



International Science and Local Conditions on the Ground: The Agricultural Sciences and Baltic German Identity, 1845–1905

Mark R. Finlay

To cite this article: Mark R. Finlay (2013) International Science and Local Conditions on the Ground: The Agricultural Sciences and Baltic German Identity, 1845–1905, Journal of Baltic Studies, 44:3, 339–362, DOI: [10.1080/01629778.2012.737505](https://doi.org/10.1080/01629778.2012.737505)

To link to this article: <https://doi.org/10.1080/01629778.2012.737505>



Published online: 05 Nov 2012.



Submit your article to this journal [↗](#)



Article views: 162



View related articles [↗](#)



Citing articles: 2 View citing articles [↗](#)

INTERNATIONAL SCIENCE AND LOCAL CONDITIONS ON THE GROUND: THE AGRICULTURAL SCIENCES AND BALTIC GERMAN IDENTITY, 1845–1905

Mark R. Finlay

Questions of how agricultural science would be defined, who would conduct the research, where investigations and teaching would take place, and whose interests it would serve became significant issues in the Baltic provinces in the nineteenth century. The Baltic German elite made repeated efforts to bring scientific agricultural practices into the region and to build institutions that would disseminate them in ways that suited local interests. While previous studies have defined Baltic German endeavors in the agricultural sciences as successes, this study focuses on the frustrations, cultural complexities, ideological controversies, and even violence that came with efforts at agricultural modernization.

Keywords: Baltic Germans; agricultural science; Justus von Liebig; Alexander Petzholdt; Georg Thoms; Woldemar von Knieriem; public science; Livland

On 29 July 1905, a manor house in rural Livland that for decades had been a center for Baltic German advances in agricultural science and education came under attack. A band of 70–80 armed rebels stormed Peterhof (now Petermuiza), burned the Tsar's picture, destroyed documents, and terrorized the Baltic German family that managed the manorial estate. After departing briefly, the force returned with nearly 200 well-armed insurgents around 2:45 the next morning. They seized the manor house as a residence for the farm workers and told peasants and staff to quit working immediately unless they were offered a rise in pay. The rebels retreated into the woods, observing developments from there in order to further disrupt the estate's routine marketing activities and ensure that work at the experimental facility stopped.

Woldemar von Knieriem, the Baltic German administrator of this experiment station, fled to Riga, where he soon secured the support of enough Russian military forces to crush the rebellion (*Baltische Revolutions-Chronik* 1907, pp. 127–29; *Düna Zeitung* 1905, 14/15 August; Knieriem 1931, pp. 18–20; *Rigaschen Rundschau* 1935).

In a summer of scores of similar attacks upon Baltic German manor houses, this episode was not particularly unusual or severe (Plakans 1995; Raun 1984, 1991). Nevertheless, it serves to illustrate an important and overlooked aspect of the history of Russia's Baltic provinces. As scholars such as Gert Kroeger, Heide Whelan, Anders Henriksson, and Michael Haltzel have shown, the Baltic German landed elite's privileged identity had been under attack from many sides for decades. After centuries atop the social order in the northwest corner of the Russian Empire, they now faced challenging economic circumstances, declining demographic significance, the imperial government's 'Russification' policies, and the increasingly nationalist mentality of their Estonian and Latvian subjects (Haltzel 1981; Henriksson 2009; Kroeger 1968; Whelan 1999).

Beginning in the 1840s, the agricultural sciences offered a timely and potentially useful tool for Baltic German landowners to increase agricultural production and expand social control. The discoveries of the German chemist Justus von Liebig were especially influential, as he boldly proclaimed that many agricultural problems could be solved with the latest chemical discoveries. Groundbreaking manufactured fertilizers, as well as new sources of natural manures such as imported Peruvian guano, seemed to confirm Liebig's predictions that experts could identify the exact chemical nutrient that was in short supply. After a series of poor harvests and peasant uprisings in the early 1840s, these promises and products found a willing audience among elite landowners in the Baltic region. Social and political circumstances also contributed to the Baltic Germans' anxieties, as aggressive efforts to convert rural Latvians and Estonians toward Orthodoxy threatened the privileged position of the German-speaking Lutheran clergy. Land reform also challenged the status quo, particularly after 1849, when Hamilkar von Fölkersