo-Baltic trade in the late 17th century, part I: the growth, structure and organisation of the trade* (Helsinki: Societas scientiarum Fennica, 1963), 52, 59.

[10] This overview of the nascency of the Royal Society is based on: Marie Boas Hall, *Promoting experimental learning: experiment and the Royal Society 1660–1727* (Cambridge: Cambridge University Press, 1991); Andreas Selling, *Deutsche Gelehrten-Reisen nach England 1660–1714* (Frankfurt am Main, Bern, New-York, Paris: Peter Lang, 1990), 33–52.

Researchers of natural sciences based on experiment and observation began forming organisations in England in the 1640's. Notably, when Oxford University fell into the hands of supporters of Parliament during the Civil War, the commission of 1648 removed faculty members and invited young scholars who based their approach on Bacon's principles to replace them. These young scholars were joined by students with keen minds. The so called 'Invisible College' of natural philosophers that met in London evolved into the core of this circle of scholars. When royal power was restored in England in 1660, Oxford's conservative faculty members who had been dismissed in 1648 were rehabilitated. Professors favouring innovation and reform were either dismissed or they resigned on their own accord. They gradually settled in London, where they started meeting in a building bequeathed by the merchant Thomas Gresham (Gresham College) in 1598 for holding public lectures on scientific themes. In the autumn of 1660, 12 interested participants decided to found a scientific society for improving the situation of the natural sciences and implementing Bacon's principles. The name chosen for it was The Royal Society of London for Improving Natural Knowledge. After the Great Fire of 1666, the Society operated elsewhere in 1667–73. The Society's library was returned to Gresham College in September of 1678.[11]

Among the Society's founding members, Robert Boyle, John Wilkins, William Petty, Christopher Wren, Abraham Hill, and Christopher Merret may be highlighted. The Society's membership had already grown to nearly forty by the end of that same year. The Royal Society received an official founding royal charter from the king in 1662.

The Society observantly kept an eye on the research of nature based on experiment and observation, and developed into an institution that spread natural scientific ideas on a scale encompassing all of Europe. A forum emerged for scientists in the form of meetings held every Wednesday for presentations where scientists had the opportunity to present the results of their research and demonstrate experiments and to familiarise themselves with the results of research conducted by their colleagues. In an era where one scientific discovery followed another, the opportunity to inform others of one's discoveries as operatively as possible was of the utmost importance. The organisation of competitions for finding the best work for solving important research problems was also an important service of the Royal Society. The Society's president, two secretaries and

[11] Marie Boas Hall, *The library and archives of the Royal Society 1660–1990* (London: Royal Society 1992), 13 ff.

a treasurer organised the Society's activities. As of 1662, two secretaries were in office simultaneously: John Wilkins (1614–72) and Henry Oldenburg (about 1619–77). The latter was the son of Heinrich Oldenburg, who had served as a professor at the Bremen gymnasium and briefly as a professor at the University of Tartu (until his death in 1634). Henry Oldenburg served as a secretary of the Royal Society until his death in September of 1677. Oldenburg had a real talent for communications. As a result of his work, the Society evolved into a capable network connecting natural scientists throughout Europe. Oldenburg acquired books on mathematics, mechanics, chemistry, physics and medicine from all over Europe to introduce to the Society at meetings and for discussion and review. The centre of gravity of his correspondence was in the Low Countries and France. Primarily information in the field of natural sciences, medicine, mechanics and mathematics was gathered and exchanged. Thanks to Oldenburg's enthusiastic initiative, a dense network of scientific contacts developed in the form of correspondence together with the opportunity to publish the results of research. Thus the Royal Society evolved into an international scientific society that transcended England's boundaries.

A period of crisis ensued for the Society after Oldenburg's death, intensified by tensions between rival scientists, scant funding and lack of interest in meetings for scientific presentations. The secretaries Robert Hooke (1635–1703) and Nehemiah Grew (1641–1712), who succeeded Oldenburg and Wilkins, were outstanding scientists but conflicts of interest emerged between the results of their own research and results arrived at by other scientists in the same field. The sustainability of the network of foreign correspondents suffered due to overload and even the continuity of the publication of *Philosophical Transactions* was threatened.

The activity of the Society was re-energised during the period when Hans Sloane served as secretary in 1693–1713. Sloane restored international scientific contacts that had in the meantime petered out, inviting renowned foreign scientists to join the Society and encouraging them to publish their work in the columns of *Philosophical Transactions*. The connections he secured while studying medicine at the universities of Paris and Montpellier supported this endeavour. Yet while Oldenburg preferred more experimental fields, Sloane, as a naturalist and collector, leaned towards supporting taxonomist natural scientists, setting the tone in the Society for a botanical orientation at the end of the seventeenth century and early years of the eighteenth century. The fact that Isaac Newton became president

of the Society in 1703 heightened the Society's reputation. After Newton's death in 1727, Hans Sloane became president (until 1741).

Both professional and amateur natural science enthusiasts were welcome to join the Royal Society. In this way, the Society helped amateurs working in laboratories or collecting specimens of natural history to develop into notable natural scientists.

Almost all prominent English natural scientists belonged to the Society. Nowadays the works by fellows of the early Royal Society are known primarily in the field of optics, mathematics and physics. At the turn of the seventeenth and eighteenth centuries, however, the study of natural history in all of its aspects, including botany and astronomy, was considered the Society's primary task.[12] Of the Royal Society fellows that are known to this day, let us highlight the physicians-mathematicians-astronomers Isaac Newton (1642–1727), Robert Boyle (1627–91), Robert Hooke, John Flamsteed (1646–1719), Edmond Halley (1656–1742), John Wallis (1616–1703); the botanists John Ray (1627–1705) and Nehamia Grew; and the physiologists Thomas Willis (1621–75), Richard Lower (1631–91), Francis Glisson (1597–1677), John Mayow (1640–79) and Walter Charleton (1619–1707).

In its first decade, only 7% of Royal Society fellows were foreigners but in the last decade of the seventeenth century, they already accounted for 24%, and in the eighteenth century, a third of the Society's fellows were foreigners.[13] Travellers arriving from abroad also took advantage of the opportunity to visit the Society's meetings for scientific presentations and presentations of experiments.

Royal Society secretaries also corresponded with scholars from the German linguistic area. In 1663, Oldenburg contacted the Danzig astronomer Johann Hevelius (1611–87), who was elected a Society fellow in 1664. Gottfried Wilhelm Leibniz (1646–1716) sent his first letter to Oldenburg in the summer of 1670 and henceforth sent him his works. He visited London in 1673 and 1676, and became a Society fellow in 1673. Marcello Malpighi (1628–94) became a Royal Society fellow in 1669. From Sweden, the Swedes Georg Stiernhielm and Urban Hiärne, who were also associated with Livland, became Royal Society fellows. During Sloane's era, the Society also corresponded closely with the American colonies.

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[12] Dominik Collet, *Die Welt in der Stube: Begegnungen mit Außereuropa in Kunstkammern der Frühen Neuzeit*, Veröffentlichungen des Max-Planck-Instituts für Geschichte, 232 (Göttingen: Vandenhoeck & Ruprecht, 2007), 280.

[13] Selling, *Deutsche Gelehrten-Reisen nach England*, 80.

In the latter half of the seventeenth century, England increasingly became the destination of not only renowned foreign natural scientists, but also of medical students who had yet to defend, or had only just defended their doctoral dissertation. They visited Royal Society sessions as well as scholars in their homes, and also visited the better known cabinets of curiosities. Foreigners, however, ran into communication problems: English did not yet have the status of a world language in the seventeenth century. The English, on the other hand, pronounced Latin the same way as their mother tongue, for which reason it was often difficult for foreigners to understand them. English scholars themselves knew French and sometimes also Italian. Yet the more renowned English scientists became in Continental Europe, the more foreigners tried to learn English in order to read the works of English scholars in their original language.

One of the scholars that foreign visitors visited the most was Robert Boyle, who had moved from Oxford to London in 1668.[14] Boyle's works on physics and chemistry were widely known abroad. They were published in many new Latin editions. In Continental Europe, the Royal Society was associated first and foremost with Boyle's name, as it later was with Newton's name.[15] Boyle's experiments with an air pump were demonstrated time and again to the Royal Society's visitors. If Boyle was not found in the Gresham College building, his home laboratory was visited. Boyle was happy to receive visitors, conversing with them freely in French, Italian or German. One reputable visitor who should be pointed out is the later great figure Friedrich Hoffmann, the Halle professor who also played a major role in training physicians of the Baltic lands. He associated with Boyle while he stayed in London in 1683–84 and was greatly influenced by Boyle.[16]

The Royal Society was a scientific society in the literal sense of the word. Meetings for scientific presentations and demonstrations of experiments took place there. The Academia Naturae Curiosorum founded in 1652 (known as the Leopoldina from 1687 onward) in Schweinfurt, Germany, and l'Academie Royale des Sciences founded in Paris in 1666 were other such societies.

Financially speaking, the Society relied on membership dues and donations from fellows. Thus the Royal Society did not have the sort of opportunities to support research work as the academies of sciences founded a little later in Berlin in 1700 and in St. Petersburg in 1725. As institutions

[14] Selling, *Deutsche Gelehrten-Reisen nach England*, 190.
[15] *Ibid*., 186.
[16] *Ibid*., 192.

financed from the state budget, these academies of sciences paid for the day to day work of scientists and financed laboratories, the work of museums, expeditions and the education of succeeding generations of scientists. The chemistry and physics experiments of Royal Society fellows were still conducted in the homes of the scientists themselves and at their own expense, and studies of nature still relied on private collections.

How important was the periodical *Philosophical Transactions*? Just as the Royal Society is the oldest natural scientific society that continues to operate to this day, so is *Philosophical Transactions* the oldest natural scientific periodical that continues to be published nowadays. The Society's secretary Oldenburg started publishing it at his own expense in 1665. The publication of the French *Journal des sçavans* admittedly began a few months earlier but it was a general scientific periodical with universal content. *Philosophical Transactions* was published regularly once a month during Oldenburg's time, even during the plague epidemic of 1665–66 and after the Great Fire of London in 1666. Its publication became irregular only in July and August of 1667 when Oldenburg was imprisoned, accused of espionage on account of his extensive international correspondence, and after his death in 1677. It was not published at all in 1680–82 and 1688–91. *Philosophical Transactions* began being published regularly again in 1691.

Until the establishment of scientific periodicals, personal correspondence had been the only possibility for obtaining scientific information. Practically all scholars of that time were diligent writers of letters. Yet correspondence could no longer satisfy the needs of scientists for operatively informing an ever expanding circle of colleagues of the results of their research. The birth of the scientific periodical, however, provided the opportunity to start presenting summaries of experiments along with observational data and results of research, and also to review and introduce new books and publish excerpts from correspondence to reach all interested persons at one time. The custom of reviewing articles prior to their publication in the periodical and of publishing reviews of published books remains in effect to this day. Many scientists who have been renowned to this day were among the contributors to the *Philosophical Transactions*, for instance E. Halley, J. Wallis, R. Boyle, I. Newton, R. H. J. Ray, Martin Lister (1639–1712), known as a researcher of shells, Christoph Wren, the astronomer Johannes Hevelius from Danzig, the astronomer Giovanni Domenico Cassini (1625–1712) from Paris, Marcello Malpighi from Italy, and from the Netherlands Anthonie van Leeuwenhoek (1632–1723), Christiaan Huygens, Reinier de Graaf, Baruch Spinoza and Jan Swammerdam,

and others. Interest in *Philosophical Transactions* arose among scientists throughout Europe, primarily in France and Germany. Scholars associated with the French *Journal des sçavans* translated *Philosophical Transactions* into French in its entirety or in the form of excerpts.[17] The activities of the Royal Society were also followed very closely in Germany and *Philosophical Transactions* became so popular that the first issues of *Acta philosophica societatis Regiae* were published in Latin in Amsterdam and in Frankfurt am Main in 1671 and in Leipzig in 1675. This title was somewhat misleading because at that time, *Philosophical Transactions* remained Oldenburg's personal private initiative published at his own expense.

Scientific journals started being published in other countries as well according to the example of *Philosophical Transactions* and *Journal des sçavans*. Two scientific journals started being published in German territories. Philipp Jacob Sachs von Löwenheim, secretary of the Academia Naturae Curiosorum who visited London and also the Royal Society's Wednesday sessions in 1669 or 1670 and was elected a Society fellow, evidently drew inspiration from there for publishing the natural scientific journal *Miscellanea curiosa medico-physica sive Ephemerides medico-physicae Germanicae curiosae*, which at that time had a medical inclination and has been published since 1670 until this day under different titles. Professor of Moral Philosophy Otto Mencke (1644–1707) started publishing the scientific monthly *Acta Eruditorum* with universal content in Leipzig in 1682. Its publication continued for one hundred years. Mencke had been in London in 1680 to gain experience from the English for starting up a scientific journal. He corresponded with John Wallis and Isaac Newton. His journal was also widely read in English scientific circles.[18] Notably, German and English scientists used the columns of *Acta Eruditorum* and *Philosophical Transactions* respectively as platforms in debates between themselves. We see this in connection with contentious issues in particular: 1) the priority dispute between Leibniz and Newton about calculus on whether Leibniz or Newton was first; or 2) which method of systematising plants is more practical, August Quirinus Rivinus's artificial classification or John Ray's natural classification of plants.

Just as universities had collections, so did the Royal Society under the name of the Repository since 1663.[19] It was established with the intention

[17] Anthony Turner, "An interrupted story: French translations from *Philosophical Transactions* in the seventeenth and eighteenth centuries", *Notes and Records of the Royal Society*, 62:4 (2008).

[18] Selling, *Deutsche Gelehrten-Reisen nach England*, 96.

[19] Collet, *Die Welt in der Stube*, 269–314.

of acquiring and preserving the collections necessary for natural scientific research. The Repository was located in the Gresham College building in Hooke's apartment. This collection was given its separate rooms in 1673. Great expectations were no doubt initially entertained for the study of nature in England, Scotland, Ireland and the colonies, and the acquisition of specimens for the Repository. Numerous questionnaires were drawn up for travellers and seafarers to take along to America, East India, Africa or wherever, and for English consuls and the Society's correspondents residing in different countries. These were aimed at the collection of specimens of natural history and ethnographic objects of aboriginal peoples as well as observations based on specific research needs. Questionnaires were also published in the columns of *Philosophical Transactions* or as separate flyers.[20] One of the persons responsible for supplementing the Repository's collections and drawing up questionnaires was the Society's treasurer Abraham Hill, who was part of the Society's leadership.[21] Yet since the Society was unable to finance the work of collection, herbaria and other such valuable resources for scientific research were collected and sold more to private collections. The Repository's collections augmented more through private donations or the exchange of specimens. Exhibits obtained in such a way, however, proved to be typical exotic curiosities, the likes of which were plentiful in private collections and the value of which was negligible as objects of research. Augmented in such a manner, the Repository did not differ from private collections. No supervisor conscious of his responsibility could be found for the Repository such as Paul Hermann in Leiden. N. Grew, whose catalogue of the properties contained in the Repository compiled in 1681 remained in use for decades,[22] did not devote much energy to working with the collection, and Robert Hooke also neglected it. The Repository was given to the British Museum in 1779.

Like all other scientific societies established in subsequent times, the Royal Society developed its own library and archive,[23] where received books and letters, and the minutes of meetings held for scientific presentations were deposited. The Royal Society probably did not receive any fewer books and manuscripts than objects as exhibits. The Society's fellows and

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[20] Collet, *Die Welt in der Stube,* 281–291.

[21] *Ibid.,* 296.

[22] See Nehemiah Grew, *Musaeum Regalis Societatis: or a catalogue and description of the natural and artificial rarities belonging to the Royal Society and preserved at Gresham Colledge* (Rawlins, 1681).

[23] Hall, *The library and archives of the Royal Society.*

correspondents sent to the Society their own works as well as other literature of interest to the Society from all regions of Europe.

The collection and exposition for visitors of art, antiques, specimens of natural history, and especially curiosities came into fashion in the seventeenth century in Europe's princely residences and in more affluent cities. Close contacts with East India and the West Indies in particular gave added impetus to this trend. Hitherto unknown objects, specimens of natural history and other items were brought from these parts of the world. Such activity became particularly prestigious among prosperous English and Dutch merchants. One part of this collecting activity was also the classification and drawing of specimens of natural history: plants, insects (including butterflies), and fossils. Here the interests of amateur collectors and professional researchers of nature intertwined. The seeds of exotic plants and flower bulbs were brought back from trips for Europe's universities, royal courts and private botanical gardens.[24] Taking stock of the plant kingdom of different regions had already begun earlier: naturalists collected and classified plants, and later systematised and published catalogues. Thus Johann Lösel compiled a catalogue of plants from East Prussia in Königsberg, in the region closest to the Baltic lands.[25] Enthusiasts, who were mainly doctors, collected and drew plants in distant lands as well, like for instance Paul Hermann in Ceylon and on the coast of the Cape of Good Hope. Very skilled drawers of insects, butterflies and plants emerged, for instance the pioneering naturalist Maria Sibylla Merian, the daughter of a Frankfurt engraver who lived in Amsterdam. Her book of plants and butterflies that she drew in Surinam was popular among enthusiasts and was also used as a handbook by scientists. The English, first and foremost from Royal Society circles, were particularly diligent collectors of plants and insects.

A new type of collector of good social and economic standing known as the *virtuoso* emerged in England as well as elsewhere in Europe in the seventeenth century. The collection and exposition of tokens from the past, such as paintings, sculptures and coins was already a fashionable pastime for the prosperous bourgeoisie and the nobility in earlier times. Borne by enthusiasm for the sciences, however, collectors made room in their

[24] Collet, *Die Welt in der Stube*, 315–348.

[25] Johann Lösel († 1655) did not live to complete his catalogue of Prussia's flora. His son published it: *Plantae in borussia sponte nascentes e manuscriptis parentis* (Königsberg, 1654); its revised and updated edition by Johann Gottsched: *Flora Prussica sive, Plantae in regno Prussiae sponte nascentes. Quarum catalogum & nomina Johannes Loeselius […] olim disseruit, … curante Johanne Gottsched* (Königsberg, 1703).

cabinets for plants, stuffed animals and animal skeletons, insects, shells, fossils and minerals. A great deal of specimens of natural history from the West Indies and East India were also to be found in the larger collections. The most elaborate cabinets of specimens of natural history belonged to the physicians John Woodward (1665–1728) and Hans Sloane, the pharmacist James Petiver (1663–1718) and William Courten-Charleton (1642–1702).

John Woodward lived in the Gresham College building, and his cabinet of specimens of natural history was visited a great deal. Woodward was in close contact with Germans. One enthusiast who sent fossils and scientific news to Woodward was Baron Schönberg of Saxony.

Hans Sloane was another of the major collectionnaires. He lived in the house of Doctor Thomas Sydenham. Sloane was the personal physician of the Governor of Jamaica from 1687 onward. After returning home, Sloane started up his own doctor's practice and served as secretary of the Royal Society in his spare time. Sloane brought no less than 800 plants back with him from Jamaica and his collection also included corals, shells, insects and other items of interest. He had collected and catalogued them himself. His cabinet of specimens of natural history thrived and grew rapidly, particularly in 1702 after he acquired his friend William Courten-Charleton's collection and in 1718 after acquiring the pharmacist James Petiver's collection. Sloane collected not only plants, insects and fossils but also ethnographic objects and ancient artefacts from Egypt, Assyria, India and the Orient, along with coins, medallions and works of art (Dürer, Holbein, Hollar). Sloane sent James Petiver to the Netherlands as his agent in 1711. Petiver purchased specimens of natural history at auctions in Holland, including part of the herbaria of the German-born Professor Paul Hermann, who had died in Leiden in 1695. Sloane's library contained over 50 000 books and 3500 bound manuscripts. The numerous medical dissertations bound together into collected volumes that Sloane collected from universities in the Netherlands are extremely valuable for contemporary researchers of the history of science. They include several dissertations from the University of Leiden published before 1654 of which no other copies survive. After Sloane's death, his collections formed the core of the British Museum, which was founded in 1759. The British Library, where Sloane's manuscripts are deposited, including his voluminous correspondence, was later detached from the British Museum. Both collectors – Woodward and Sloane – had contacts with scholars throughout Europe, but they did not get along particularly well with each other.

The London pharmacist James Petiver, who was a Royal Society fellow since 1695, is known in scientific literature primarily as an expert on butterflies. Petiver laid the foundation for his very large botanical and entomological collection in the 1670's. His herbarium collection was one of the largest in England. Many specimens were from the East Indian islands and from America. Since he never travelled to distant lands himself, he used naturalists who collected specimens of natural history in those regions, especially in the American colonies. After Petiver's death, his collections were acquired by Sloane.

William Courten-Charleton was the owner of one of the best known cabinets of curiosities in London.[26] He had received a good education in medicine and botany when he studied in Montpellier. He was in France for an extended period of time later on as well, striking up a friendship with John Locke, who was living there in emigration, and the Professor of Botany at the Jardin du Roi, Joseph Pitton de Tournefort, under whom the English botanists William Sherard (1659–1728) and Tankred Robinson (about 1658–1748) also studied. Courten-Charleton laid the foundation for his collections in France, and Locke helped him to ship them to England. The Cabinet of Curiosities that Courten-Charleton established in 1684 developed into one of London's museums that was most worth seeing. He had ample financial means for acquiring a very varied selection of exhibits, including natural rarities. Courten-Charleton enlarged his collection to demonstrate his own affluence. The scientific value of his exhibits was secondary for him, even though he associated with scientists and had thoroughly familiarised himself with the collections of the botanical garden of Paris, the director of which was his friend Joseph Pitton de Tournefort. The Courten-Charleton collection's natural history part (exotic plants, shells, insects, fossils, seeds, fragments of the skeletons of exotic animals) also fascinated the well-known botanists John Ray and James Bobart. The Temple Coffee-House Botany Club members Hans Sloane, William Sherard, Tankred Robinson, M. Lister and Leonard Plukenet (1642–1706) were part of Courten-Charleton's circle of friends.

[26] Concerning William Courten-Charleton and his collections, see: Collet, *Die Welt in der Stube*, 209–268.

Nicolaus Witte's contacts with the Royal Society

Nicolaus Witte von Lilienau (1618–88), who had demonstrated during his studies in the Netherlands that he was a student who favoured new ideas, including the theory of blood circulation, served as Riga's second municipal physician starting in 1652, and as the city's first municipal physician starting in 1663,[27] while simultaneously serving as archiater (chief physician) of Sweden's royal household. Thus he held the highest social position possible in the field of medicine in Livland. During the 1660's, when the City of Riga was still recovering from the plague of 1657 and from the damages of the Swedish-Russian and Swedish-Polish wars, Witte felt that he was *in ultimo Barbariae angulo*, as one of his former university friends pointedly characterised him,[28] evidently cut off from the rest of the scientific world. Aware of the strides made in English natural sciences in the 1660's, Witte sought opportunities for establishing contact with someone who would keep him informed of the newest developments in English science and send him the newest literature. The London merchant Benjamin Ayloff recommended Abraham Hill (1633–1721) to Witte. Hill was interested in natural science and his background was in commerce and trade.[29] Ayloff was himself a successful London merchant active in Baltic trade and with close ties to the Baltic lands.[30] Hill was also interested in natural sciences. He was the treasurer of the Royal Society and one of its founder-organisers. It is due to the fact that Hill's correspondence was published about a hundred years later and that this was in turn issued as a facsimile in 2010 that we know about Witte's English contacts in more detail.

The correspondence between Witte and Hill took place at a time that was highly unfavourable for both Riga and London: Riga was struggling with the woes described above while London was scourged by the English-Dutch maritime war in addition to other woes. There are a total of six letters from the interval 1663–69: letters dated 17 July 1663, 18 December 1664, 17 February 1668 and Hill's subsequent undated letter written in reply in English, an undated letter from Witte to Hill and the final letter from 9 January 1669.[31] These letters contain mutual information exchange as well as mutual sending of literature and objects. Witte's fields of interest become apparent from the first letter, and they are medicine, physics,

[27] Tering, "Riga municipal physician Nicolaus Witte von Lilienau (1618–1688)", 70–116.
[28] *Ibid.*, 108.
[29] Hill, *Familiar letters*, 209.
[30] Åström, *From cloth to iron*, 100, 162, 167.
[31] Witte's letters to Hill: Hill, *Familiar letters*, 207–241.

chemistry, surgery, mathematics, mechanics, discoveries and news in agriculture and gardening, travels, linguistic etymology, didactics, mnemonics, and tachygraphy.[32] Thus they coincide to a considerable degree with the fields of activity prioritised by the Royal Society. Since it was England where the greatest strides in natural science were being made at that time, Witte started studying English especially with the aim of reading the books written by English scientists in their original language.[33] He nevertheless wrote to Hill in French and Latin. Extolling English science, he referred to Francis Bacon, William Harvey and Kenelm Digby (1603–65) as geniuses.[34]

Witte was very interested in how things were going for the Royal Society. In his first letter already he wanted to find out from Hill about the new society in greater detail.[35] Before 1668, he had received the newly published overview of the first five years of activity of the Royal Society drawn up by Thomas Sprat.[36] This provided Witte with important grounds for extolling the English scientific society. He repeatedly made known his wish to correspond with one of the scientists associated with the Society, particularly Robert Boyle. He expressed this wish in the first letter he sent in 1663 already.[37] He had obtained Boyle's works and was inspired by them. Admittedly, Hill discouraged this idea, referring to Boyle's enormous workload.[38] Boyle moved from Oxford to London at precisely the same time as Hill sent his reply (1668) but he had actively participated in the Royal Society's Wednesday meetings prior to that as well.[39]

It is important to note that Witte reported in February of 1667 that he had received the autumn issues of *Philosophical Transactions*.[40] In a later undated letter, Witte also quotes an article that had been published in *Philosophical Transactions* in 1665.[41] Thus there is reason to stress the crucial fact from the viewpoint of the history of the reception of science that

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32 Hill, *Familiar letters,* 212.
33 *Ibid.,* 207–209.
34 *Ibid.,* 208. The same names also figure in the letter from the Silesian Philipp Jacob Sachs von Löwenheim to Henry Oldenburg extolling English science: Selling, *Deutsche Gelehrten-Reisen nach England*, 140.
35 Hill, *Familiar letters*, 211.
36 *Ibid.*,219. This was: Thomas Sprat, *History of the Royal Society* (London, 1667).
37 Hill. *Familiar letters*, 212.
38 *Ibid.,* 219.
39 Marie Boas Hall, *Robert Boyle on natural philosophy: an essay with selections from his writings* (Bloomington: Indiana University Press, 1965), 29–30.
40 Hill, *Familiar letters*, 219.
41 *Ibid.,* 233.

Philosophical Transactions arrived in Riga quite soon after its publication began in 1665.

As a physician, Witte was particularly interested in new literature on medicine. In December of 1664, he wrote that he had sent his doctoral dissertation on the plague that he had defended in Leiden in 1648. In February of 1669, Witte hoped to receive a treatment of the great London plague epidemic of 1665–66 for the purpose of comparison with his own dissertation.[42] He also wished to receive the works of Charleton and Merret.[43] Hill informed him in his reply letter of 1667 that a book *de morbis capitis* by T. Willis was forthcoming.[44] This may refer to the treatise *Pathologiae Cerebri et nervosi generis specimen* (1667).

It is just then that literature dealing with the microscope became topical, providing support to research in natural sciences. Hill reported on the publication of works by Royal Society fellows Robert Hooke – *Micrographia* (1665) – and Henry Power – *Experimental philosophy* (1664).[45] It is unclear from the letter whether Hill also sent them to Witte.

Witte's interest in agricultural innovations arouses interest. On the one hand he tried to brief Hill on Livland's agricultural news: in a letter sent in February of 1667 he promised to send a forked wooden plough of the kind in use in Livland and two books on agriculture in the upcoming shipping season.[46] The books were handbooks that had attracted a great deal of attention at that time: Salomon Gubert's *Stratagema oeconomicum oder Acker-Student* published in Riga in 1645 or 1648, and Johann Hermann von Neidenburg's *Liefländische Landmann* published in 1662.[47] Witte appears to have been rather disappointed later when he had not received

[42] Hill, *Familiar letters,* 215–216, 223.
[43] *Ibid.,* 211, 215, 228.
[44] *Ibid.,* 228.
[45] *Ibid.,* 228.
[46] "[…] mittam proxima navium occasione aratrum Livonicum, quo heic terram, uno saltim adhibito equo, proscindunt, quod ob levitatem et parabilitatem non contemnendum videtur. Mittam insuper duos libros Germanicos de oeconomia rurali Livonorum impressos, in quibus licet nihil rari aut novi occurrat, attamen, quia depingunt ideam oeconomiae nostrae Livonicae, (quamvis in ea plurimi errores, superstitiones, et defectus occurrant,) non injucundum nec inutile videtur varios modos terrae colendae a variis gentibus sub diverso coelo usitatos, cognoscere. An aliquid circa currum illum, ventorum remigio absque equis, mobilem, (de quo in prioribus meis ad te literis) tentatum sit, ex te scire gestio." (Hill, *Familiar letters*, 223).
[47] Concerning these books, see: *Eesti talurahva ajalugu I*, toim. Juhan Kahk, Enn Tarvel (Tallinn: Olion, 1992), 363–365.

a response from Hill concerning the forked plough.[48] Since Hill was the keeper of the Royal Society's Repository and as such was responsible for acquiring objects of the material culture of exotic peoples, he should have been pleased by the receipt of the forked plough as an implement used by Latvians – an indigenous people from the peripheral regions of Europe. Moreover, Hill had just purchased an estate for himself then in 1665 and he would have had the chance to personally try out the plough there. If that forked plough were indeed to be deposited in the British Museum, it would most likely be the oldest of all ploughs from Livland that have been preserved to this day.

It follows from the correspondence between Witte and Hill that Witte considered the invention of a wind-powered carriage that did not require human or horse power for locomotion to be a service that he himself had rendered.[49] Witte apparently hoped to find support from England for this project, which at that time was at the idea stage, but Hill did not appear to have been particularly interested in this vehicle operating on the principle of a windmill. In any case, Witte once again asked in his letter from 1669 about the stance on this idea and whether it had been tried out.[50] In and of itself, this idea was not new: ever since the Renaissance, inventors had attempted to construct carriages powered by either sails or wind powered rotating blades. Since his letters indicate that Witte was very much taken by this idea, it is quite likely that he consulted on this theme with the technical experts of that time in Riga, for instance the municipal engineer Franz Murrer or the land surveyor Johann Svenburg. This inspires hope for finding a drawing of such a carriage or its description in archival documents to be found in Riga.

Witte was very much interested in the English agricultural innovator Gabriel Plattes and the grain seeding machine that he invented. He wrote in his first letter to Hill already that he had found information in Plattes's book on the *cornsetting instrument* that he had invented.[51] Witte wrote about that instrument again in another letter sent in 1664.[52] In his letter to

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[48] "Aratrum Livonicum, quod ob suam. levitatem non contemnendum mihi videtur, jam mississem, si gratum id tibi fore vel uno verbulo indicasses. Quod si tanti esse videbitur, imperabis, et impetrabis ab eo qui se totum et omnia sua tibi debet impetro" (Hill, *Familiar letters*, 240).

[49] Hill, *Familiar letters*, 215–216.

[50] "An aliquid circa currum illum, ventorum remigio absque equis, mobilem, (de quo in prioribus meis ad te literis) tentatum sit, ex te scire gestio" (Hill, *Familiar letters*, 223).

[51] Gabriel Plattes, *A discovery of infinite treasure, hidden since the worlds beginning whereunto all men, of what degree soever, are …* (London, 1639) (Hill, *Familiar letters*, 211).

[52] Hill, *Familiar letters*, 217.

Witte from 1667 or 1668, Hill described Plattes's invention in greater detail: "he was one that undertook what he could not perform, and so was not credited in those things which he really could. That cornsetting instrument was used by Dr. Williams at Oxford, who, making the experiment in an open field, and after entrusting others to reap and thresh it, tells me, he had an accompt of the produce as seventy-four to one. The engine is shortly to be brought to London, and then I shall procure the model to send you but that other engine of motion, mentioned in a little book A. D. 1651, is kept as a secret by the inventor. It works by the strength of a man's hands, and in practice has performed much, and was sent to Barbadoes to be applied to the sugarworks there, but miscarried by the way."[53] Witte wrote in 1669 that he had received a model of this machine from Hill several years ago already but that he would have wanted to acquire it in its full size for actual seeding. Unfortunately, however, not a single craftsman was to be found in Riga who would have been capable of constructing a seeding machine to the right scale according to this model but he still hoped to find such a craftsman.[54] This gives very graphic outlines to one episode in the history of technology in the Baltic lands, providing fixed points for the detailed research of these issues and for seeking new sources in archives, museums and libraries in both Riga and London.

A letter from January of 1669 indicates that Hill had offered Witte the seeds of several cultivated plants that were considered exotic at that time but later became common. The plant in question is Portuguese quince, towards which Witte was indifferent, adding that this was a common plant in England. On the other hand, Witte was interested in potato tubers, corn and Flandrian clover.[55] If Witte did receive these seeds and tried to grow them

[53] Hill, *Familiar letters*, 228–229. There is presumably more extensive information on Plattes's inventions in the book: *The agrarian history of England and Wales, 5: 1640–1750* (Cambridge: Cambridge University Press, 1984). Unfortunately, this book was unavailable to the author of this paper.

[54] "[…] instrumentum ad ordinatam seminis sationem inventum, accepi in modello (ut vocant) quale jam ante aliquot annos beneficio tuo acceperam. Ego autem illud in justa et debita sua magnitudine, quae ad frumentum terrae implantandum requiritur, desiderabam, ob artificum hujus loci penuriam, per quos stetit, ut hactenus voti mei compos non factus fuerim. Sed tandem idoneum artificem nactus, ejus potiundi spe sustentor" (Hill, *Familiar letters*, 238–239).

[55] "De malo Cydonea ex Lusitania deferenda, non est, quod labores, vir humanissime, putavi illam, ex indicio R. Austini, in Anglia satis esse frequentem, ubi illam vocari. The Portugal Quince-tree, ait. Nec adeo, nisi sit ad manus, ea arbore jam indigeo. Si autem radicibus patatis, frumento Turico, (quod a quibusdam maiz, ab aliis Virginian, or Ginny-Wheat vocatur) semine trifolii illius Flandrici, &c. per tuam aut mercatoris operam potiri liceret, longe id mihi gratissimum foret." (Hill, *Familiar letters*, 238).

in his garden plot, this could be considered another extremely important anchor point in the history of agriculture in the Baltic lands. The cultivation of both potatoes and clover did not begin in the Baltic countries until a hundred or more years later.[56]

As became apparent above, Witte was very much fascinated by the works of Robert Boyle and wanted to correspond with him. Witte had presumably managed to acquire most of Boyle's works. It is, however, certain that he had a copy of Boyle's *The experimental history of cold* (London 1665).[57] The topic of cold and the freezing of liquids was an important research problem for Boyle.[58] It appears that Witte tried to find a practical application for this: namely, an excerpt from his letter on the possibilities for preventing wine from freezing was read out at a Royal Society session in 1669.[59]

Witte was very much interested in the works of Christopher Merret (1613–95).[60] Merret was particularly interested in the art of glassmaking and glass working (colouring, emailing etc.). He translated Antonio Neri's *The art of glass* (published in 1611) from Italian into English and added his own in-depth commentary, publishing it in London in 1662. Later, after 1667, Hill informed Witte of the publication of Merret's *Natural history of England*,[61] which was the book *Pinax rerum naturalium britannicarum continens vegetabilia, animalia, et fossilia* published in 1666. This edition was destroyed in the Great Fire of 1666.

Mathematical subject matter was also among Witte's sphere of interests. It was just then that the disagreement between Thomas Hobbes and the mathematician and Royal Society fellow John Wallis, that lasted from the 1650's through the 1670's, was a topic of interest. In any case, Witte wished

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[56] The potato was brought to Courland from Holland in 1675 but its cultivation remained the private passion of Duke Jakob. The peasantry related to the potato with distrust in the latter half of the eighteenth century. The cultivation of clover, which spread extensively in the first half of the eighteenth century, especially in the Netherlands and England, began on an experimental basis in Livland only as late as the 1770's and did not become more widespread until the 1830's (*Eesti talurahva ajalugu I*, 370–372).

[57] Hill, *Familiar letters*, 234.

[58] Christiana Christopoulou, "Robert Boyle's experiments on cold: a study of the role of chemical experiments", <http://www.euchems.eu/fileadmin/user_upload/binaries/49_Christopoulou_tcm23-139407.pdf > (viewed on 8 April 2015).

[59] Boas Hall, *Promoting experimental learning*, 54. Hill's *Familiar letters* does not include this letter. Witte's undated letter, probably from 1668, however, does mention grapevines in Germany that had long since been made frostproof (Hill, *Familiar letters*, 233).

[60] Hill, *Familiar letters*, 211, 216.

[61] *Ibid.*, 228.

to obtain a copy of *Hobbius heauton-timorumenos* (1662), a pamphlet in which Wallis attacked Hobbes.[62]

In his last letter, sent in January of 1669, Witte asked Hill to recommend him to Henry Oldenburg for engaging in correspondence.[63] Since their correspondence subsequently broke off, it may be presumed that Witte continued his correspondence with Oldenburg. This correspondence, however, apparently did not materialise because the 13 volumes of Oldenburg's correspondence do not include a single letter from Witte.[64]

It appears that Hill conscientiously sent Witte the newest English natural scientific literature but was rather indifferent towards what Witte sent him. It seemed to Witte that corresponding with him was a great burden for Hill. That was indeed probably the case because Hill purchased a large estate in Kent in 1665[65] and started devoting his energies to it in 1667, so that he resigned his post as treasurer of the Royal Society on 30 November 1665, where he had served for two years. Hill was re-elected to this post on 1 December 1679. It is not known who became Witte's subsequent partner in correspondence. In any case, he did not correspond with Boyle.[66] Yet the correspondence between Witte and Hill does provide an excellent idea of Witte's interests and their realisation, at least in the time interval of 1663–69.

David Krieg – naturalist in London, America and Riga

David Krieg (about 1669–1710) was a naturalist who has become part of the history of studying nature in England and the American colony of Maryland. His work has been mentioned in several British and American scientific history treatments, beginning for example with Richard Pulteney's history of botanical research prior to Linné published in English in the eighteenth century[67] and ending with the history of science in the British

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62 Hill, *Familiar letters,* 211.

63 *Ibid*., 240.

64 I owe thanks to MA Ave Teesalu for searching for possible letters from Witte in the volumes of Oldenburg's correspondence deposited at the University of Göttingen Library.

65 Hill, *Familiar letters*, 7.

66 Witte's own personal archive is not known to have survived. In any case, there are no letters from Nicolaus Witte among Boyle's correspondence, see Michael Hunter, *Letters and papers of Robert Boyle* [microform]: from the archives of the Royal Society, project editor Paul L. Kesaris. Microfilm reels accompanied by printed reel guide compiled by Michael Hunter <http://cisupa.proquest.com/ksc_assets/catalog/3469_BoylePapersLtrs.pdf> (viewed on 8 April 2015).

67 Richard Pulteney, *Historical and biographical sketches of the progress of botany in England from its origin to the introduction of the Linnæan system* (1790), vol. 2, 57–58.

colonies in America compiled by Raymond Phineas Stearns.[68] The more thorough treatments that consider David Krieg's work more extensively have been published by American historians of science in 1952 and 1987,[69] based mostly on Krieg's letters to his English friends and colleagues James Petiver 1700-1708 and Hans Sloane 1699-1708, which are deposited in the Sloane collection of manuscripts in the British Library. German historical literature has also mentioned Krieg in various contexts.[70] Baltic German reference literature, however, contains little information on Krieg. It is written in the lexicon of doctors in Livland compiled by Isidor Brennsohn that Krieg was born in Annaberg, Saxony in 1669; that he was a medical doctor; that he became a medical surgeon in Livland in 1705 and the first municipal physician in Riga in 1707; that he was an English Royal Society fellow and died of the plague in 1710.[71] Krieg, however, is not mentioned in Recke and Napiersky's lexicon of men of letters since the compilers of this lexicon did not know of a single piece of writing of his that had been published. We also do not find Krieg's name in the thorough monograph on the history of science by Janis Stradinš that was recently published in Latvia, which contains a summary of the hitherto existing works by researchers of the history of botany.[72] Krieg's life and his contribution to the history of botany are followed subsequently in this paper based on studies that have hitherto been published, focusing primarily on his work in the context of Riga.

David Krieg was from the Erzgebirge mining region in Saxony. It is possible that his parents initially lived in Crotendorf near Annaberg, which is given as his place of origin in the University of Leipzig register.[73] The years of Krieg's youth passed in Schwarzenberg, where his elderly father died before 1702.[74] Krieg was registered for the deposition initiation ritual at the University of Leipzig in the summer semester of 1686 but it was not

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[68] Raymond Phineas Stearns, *Science in the British colonies of America* (1970), 270–271.
[69] Spineas, *James Petiver. Promoter of natural science, c. 1663–1718*, 306–310; Frick, Reveal, Broome, Brown, "Botanical explorations and discoveries in colonial Maryland", 23–29.
[70] Selling, *Deutsche Gelehrten-Reisen nach England*, 97, 364; Collet, *Die Welt in der Stube*, 243, 253.
[71] Isidorus Brennsohn, *Die Ärzte Livlands vom Beginn der historischen Zeit bis zur Gegenwart* (Riga, 1905), 253.
[72] Janis Stradiņš, *Zinātnes un augstskolu sākotne Latvijā* (Rīga: Latvijas vēstures institūta apgāds, 2009).
[73] *Die jüngere Matrikel der Universität Leipzig*, 2: 1634–1709, hrsg. von Georg Erler (Leipzig, 1909), 239.
[74] Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 28; David Krieg's father was probably David Krieg (senior), born in Buchholz in 1613, who worked in Crottendorf as an "Inwohner, Erbangeseßener und Gerichtsgeschworener" and died

until the winter semester of 1689 that he was matriculated at the university.[75] It is possible that Krieg's interest in botany was aroused when he was studying at the University of Leipzig. In any case, the conditions of the learning environment there were very favourable. The professor of medicine and botany at Leipzig who also served simultaneously as the director of the botanical garden was the internationally renowned natural scientist Paul Amman (1634–91), who had compiled a catalogue of the flora of Leipzig and its surroundings. Professor of Botany at the University of Leiden Paul Hermann (died in 1695), for instance, was one of his students.[76] Amman died in 1691 when Krieg had studied medicine for a year at Leipzig. Amman's successor at that post was August Quirinus Rivinus (1652–1723), one of the most highly regarded classifiers of plants of that time. The first two volumes of his three-volume primary work *Introductio generalis in rem herbariam* were published in 1690 and 1691, right when David Krieg was studying in Leipzig. Rivinus's discussion with the English naturalist John Ray also took place during that same time period. Rivinus was one of the most productive contributors to the *Acta Eruditorum* that was published in Leipzig. Even though we do not have direct documented information on Krieg's connections with these botany professors, he can with certainty be considered a student of Rivinus. Notably, the teaching of botany fell under the jurisdiction of the Faculty of Medicine at that time, considering the need to learn about medicinal herbs. All medical students had to attend lectures on botany and go through summer training in collecting medicinal herbs. In the field of medicine, Krieg considered Andreas Petermann (1649–1703) his favourite lecturer. Specifically, Petermann is one of the persons to whom Krieg later dedicated his doctoral dissertation. Notes on several of Petermann's lectures from the *Collegium practicum anatomiae* attended by David Krieg in 1690 are deposited in the St. Petersburg Academy of Sciences Library.[77] It is not known how Krieg related to Professor of Medicine Johannes Bohn (1640–1718), known as a progressive physiologist and the founder of forensic medicine.

on 18 December 1701 (I owe thanks for this data to Pastor Friedrich Preissler and the genealogist Missis Schreiber).

[75] *Die jüngere Matrikel der Universität Leipzig*, 239.

[76] Paul Amman, *Supellex botanica, hoc est: enumeratio plantarum, quae non solum in horto medico Academiae Lipsiensis, sedetiam in aliis circa urbem viridariis, pratis ac sylvis &c. progerminare solvent* (Leipzig, 1676).

[77] *Opisanie rukopisnogo otdela BAN SSSR, tom 6. Rukopisi latinskogo alfavita XVI.–XVII. vv.*, sost. I. N. Lebedeva (Leningrad, 1979), 141.

Krieg's *album amicorum* superbly documents the period of 1691–97 in his life.[78] Krieg's last entry from Leipzig in his travel album is dated 2 May 1694. Krieg was at the home of his parents in Schwarzenberg in March, that is apparently during the Easter holiday. Yet by the beginning of April, he was back in Leipzig. Thus his studies at the University of Leipzig had ended. They had lasted four and a half years, which was the usual duration of studies for medical students.

Thereafter Krieg travelled to Riga, where the first entry in his travel album was written on 15 September 1694. In the early modern era, many young men from Saxony went to Europe's German-speaking peripheral areas, including the Baltic lands, to find employment as private teachers since the two great universities in Saxony – in Leipzig and Wittenberg – educated more intellectuals than were needed for the available employment opportunities in their Saxon homeland. Krieg probably also came to Livland as part of the wave of overproduction of intellectuals, apparently with the motive of earning money for defending his dissertation. Yet Krieg did not come to Riga as a random job seeker. His older brother Elias Krieg worked in Riga as a municipal notary since 1674 already and as a part-time organist at the city's Dome Church.[79] David Krieg stayed in Riga at least until April of 1696, when he went to Utrecht to defend his doctoral dissertation. Entries in his travel album in Hamburg on 15 May and in Amsterdam on 30 May mark the route of his journey. His first entry in Utrecht is dated 3 July. Krieg defended his doctoral dissertation on the changes in bodily fluids in the human body due to the effect of air on 27 August.[80]

Krieg travelled to London from Utrecht. His travel album and his correspondence do not shed light on the question of whether this trip was planned in advance, for instance upon the recommendation of Professor Rivinus or Professor Bohn, who were in contact with English scholars, or if some Englishman he may have met in Utrecht persuaded him to do so. Krieg was in London by the beginning of 1697 at the latest. This is affirmed on the basis of a letter written in early 1698 by Krieg's landlord James Petiver (who is discussed earlier in this paper in connection with the study of nature in England), where it becomes evident that Krieg had

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[78] David Krieg, *Album amicorum 1691–1697* (*Album hoc immortali patronorum, fautorum et amicorum memoriae cum debita observantia consecrat David Krieg Annaemont Hermond)* – British Library, Sloane MS 2360.

[79] *Riga in Livonia metropolis literata anno MDCXCVIII Calendis Julii exhibita* ([Riga], 1698.

[80] David Krieg, *De humorum in corpore humano mutatione ab aere. Trajecti 1696* (University Library Utrecht).

been his tenant for about a year already.[81] The first concrete fact confirming Krieg's presence in London is an entry in his travel album from May of 1697.[82] The author of this entry was Johann Depkin from Riga, who travelled onward to Italy, where he defended his medical doctoral dissertation in Padua in that same year already.[83] David Krieg also attended several meetings of the Botany Club held on Friday evenings at the Temple Coffee-House in London.[84] Coffee houses were the focal points of public life and meeting places for scholars in London. Coffee houses were appreciated first and foremost as places for intelligent conversation and finding out news. Additionally, newspapers could be read in coffee houses.[85] Royal Society fellows demonstrated scientific experiments, exhibited curiosities, and sold and bought books at auctions in coffee houses. Botany Club members were collectors, collectionnaires arriving with exhibits of natural history, and scientists. At these club meetings, exhibits were exchanged and newer topical literature was introduced. Joint botany excursions were held in the surroundings on Sundays. Since club meetings were informal, no minutes were kept and the only source on them is correspondence. Let us name only those naturalists who were club members and could have related to the hero of this paper, David Krieg, before and after his stay in America. These were H. Sloane, M. Lister, N. Grew, researcher of plants belonging to the cryptogams class Samuel Doody (1656–1706), expert on fossils John Woodward, James Petiver, W. Courten-Charleton, and the botanists W. Sherard, L. Plukenet and T. Robinson.[86] Needless to say, participation in this company of naturalists immensely broadened David Krieg's natural scientific outlook.

Due to considerable artistic talent, Krieg found employment in drawing insects, butterflies and other such natural exhibits, and he prepared drawings of most of the insects found in England.[87] In June and July of 1697,

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[81] Spineas, *James Petiver: promoter of natural science*, 308; Stearns, *Science in the British colonies of America*, 272.

[82] David Krieg, *Album Amicorum*, fol. 15.

[83] Depkin began his studies at the University of Leipzig just when Krieg left Leipzig for Riga. They both died of the plague in 1710, Depkin as a military surgeon, Krieg as municipal physician.

[84] For further information: Spineas, *James Petiver: promoter of natural science*, 253–254; Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 11.

[85] See Selling, *Deutsche Gelehrten-Reisen nach England*, 129 ff.

[86] Here and in the case of the naturalists subsequently under discussion, biographical reference books are not referenced since there are articles on almost every one of them in biographical reference works, including Wikipedia.

[87] Spineas, *James Petiver: promoter of natural science*, 308; Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 24.

Krieg was in Oxford, visiting Oxford's Professor of Botany Jacob Bobart, and in Cambridge and Essex, where he was introduced to John Ray, one of the most knowledgeable seventeenth century English botanists, whose debate on plant classification with Krieg's teacher August Quirinus Rivinus was followed very closely by botanists of that time. Krieg undertook excursions in the vicinity of Oxford and Cambridge to collect plants and insects.[88]

The naturalists gathered together by the Botany Club played a central role in collecting specimens of natural history. While the work of collecting specimens of natural history in Europe, East India and America already had a decades-long history by the end of the seventeenth century, it was the undertakings of English naturalists in particular at the end of the seventeenth century that became the pinnacle of the pre-Linné period. Several favourable circumstances happened to fortunately coincide to this end: *virtuoso* collectionnaires formed a body of customers for plant herbaria and other specimens, several energetic and eager naturalists were prepared to go to distant America to classify and draw plants, and many botanists brought together by the Royal Society and the Temple Coffee-House Botany Club were prepared to systematise and scientifically process the collected materials. It was at club meetings where instructions for collecting and bringing back specimens of natural history were given to the people who were about to set out on their journeys, and where specimens brought back were distributed after their arrival among the collectionnaires who had ordered those specimens.

While the flora of Virginia had been studied relatively thoroughly, the flora and fauna of Maryland still awaited collection and description, cataloguing and systematising. In 1696, the amateur botanist Hugh Jones was sent to Maryland to serve as parson there at the initiative of Henry Compton, Bishop of London. Jones was given the additional assignment of collecting plants. In that sense, he had to continue the invaluable work that the naturalist John Banister had done to that point in collecting the plants of Virginia. Jones, however, came down with tuberculosis in Maryland and died in early 1702. In 1698, moss researcher and graduate of Cambridge University William Vernon was sent to Maryland especially for collecting specimens at the initiative of the Royal Society and the Temple Coffee-House Botany Club, and primarily the initiative of Sloane. Demand among the researchers and collectionnaires of London's Botany Club for natural history specimens from temperate North America was

[88] Frick *et al.*, "Botanical explorations and discoveries in colonial Maryland", 23–24.

exceedingly great, even leading to quarrels: recall John Woodward's plots against Sloane and Petiver.

Petiver's tenant David Krieg appeared to be an ideal collector of specimens for Petiver with his excellent knowledge of nature and skill in drawing. When William Vernon was sent by the Royal Society and the Temple Coffee-House Botany Club to America to collect specimens, David Krieg also went to America at Petiver's initiative in order to supplement Petiver's natural history collections and if possible also the collections of other club members. Krieg sailed to America on the ship *John and Thomas* in the winter of 1697/98, earning his fare as the ship doctor.[89] Krieg himself dated the beginning of his journey as 6 January 1698.[90] The ship arrived at the mouth of the Virginia River at the end of March. At first, Krieg collected specimens in the region of the Choptank River for at least the first six weeks.[91] William Vernon arrived a week or two after Krieg. Both collected plants and insects in Maryland, particularly butterflies, birds and shellfish, for almost five months until either the end of August or the beginning of September, but evidently separately like they were upon arrival. A competitive rivalry prevailed between the two naturalists.[92] Krieg covered his living costs while there by treating planters as a doctor, receiving remuneration in kind, in other words in tobacco. On a number of occasions, he also served as an expert in forensic pathology.[93] American historians of botany have pointed out that although there are no direct evidential facts to indicate that Krieg and Vernon collected specimens from outside of Maryland, some of the specimens they collected are found only on the coast of South Virginia and appear to have been collected in late summer in either August or September.[94] Notifications found in Krieg's second bound manuscript deposited in the St. Petersburg Academy of Sciences Library indicating that at least in the case of Krieg, the collection areas were located in both Virginia and Maryland, perhaps help to explain this discrepancy. Furthermore, descriptions of Virginia's natural conditions and even dated observations are also

[89] Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 23.
[90] Krieg begins the second volume of his catalogue of specimens of natural history entitled *Observationes in rerum naturalium*, deposited in the St. Petersburg Academy of Sciences Library, as follows: "angefangen mit der Reise nach Virginien den 6. januarii anno christi 1698 von David Krieg (*Opisanie rukopisnogo otdela BAN SSSR*, tom 6, 142).
[91] Spineas, *James Petiver: promoter of natural science*, 308; Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 25.
[92] Frick, *et al*., "Botanical explorations and discoveries in colonial Maryland", 24.
[93] *Ibid*., 24–25.
[94] *Ibid*., 44.

provided in the catalogue.[95] Dominik Collet also points out that Vernon was sent to Maryland and Krieg was sent to Virginia.[96]

Which of the three naturalists made the greatest contribution to the collection and drawing of natural history specimens from the eastern coast of Maryland? Much was hoped for from Hugh Jones but the collection of specimens of natural history was only an additional assignment for him alongside his main function as a clergyman. From 1699 onward he grew ever weaker as his tuberculosis went into advanced stages. William Vernon had been sent especially to collect specimens of natural history for a period of several years but in the summer of 1698, he found out that his patron – the governor of Maryland – was to be transferred to the post of governor of Virginia, and thus Vernon decided to return to England in the autumn of that same year. Since he did not anticipate this, Vernon was in no hurry to collect or classify springtime plants and did not start until the end of May. David Krieg had banked on staying in Maryland for only one growing season, and on 7 May he still thought that he would return to England in July already. Thus he set about intensively collecting specimens immediately upon his arrival. Krieg was able to set sail in September, arriving in London in November.[97] The result was recognition by the members of the Botany Club. The spring plants that he had collected were especially valued.[98]

Krieg spent the winter of 1698/99 in London. On 11 January 1699, Krieg was elected as a Royal Society fellow upon the recommendation of Sloane and Petiver.[99] In the meantime, the material that had been collected in Maryland was distributed to the customers that had ordered them at a session of the Temple Coffee-House Botany Club. Most of what Krieg had collected went to Petiver. Most of what Vernon had collected went to Sloane. Other club members such as Plukenet, Sherard, Courten-Charleton and

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95 *Opisanie rukopisnogo otdela BAN SSSR*, tom 6, 143.

96 Collet, *Die Welt in der Stube*, 143.

97 This overview of Krieg's subsequent activity after returning from America is based on Frick *et al.*, "Botanical explorations and discoveries in colonial Maryland", 24–29, which is in turn based on Krieg's letters to Sloane and Petiver from Riga and Paris. David Krieg's letters to Sloane are also accessible on the internet but not in transcribed form, rather as registers. Unfortunately, the registers of letters sent to Petiver and others deposited in Sloane's collection are inaccessible. The use of the original letters that Krieg sent to Sloane and Petiver after arriving in Riga would enrich the picture of Krieg's activity with far more nuances, but the prohibitively high cost of ordering copies from the British Library forced the abandonment of this option.

98 Reveal, "Significance of pre-1753 botanical explorations", 14; Frick *et al.*, "Botanical explorations and discoveries in colonial Maryland", 44.

99 Frick *et al.*, "Botanical explorations and discoveries in colonial Maryland", 26.

Woodward also got their share. Plants that had sprouted from seeds brought from Maryland could be seen in many English gardens.[100] Sloane put the material collected from Maryland by all three naturalists all together and sent it to John Ray in March of 1699 to sift through it and put together a catalogue. Unfortunately, Krieg did not visit Sloane to specify the dates and places of collection of specimens and departed for Riga on 30 May 1699. This made the task very time-consuming and laborious for Ray, who was already having health problems.[101] Krieg finally apologised to Sloane for leaving London unexpectedly without saying farewell in a letter he sent from Riga on 12 July 1699.[102] William Courten-Charleton had commissioned Krieg to collect exotic butterflies. They remained in contact with each other after Krieg had arrived in Riga as well.[103] While in America, Krieg had sent Courten-Charleton news of conditions over there.[104]

There was great interest among botanists in the results of the collecting done by Krieg and Vernon. William Sherard wrote to Sloane on 11 April 1699 from Rome that "he is glad that Krieg and Vernon are in London again; he asks Sloane to be one of their subscribers in his stead, so as to improve his collection".[105] The collecting expeditions of Jones, Vernon and Krieg fostered a great deal of activity in English botany. The Temple Coffee-House Botany Club focused this activity and stimulated not only those of its members who bought specimens but also botanists who wrote for their own cabinets of rarities. From that very productive period, let us highlight only those writings by naturalists that are in one way or another connected with David Krieg, including those that contained specimens that he himself had collected in Maryland, as well as works that were sent to him in Riga. Three English natural scientists from that time stand out in particular: John Ray, who continued to summarise his studies in spite of his deteriorating health,[106] William Sherard, who was looking for his place in the world of English science after spending time abroad, and Leonard

[100] James L. Reveal, "Significance of pre-1753 botanical explorations in temperate North America on Linnaeus' first edition of Species Plantarum", *Phytologia: An international journal to expedite botanical and phytoecological publication*, 53:1 (March 1983), 14.
[101] *Ibid.*, 26–27.
[102] British Library, Sloane MS 4037, fol. 299.
[103] Collet, *Die Welt in der Stube*, 243, footnote 165.
[104] *Ibid.*, 253.
[105] British Library, Sloane MS 4037, fol. 246–247.
[106] John Ray's biographers: Malcolm Bryan, *John Ray (1627–1705): pioneer in the natural sciences: a celebration and appreciation of his life and work* (Essex: John Ray Trust, 2005); Charles Raven, *John Ray: naturalist, his life and works* (Cambridge: Cambridge University Press, 2009) (first published: 1942).

Plukenet.[107] Petiver's friend and confidant William Sherard had studied in 1686–88 under the instruction of Joseph Pitton de Tournefort in Paris and under the instruction of Paul Hermann in Leiden. He was away from England in the 1690's. Sherard assisted Hermann at the Leiden botanical garden in 1694–95. He was in London for a brief interval until 1703.[108] Sherard's most voluminous work at the beginning of the eighteenth century was correcting and revising Caspar Bauhin's (1560–1624) *Pinax theatri botanici* 1671 edition and adding to it all plants that had been discovered in the meantime. This book by Bauhin, which was first published in 1623, was considered one of the most authoritative plant handbooks until the publication of Linné's *Species plantarum* in 1753. Sherard nevertheless did not finish supplementing this work. Sherard also assisted other botanists in publishing their work. Thus John Ray managed with his help to complete and publish the third volume of *Historia plantarum* in 1704, which among others also describes plants that David Krieg collected from Maryland.[109] Ray was also working on his *History of insects* but as his health deteriorated, he only managed to put together the description of his method for classifying insects. This part of the work was published in 1705. The catalogue that followed this method was nevertheless completed after Ray's death, presumably at Petiver's initiative, and was published in 1710.[110] Numerous butterflies and insects drawn by David Krieg were also included in this catalogue.[111] Leonard Plukenet, who had published several plant catalogues in the 1690's, compiled an additional volume entitled *Almagesti botanici mantissa* in 1700, which also contained 200 descriptions of plant species from Maryland. These had mostly been collected by Jones and Krieg.[112] Sloane, who was both a collectionnaire and systematiser of specimens, continued to collect all manner of rarities and prepared his *The natural history of Jamaica* for publication. It was published in 1707. Petiver's publication of continuation publications meant to disclose many natural specimens is praiseworthy: *Musei petiveriani centuria prima (-decima) rariora naturae* (1695–1703) and *Gazophylaci naturae et artis* (1702–06). In these publications, he published specimens and descriptions sent by correspondents, and engravings of animals, insects, plants, shells and fossils together with

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107 Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 33–34.
108 Spineas, *James Petiver: promoter of natural science*, 272–273.
109 Johannes Rajus, *Historia plantarum*, tomus 3 (London, 1704).
110 Johannes Rajus, *Historia insectorum, autore Joanne Rajo, opus posthumum* (London, 1710); see further: Bryan, *John Ray (1627–1705): pioneer in the natural sciences*, 46.
111 Spineas, *James Petiver: promoter of natural science*, 309.
112 Reveal, "Significance of pre- 1753 botanical explorations", 14.

brief descriptions.[113] In 1699 or later, Petiver published in the first of these continuation publications Krieg's butterfly sent from Riga and the fossil *Siliquastrum Rigensis Limacis cinerei facie*. Petiver obtained pre-orders with the help of his friends for the publication of *Gazophylac*. For instance, Sherard promised to help him in this with 20 pre-orders, Vernon with 8 or 10 orders and David Krieg also tried to obtain orders in Paris.

The pre-Linné collection of plants in Maryland was of significant importance for the study of botany but this period proved to be a brief outburst of energy. English study of botany, which had been so vigorous over a short period of time, abated so that contemporaries in the eighteenth century lamented that natural history, and especially botany, found little respect.[114] Yet from that point onward, Sweden played the main role in natural history. Carl Linné and his students did not neglect the use of Sloane's numerous collections of herbaria, including material collected by David Krieg.

Bearing in mind the perspective of studying German-English scientific contacts, it should be accentuated that just then in 1698/99, Johann Burkhard (1674–1732), who had studied at the same time as Krieg and was the son of Otto Mencke, was also a participant in London's scientific circles. Burkhard immediately became a professor of history upon his return to Leipzig.[115]

Krieg arrived in Riga on 14 June 1699[116] and practiced for over two years as a private doctor. In a letter to Hans Sloane dated 12 July 1699, Krieg hoped to return to England.[117] Saxon forces advanced to the outskirts of Riga in 1700 and the City of Riga was under siege until the arrival of Sweden's main force in the summer of 1701. When the Saxon forces were forced to retreat, their garrison remained stationed in Daugavgrīva fortress until mid-December of 1701, when it was forced to capitulate due to illnesses, mainly scurvy. It is difficult to imagine the kind of psychological pressure David Krieg as a doctor and his brother Elias as a municipal notary, both of them from Saxony, had to feel in pro-Swedish Riga in a situation where their fellow countrymen could surround Riga at any moment and invade the city. There could conceivably have been quite a few of Krieg's childhood friends among the besiegers. Krieg's Saxon origin evidently had no pejorative meaning nevertheless because otherwise the Swedes would not have trusted him to later summon him to the responsible post of garrison

113 Spineas, *James Petiver: promoter of natural science*, 286.
114 Frick *et al.*, "Botanical explorations and discoveries in colonial Maryland", 33.
115 Selling, *Deutsche Gelehrten-Reisen nach England*, 367.
116 Frick *et al.*, "Botanical explorations and discoveries in colonial Maryland", 26.
117 British Library, Sloane MS 4037, fol. 299.

doctor. Yet in September of 1701 after the end of the siege of Riga, David Krieg had the opportunity to travel to Paris as the private doctor of the French diplomat Louis Comte de Guiscard-Magny (1651–1720).[118] Louis XIV had sent Guiscard to King Charles XII of Sweden with the aim of convincing him to support France as an ally in the event of the outbreak of the Spanish War of Succession. Yet when Sweden went to war, Guiscard had to reconcile Sweden and Saxony. As soon as Charles XII had landed in Tallinn with his main force, the French delegation followed the King of Sweden. Guiscard was definitely still in Tallinn on 16 July 1701. He arrived in Riga on 28 July 1701.[119] That is when Krieg and Guiscard became acquainted. As a diplomat who had just turned 50 and lived in a constant state of travel, Guiscard obviously needed a personal physician. Krieg, who had experience as a ship doctor on a long ocean journey, was well-suited for the job. The King of France, however, sent Guiscard into retirement and thus Guiscard had to return to Paris. He set out from Riga on 18 September 1701. The route passed through Tallinn, followed by a three-week journey to Stockholm, where he arrived on 19 October. He departed from Stockholm on 22 October and travelled from there via Hamburg to France: he was still in Hamburg on 28 November.[120] Krieg served as Guiscard's private physician for a while in Paris but in 1702, the Comte had to set out for the battlefield in connection with the Spanish War of Succession.[121] Krieg declined to accompany him there and thus he set out to return to Riga in the spring of 1702.

Krieg met several botanists in Paris.[122] His acquaintance with France's royal botanist Charles Plumier (1646–1704) should be highlighted. Plumier had gained his skills on Joseph Pitton de Tournefort's collecting expeditions and had also undertaken several expeditions of his own to the Caribbean

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[118] Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 28.

[119] Herman Brulin, *Sverige och Frankrike under Nordiska kriget och spanska successionskrisen åren 1700–1701* (Upsala: Almqvist & Wiksell, 1905), 208. According to Margus Laidre, however, Guiscard witnessed the spectacular crossing of the Daugava River that took place on 8 July 1701 and the episode in which the Saxon-Russian forces were forced to retreat (Margus Laidre, *Lõpu võidukas algus: Karl XII Eesti- ja Liivimaal 1700–1701* (Tartu: Tartu Ülikooli Kirjastus, 1995), 267).

[120] Brulin, *Sverige och Frankrike under Nordiska kriget och spanska successionskrisen,* 214.

[121] Louis Guiscard had in earlier times been friends with the philosopher Pierre Bayle and Pierre Jurieu, like his younger brother Antoine. Guiscard presumably switched to the side of the allies in the coalition opposed to Louis XIV in the Spanish War of Succession (Peter Jones, "Antoine de Guiscard, abbe de la Bourlie, Marduis de Guiscard, 4", *Electronic British Library Journal*, <http://www.bl.uk/eblj/1982articles/pdf/article6.pdf> (viewed on 8 April 2015). It is possible that Krieg was aware of Guiscard's intentions.

[122] Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 28.

Islands and Central America. He had published *Description des plantes de l'Amérique*. In Paris, Krieg also met the naturalists Etienne Francois Geoffroy (1672–1731) and Sebastien Vaillant (1669–1721) from the Jardin du Roi. Geoffroy was in close contact with the Royal Society and was one of the people who introduced *Philosophical Transactions* in French.[123]

Krieg tried to convince Paris's botanists to pre-order Petiver's book *Gazophylac* but with no success. His French colleagues evidently did not consider Petiver's works to be particularly credible. Their misgivings may also have been due to the fact that France was at war with England. The fact that Krieg asked in his letter to Sloane dated 28 April 1702 what he planned to do with the collection left behind by William Courten-Charleton is an indication of the speed with which information passed between London and Paris.[124] William Courten had died on 26 March 1702 and thus information concerning his death had taken a month to reach Paris. Krieg also knew that Courten's collections were left to Sloane and not to Oxford University as their Oxford colleagues had hoped.[125]

Thus Krieg set out from Paris for Riga in the late spring of 1702. On the way back, Krieg visited his brother August, who worked as a surgeon in Strasbourg and whom he had not seen in 12 years. He also visited Leipzig and his father's home in Schwarzenberg, where his elderly father had recently died.[126] It is possible that Krieg also visited his teachers in Leipzig, who intensively followed the activities of English natural scientists. August Quirinus Rivinus was in disagreement with John Ray concerning the systematisation of plants but since he was respected among English scholars, he was elected a Royal Society fellow in 1703. Plumier could also send his greetings with Krieg to Rivinus. Plumier named a Central American plant *Rivina humilis* (pigeonberry) in recognition of Rivinus in his forthcoming book *Nova plantarum americanarum genera* (1703). In Leipzig, Krieg could also have met with Professor of Medicine Johannes Bohn from the time when he had studied there. Bohn had himself been in England and was deeply interested in the works of English authors, first and foremost Boyle, and he sent his studies to the Royal Society, receiving *Philosophical Transactions* in return.[127]

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123 Turner, "An interrupted story".
124 British Library, Sloane MS 4038, fol. 333–334.
125 See Collet, *Die Welt in der Stube*, 220.
126 Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 28; Spineas, *James Petiver: promoter of natural science*, 273.
127 Selling, *Deutsche Gelehrten-Reisen nach England*, 110, 131, 353.

Krieg himself reported that he stayed in Saxony for eight weeks, whereas he also visited mining regions with the aim of observing how cobalt was obtained.[128] It is not known when Krieg arrived in Riga. He was definitely in Riga in any case in January of 1703 and remained there continuously for seven years until his death of the plague in 1710.

In one undated letter to Petiver apparently sent in 1703 prior to his marriage, Krieg informed him that he had been bedridden for seven weeks with a fever. Thereafter, however, he had been overloaded with treating patients. He often had to examine over 20 patients per day. His elder brother Elias died at that time. Thus he could not at the same time engage in his favourite sphere of interest – collecting specimens of natural history. In the same letter, Krieg expressed discontent with his situation. Although he earned well, he lamented the absence of company with the necessary knowledge to converse on topics related to his sphere of interest and longed to return to either England or America.[129] Actually, there were other educated doctors besides Krieg in Riga during the Great Northern War. Thus for instance, a second municipal physician named Nicolaus Martini was in Riga around 1699. He was later prepared to collect natural specimens for Sloane from the vicinity of Riga. Martin Benzien, who was in Leipzig together with Krieg in 1690–91, engaged in private practice in Riga. Johannes Depkin, whom Krieg met in London, and garrison doctor Christian Gottlieb Fischer, who died in 1710, are others who were in Riga at that time.

In the meantime, Krieg was appointed garrison doctor. It is unclear whether this occurred in 1705 or beforehand. In any case, he was already serving at this post when he married Margaretha Rademacher on 9 May 1705.[130] When he was appointed first municipal physician in 1707, Krieg accepted responsibility for organising the medical care system for the entire city. Riga's economic situation was relatively stable considering the war conditions at the time when Krieg exchanged his post working for the crown for the position of Riga's first municipal physician. At that time from September of 1706 to September of 1707, the main Swedish force was in Krieg's country of origin in Saxony. At the end of October 1709, Riga was besieged by Russian forces, culminating in the decline of the city's population due to

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128 "Part of a Letter from Dr David Krieg, F. R. S. to the Publisher, concerning Cobalt, and the Preparations of Smalt and Arsenic", *Philosophical Transactions*, 24 (September and October 1704), 1753.

129 Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 29.

130 Latvijas Valsts vēstures arhīvs (henceforth LVVA), 1426. f., 1. apr., 300. l.: Riga Dome Church weddings 1702–1770, <http://www.lvva-raduraksti.lv/en/menu/lv/2/ig/1/ie/233/book/5769.html> (viewed on 1 June 2015).

the plague and Riga's capitulation on 4 July 1710.[131] Under such conditions, Krieg's burden of responsibility was heavy. Krieg himself died of the plague on 23 July 1710 a few weeks after Riga's capitulation. Krieg's friend Petiver did not find out about his death until three years later. He entertained the hope of acquiring materials related to natural history from Krieg's widow, promising to publish them either in *Philosophical Transactions* or at his own expense. Krieg's widow, however, sold his heritage of scientific interest, Krieg's *Collectanea Curiosa*, cheaply to Robert Erskine, the Scottish personal physician of Peter I.[132] Needless to say, Robert Erskine was particularly interested in Krieg's heritage because he was a collectionnaire himself and also a Royal Society fellow. Erskine, however, died in 1718 and along with his library, Krieg's manuscripts also ended up in the possession of Peter I and later in the Russian Academy of Sciences Library. They are deposited to this day in the manuscripts department of the St. Petersburg Academy of Sciences Library.[133]

Krieg's heritage includes two bound manuscripts under the title *Observationes in rerum naturalium*, which form a catalogue of natural history specimens. They also include notes on lectures by Leipzig Professor of Medicine Andreas Petermann and Leiden Professor Paul Hermann. The first volume of the catalogue of natural specimens started in 1698 contains 415 descriptions of insects and molluscs collected in the surroundings of London, Cambridge and Oxford, and in Maryland and Virginia in America, together with references to hitherto extant literature, especially Maria Sibylla Merian's book. Thereafter descriptions follow of the time and place of the specimens in their natural conditions. Descriptions of animals, fish, birds, insects and plants seen in America are contained in the first series of the second volume. Some very important chronological entries and brief remarks on natural features in Virginia are contained in *Memoranda in Virginia*, the second series of entries. Observations of nature in Livland follow, where Krieg describes Livland's animals, birds, fish, insects and butterflies.

Amongst Krieg's manuscripts, notes on two of University of Leiden Professor Paul Hermann's *Materia medica* lectures from 1688 merit attention. Krieg was in Leipzig at that time and there was no way he could have been in Leiden. Someone else of Krieg's friends had to study at Leiden at that

[131] On conditions in Riga during the Great Northern War, see *Feodālā Rīga* (Riga: Zinātne 1978), 229–251.
[132] Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 29; Spineas, *James Petiver: promoter of natural science*, 308.
[133] *Opisanie rukopisnogo otdela BAN SSSR*, tom 6, 10, 135–136, 140–146.

time who later gave his notes to Krieg either to use or to be transcribed. It may be speculated that this friend could have been the English naturalist William Sherard, who attended Paul Hermann's lectures at Leiden in 1688–89 after his trip to France, and later in 1694–95 served as Hermann's assistant at the University of Leiden botanical garden. After Hermann's death, Sherard was one of the co-publishers of Hermann's unfinished *Paradisus Batavus* (1698). Like Krieg, Sherard was a member of the Temple Coffee-House Botany Club.

Another presumption presented later in this paper dovetails with this presumption, namely that the 1671 edition of Caspar Bauhin's *Pinax* in Krieg's possession was the very same copy or transcription that Sherard was supplementing and which Krieg sent to London. It could be deposited in either the Royal Society Library or the British Library. All that is needed to arrive at the answer is to compare Sherard's texts in manuscript form.

If Robert Erskine acquired Krieg's heritage in manuscript form, it may be presumed that it was purchased together with Krieg's library, which may in such an event also be deposited in the St. Petersburg Academy of Sciences Library, although not as a complete whole. Yet it also cannot be ruled out that Krieg's library was not sold and henceforth was in the possession of the doctor and professor at Tallinn's Gymnasium Heinrich Dahl, who married Krieg's widow.[134]

The collections collected by Krieg in Maryland and also in Livland that were sent from Riga to London, however, are deposited in London at the British Museum in Hans Sloane's collection.[135]

Who were David Krieg's correspondents during his Riga period, to what extent was he informed by them, and what kind of feedback did Krieg provide? Krieg's closest correspondence was with his friend Petiver. Their correspondence and sending of books and objects to each other presumably lasted until the autumn of 1709, after which Petiver lost track of Krieg's fate so that even as late as 1713, notification of Krieg's death three years previously came unexpectedly for him. The information blackout can on the one hand be explained by the fact that Riga had been under siege by the Russian forces since late autumn of 1709, during which time official

[134] If Krieg's heritage was in the possession of Heinrich Dahl's wife, it could have been passed down to their son Joachim Heinrich Dahl (1719–1796), pastor at Kullamaa, whose mother, the former widow of David Krieg, died in 1762 (Arvo Tering, *Lexikon estländischer, livländischer und kurländischer Studenten an europäischen Universitäten 1561–1800*, unter Mitwirkung von Jürgen Beyer, initial nr. 1351, currently being edited).

[135] Sloane's collection contains for instance Sloane MS 3324, fols. 75–8; 4020, fols. 42–7; and several were displayed by Petiver to the Royal Society (*Journal-Book,* IX, 291; X, 131).

postal service did not operate and shipping links were also not restored during the 1710 shipping season. On the other hand, Petiver himself was completely occupied with his first trip abroad in the summer of 1711 – to Holland, where he represented Sloane and had to purchase the collections of naturalists from the Netherlands, especially Paul Hermann's collection, to supplement Sloane's collections.

Krieg maintained contact with Sloane during his Riga period.[136] After arriving in Riga in 1699, he also continued to communicate with the collectionnaire William Courten-Charleton. Krieg's letters to these three men have been preserved because they went into Sloane's collection along with the other collections, and passed from there to the British Museum. Krieg's letters are currently deposited in the British Library. It is possible that Krieg's letters to other naturalists may be found in family archives or perhaps even published in print similarly to the letters sent to Abraham Hill. Krieg's own correspondence, however, could have been left in the possession of the Dahl family of Estland due to the fact that his wife remarried.

The things that Krieg's friends sent to him from London to Riga are most interesting. On 26 August 1704, Krieg thanked Sloane for the newly published third volume of John Ray's *History of plants*.[137] He also received Petiver's supplemental publications. On 21 November 1707, Krieg thanked Sloane for the newly published first volume of Sloane's own *Natural history of Jamaica*. Krieg also asked to be sent a microscope, *Aequinoctal rings* for finding latitude, engraving plates for his depictions of Livonian rarities, a Russian grammar textbook, and Martin Lister's *Historia conchyliorum*.[138]

But what did Krieg send to Petiver and Sloane to London from Riga? Krieg tried to maintain his contacts with his English friends and sent objects for the Royal Society's Repository.[139] Thus Krieg sent a Latvian translation of the Bible to the Royal Society.[140] Thus Royal Society fellows could acknowledge and admire an indigenous people from the periphery of Europe joining the family of literate peoples. It would be worthwhile to investigate whether this Bible is the complete Bible translated by Ernst Johann Glück and published in 1694, the New Testament published in 1685, or the Old Testament published in 1689, and whether it remains in the Royal Society Library nowadays as well. Krieg informed Sloane on 12 July 1699 that he had sent him a few books, and on 28 August 1699, he

136 Spineas, *James Petiver: promoter of natural science*, 309.
137 British Library, Sloane MS 4039, fol. 356
138 Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 29.
139 Collet, *Die Welt in der Stube*, 243.
140 Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 29.

expressed the hope that the books, rock samples and the Livonian harp (apparently a zither) that he had sent had arrived.[141] On 21 November 1707, Krieg sent Sloane minerals and Lapp wedding clothes. Krieg sent Petiver plants, insects and butterflies,[142] as well as a copy of Caspar Bauhin's *Pinax* (1671) publication,[143] which merits the full attention of botany historians. Sherard, who had taken the task upon himself to supplement and revise Bauhin's *Pinax*, had apparently sent a copy to Krieg in Riga so that Krieg could make his own additions and corrections.

What did David Krieg manage to achieve as a naturalist in systematising Livland's natural specimens? Krieg was up to his ears in work as a doctor in Riga but he also engaged in his favourite activity as much as time permitted: as much as wartime conditions and his work as a doctor permitted, he collected specimens of natural history, and planned to put together a catalogue of "all natural things in Livland".[144] Krieg promised to continue to send Sloane natural curiosities from Livland, but as late as the spring of 1702, he wrote from Paris that the tense state of war and the burden of his work as a doctor prevented him from collecting them.[145] On 26 August 1704, Krieg lamented to Sloane that because of the war, he could not collect sufficient numbers of plants for the benefit of the Royal Society.[146] On 21 November 1707, Krieg wrote that he was continuing to deal with the natural history of his country, focusing on birds, plants and insects, samples of which he promised to send.[147]

Krieg also sent specimens of natural history to Petiver, who appreciated this worthily: thus he named a butterfly found in England *Riga fritillary*, that is after the butterfly that Krieg caught near Riga and sent to Petiver. This was later named *Queen of Spain* and in 1758, Linné in turn named it *Argynnis lathonia*.[148]

Krieg's observations on nature in Livland can also be partially traced on the basis of the second volume of his catalogue *Observationes rerum*

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141 British Library, Sloane MS 4037, fol. 299; 4037, fol. 269; Frick, *et al*., "Botanical explorations and discoveries in colonial Maryland", 28.
142 Frick *et al*., "Botanical explorations and discoveries in colonial Maryland", 29.
143 *Ibid*.
144 British Library, Sloane MS 4038, fol. 333–334.
145 Collet, *Die Welt in der Stube*, 220.
146 British Library, Sloane MS 4039, fol. 356.
147 British Library, Sloane MS 4041, fol. 71.
148 Michael A. Salmon, Peter Marren, Basil Larley, *The Aurelian legacy: British butterflies and their collectors* (University of California Press, 2000), 331.

naturalium, where Krieg has described or enumerated Livland's animals, birds, fish, insects and butterflies.[149]

It would be worthwhile to investigate which principle of systematisation Krieg used in describing and classifying flora and fauna. Similarly, what was the basis for classification in the catalogues of Sherard, Plukenet or Petiver, all of which also included specimens of natural history that had been collected by Krieg? At that time, there was no generally accepted system of plant taxonomy yet. Plant taxonomy began developing in the sixteenth century. The Swiss naturalist Caspar Bauhin was a pioneering botanist whose main work was *Pinax theatri botanici* (1623), a catalogue containing descriptions of over 6000 plants that laid the foundation for the binary system of nomenclature. (It was the second volume of precisely this work published in 1671 that Sherard planned to update). The most influential systems of classification in the latter half of the seventeenth century were those of John Ray and Joseph Pitton de Tournefort. Ray established the so called *natural monocots vs dicots* classification. Pitton de Tournefort's so called artificial system was based on the structure of the corolla. He was the first to define the concept of the genus of plants. Linné considered Tournefort's system the immediate predecessor of his own. Tournefort's influence could also have been important among English naturalists because Sloane was acquainted with him, and William Sherard and William Courten-Charleton had studied under him. The principles of August Quirinus Rivinus, professor at Leipzig and thus presumably a teacher of Krieg, were similar to those of Tournefort. This approach favoured binary nomenclature and considered the corolla to be the distinctive feature in plant taxonomy.

David Krieg's interest in chemistry also must not go unnoticed. In Krieg's letter of 12 July 1699 to Hans Sloane, there is a very interesting promise to translate *Ars vitraria* into English in the event that some London bookseller demonstrates interest in it.[150] On the one hand this indicates that Krieg had by then acquired such a sound command of English that he was capable of translating complicated specialised text into that language. On the other hand, however, Krieg's deep interest in practical chemistry can be seen from this. The book in question was probably *Ars vitraria experimentalis oder vollkommene Glasmacher Kunst* (1679) by Johannes Kunkel. Four years later, Krieg became interested in the art of glassmaking. In a fragment of his letter dated 1 January 1704 to the publisher of *Philosophical Transactions*, he mentions "cobalt and the preparations

[149] *Opisanie rukopisnogo otdela BAN SSSR* , tom 6, 143.
[150] British Library, Sloane MS 4037, fol. 299.

of smalt and arsenic". Here he discusses a fusion of frit and cobalt oxide that was used to colour ceramics. His article was published in *Philosophical Transactions*, volume 24.[151] Krieg might have been interested in practical chemistry ever since the time of his youth because he came from the mining area of Erzgebirge. In his letter to Sloane dated 13 June 1703, Krieg describes the process of mining cobalt and its separation from rock, along with its smelting, and describes the corresponding activity in Germany in general.[152] Krieg's letter published in *Philosophical Transactions* provides an overview of the preparation of smaltum – glass colour obtained from blue cobalt. No previous author had clearly described this process.[153] Perhaps another topic of investigation may branch out from here: was Krieg's interest in the chemistry of coloured glass purely scientific or did he have a commission for this investigation from Riga's glassmakers' guild?

David Krieg's contribution to the research of North America's botany is invaluable because the specimens he collected were included in the important plant catalogues compiled by Ray, Plukenet and Petiver. They were carried over from these catalogues into Linné's *Species plantarum* plant catalogue. Yet on the other hand, the study of the natural history of the English colonies in the zones of temperate climate in America faded into the background for decades. The interest of naturalists shifted to studying the flora and fauna of tropical regions. Thanks to the preservation of the herbaria collected by Krieg and other contemporaries of his and their inclusion in catalogues, a group of American historians of botany succeeded over the course of a four-year project to comparatively study the vegetation of Maryland's coastal area in temporal comparison. From this study, it emerged that the natural composition has significantly changed over the course of nearly 300 years. Some species have disappeared and new foreign species have emerged in their place.[154] Thus Krieg had excellent experience as a collector of American specimens of natural history and he communicated with English naturalists at the very crest of botany research activity, which subsided in England for a long time after Krieg's colleagues passed on. Krieg's contribution to the study of North American flora and fauna has been thoroughly studied, yet Krieg's heritage deposited

[151] "Part of a Letter from Dr David Krieg", *Philosophical Transactions*, 293 (Sept-Oct 1704), 1753.
[152] British Library, Sloane MS 4039, fol. 145–147.
[153] "Part of a Letter from Dr David Krieg", 1753.
[154] James L. Reveal, C. Rose Broome, Melvin L. Brown and George F. Frick, "The identification of pre-1753 polynomials and collections of vascular plants from the British colony of Maryland", *Huntia: A Journal of Botanical History*, 7 (1987), 204–205.

in the St. Petersburg Academy of Sciences Library would add important information to it. On this background we can claim that Krieg had everything needed for compiling a complete catalogue of Livland's specimens of natural history. Krieg's heritage in the field of naturalist studies in Livland requires in-depth study. Krieg's planned catalogue of Livland's specimens of natural history should be reconstructed on the basis of materials found in the British Museum, the British Library and the St. Petersburg Academy of Sciences Library.

Peregrinations of Baltic medical students to England

London, which over the course of the latter half of the seventeenth century became ever more central on the scale of the whole of Europe in the field of evidence-based medical studies and natural sciences, captivated doctoral candidates and doctors who had completed their medical studies throughout Continental Europe, including from the German linguistic area and from the Nordic countries. There were admittedly only a few medical students from the Baltic lands who visited England but the total number of students from the Baltic lands studying medicine at that time was not at all large to begin with.[155] During the period under consideration, the following persons are known to have visited London: David Martini from Riga in 1673 after defending his doctoral degree at Leiden, Johann Depkin from Riga in 1697 before defending his doctoral dissertation at Padua, Nicolaus Martini from Riga in 1702–03 before defending his doctoral dissertation at Halle, Heinrich Dahl from Tallinn around 1705, and Johann Bernhard Fischer from Riga in 1710 after his doctoral promotion at Utrecht.

Nicolaus Martini, municipal physician of Riga and later the personal physician of the Russian Tsarina Anna, provides very interesting information in his letter to Hans Sloane from 1717.[156]

In this letter he thanks Sloane post-factum for hosting him in London in 1702–03. He praised Sloane for the book he had published on Jamaica and promised to send him specimens of natural history collected from the vicinity of Riga. He offered to serve as go-between for the possible import of sugar and coffee from Sloane's plantation in Tobago to the Baltic lands. Interestingly, Martini asked about Flagsby and Wilson. The former built a barometer and a thermometer, and the latter built a microscope. He referred to James Wilson, optical instrument maker in London who had

[155] Tering, *Eesti-, liivi- ja kuramaalased Euroopa ülikoolides*, 657.
[156] British Library, Sloane MS 4042, fol. 157.

advertised this model in *Philosophical Transactions* in 1702, exactly when Martini was in London.[157]

Another inhabitant of Riga, Johann Bernhard Fischer, who later became Riga's municipal physician and served in 1734–40 as the personal physician of the Russian Tsarina Anna, personally made the acquaintance of Hans Sloane on his trip to England in 1709. In his letter written in English dated 25 July 1710 as he waited in Amsterdam after arriving from France to continue his journey to Riga, Fischer thanked Sloane for his reception in London.[158] In Paris he had received a treatise for Sloane published in Montpellier from Sloane's friend, the chemist Etienne-Francois Geoffroy (1672–1731), who was a Royal Society fellow and one of the persons who introduced *Philosophical Transactions* and translated it into French. Fischer promised to forward the treatise from Amsterdam with a physician of German origin who was travelling to London. Fischer also informed Sloane that as he was departing from London in 1709, he had forwarded Sloane's greetings to their mutual friend David Krieg, who had been very pleased by those greetings. Admittedly, Fischer was apparently unaware in the summer of 1710 of the extent of the plague epidemic raging in Riga and needless to say, he was unaware of Krieg's death from the plague on 23 July, that is two days before Fischer wrote the letter. Fischer apparently also met James Petiver in London and based on the catalogue in Sloane's collection, he had sent Petiver several letters.[159] Several decades later, Fischer was elected a Royal Society fellow in 1744.

Summary

Physicians who had reached the pinnacle of Livland's social pyramid or were about to reach it sustained academic contacts between Riga and England in the latter half of the seventeenth century and the early eighteenth century, whether it be Nicolaus Witte von Lilienau, David Krieg, and later Nicolaus Martini and Johann Bernhard Fischer. While Nicolaus Witte tried

[157] Marian Fournier. *The fabric of life: microscopy in the seventeenth-century* (Baltimore: Johns Hopkins University Press 1996), 16.

[158] British Library, Sloane MS 4042, fol. 157–158.

[159] British Library, Sloane MS 3321, ff. 35, 252; 4064, f. 211; 4066, ff. 175, 343. Index to the Sloane manuscripts in the British Museum by Edward J. L. Scott (London 1904) mentions 1700–10 as the interval in which Fischer's letters are dated, which is improbable in the case of Johann Bernhard Fischer from Riga. His correspondence with Petiver, however, could have taken place after 1710.

to remain abreast of the newest developments in English natural sciences by corresponding with the Royal Society treasurer Abraham Hill, David Krieg was a member of equal standing of the community of naturalists of that time, which included collectionnaires, collectors and classifiers. His contribution is appreciated to this day by botany historians. He can be considered the first known key figure in the triangle of natural scientific contacts: England – the American colonies – the Baltic lands. According to current information, Krieg can be considered the first researcher of Livland's plants and insects: he planned to compile a catalogue of Livland's flora and fauna. He evidently had good preliminary knowledge for this work from his time studying in Leipzig already. Similarly, his collecting expedition to America in 1698 and interaction with the elite of botany enthusiasts of that time in London provided him with extensive practical experience. Yet strenuous work as a doctor in Riga ravaged by the Great Northern War hindered Krieg's work in his field of interest. Even so, Krieg managed to do a great deal of preliminary work, which is deposited in both London and St. Petersburg.

Contacts between Riga and London were indeed bilateral in the case of both of these men: issues of *Philosophical Transactions*, newer English natural scientific literature, and objects (a model of a seeding machine, new field crops – the potato, corn, clover seeds, presumably the microscope and literature on microscopes) reached Riga rather quickly, and in turn, a typical Livland forked plough, a zither, a Bible in Latvian, agricultural literature from Livland and Livland specimens of natural history were sent to London. Both physicians were interested in the foundations of practical chemistry and in literature on the colouring of glass and ceramics. An article by Krieg himself even appeared in *Philosophical Transactions* providing an overview of the technology for separating the cobalt necessary for colouring ceramics from ore. This article has highlighted only the tip of the iceberg regarding the plans and activities related to natural sciences of Nicolaus Witte, David Krieg, Johann Bernhard Fischer and Nicolaus Martini, which could serve as an anchor point for further in-depth research of the activity of these natural scientists. By outlining the activities of Witte and Krieg, this article aims to appeal to historians interested in the natural sciences or botanists interested in history to undertake the corresponding in-depth research. The fragmentary information provided in this article may serve researchers as an inspiring anchor point for searching the memory institutions of Riga, London and St. Petersburg for new source material concerning life in Riga related to the natural sciences in the latter half

of the seventeenth century and the eighteenth century. Krieg's encounters with very prominent personalities in the history of science from that time remain fragmentary, but they direct one's attention to keeping an eye out for relevant information (letters, memoirs, diaries) preserved in literature and archival sources with a view to the history of ideas.[160]

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Kokkuvõte: *Loodusteaduslikud kontaktid Riia ja Inglismaa vahel 1660–1710*

17. sajandi teisel poolel kiiresti arenevate loodusteaduste üheks olulisemaks keskuseks kujunes London. 1660/62. aastal asutatud Londoni Kuningliku Seltsi (*Royal Society of London*), samuti 1665. aastal ilmumist alustanud esimese loodusteadusliku ajakirja *Philosophical Transactions* mõjusfäär haaras uute seltsiliikmete ja ajakirja kaastööliste võrgustiku kaudu kogu Euroopa. Käesolevas artiklis võetakse vaatluse alla Inglismaa kui loodusteadusliku uurimistöö keskuse ja Euroopa ühe perifeeriapiirkonna keskuse – Riia – teadushuviliste vastastikused kontaktid, mis on keskuse ja perifeeria vahelise suhestuse ilmekaks näiteks.

Riia ja Inglismaa akadeemilisi kontakte hoidsid 17. sajandi teisel poolel ja 18. sajandi algul alal Liivimaa sotsiaalse püramiidi tippu jõudnud või jõudvad meedikud. Aastatel 1663–69 olid omavahelises kirjavahetuses Riia linnafüüsikus Nicolaus Witte von Lilienau (1618–88) ning Kuningliku Seltsi asutajaliige ja varahoidja Abraham Hill (1633–1721). Vastastikku saadeti raamatuid ja põllumajanduslikke esemeid. Just Hilli vahendusel jõudsid katkust ja sõjast räsitud Riiga esimesed *Philosophical Transactions*i numbrid.

Saksi päritolu Riia arst David Krieg (u 1669–1710) veetis 1697. aasta Inglismaal sealsete naturalistide seltskonnas ning 1698. aastal käis ta liikide

[160] The research of Baltic-English contacts in the natural sciences could also tie in with current international interest in this direction, one expression of which was a thematic conference in Edinburgh: *The Developing Relationship of England and Sweden, 1650–1700*, Nordic Research Network (University of Edinburgh), 18–19 February 2015.

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kogumisretkel Ameerika kolooniates Marylandis ja Virginias, andes nõnda väga olulise panuse sealsete taimede ja putukate uurimisse. 1699. aastal valiti ta Kuningliku Seltsi liikmeks. Kriegi võib pidada esimeseks teadaolevaks võtmefiguuriks loodusteaduslike kontaktide kolmnurgas Inglismaa – Ameerika asumaad – Baltikum ning praegustel andmetel ka Liivimaa taimede ja putukate esimeseks uurijaks. Tal oli kavatsus koostada Liivimaa floora ja fauna kataloog, omades selleks tööks häid eelteadmisi ilmselt juba oma Leipzigi-õpingute ajast, samuti andis suured praktilised kogemused kogumisretk Ameerikasse ning suhtlemine tolleaegsete botaanikahuviliste eliidiga Londonis. Kuid pingeline töö arstina Põhjasõjast räsitud Riias pidurdas Kriegi huvialalist tegevust. Sellegipoolest jõudis ta kataloogi koostamisel teha ära hulga eeltöid, mis on tänaseni tallel nii Londonis kui Peterburis. Riias elades pidas Krieg kuni 1708.aastani kirjavahetust Kuningliku Seltsi sekretäri Hans Sloane'iga ja apteekrist kollektsionääriga James Petiveriga ning saatis neile oma uurimistulemusi, millest üks ilmus *Philosophical Transactions*i 1704. aasta numbris.

Kontaktid Londoni teadlastega olid mõlema mehe – nii Witte kui Kriegi – puhul tõepoolest mõlemapoolsed: Riiga jõudsid inglise uusim loodusteaduslik kirjandus ja esemed (viljakülvimasina mudel, uute põllukultuuride-kartul, mais, ristikheinaseeme, arvatavalt mikroskoop ja mikroskoobi-alane kirjandus) ning omakorda Londonisse saadeti Liivimaa harkader, kannel, lätikeelne piibel, siinset põllumajanduslikku kirjandust ning loodusliike.

Londonit külastasid ka mitmed Riiast pärit ja pärast ülikooliõpinguid oma akadeemilise peregrinatsiooni ette võtnud doktorandid, neist hilisematel Riia arstidel ja Vene keisrinna Anna ihuarstidel Johann Bernhard Fischeril (1685–1772) ning Nicolaus Martinil (1678–1741) olid Londonis viibides isiklikud kokkupuuted ka Hans Sloane'iga.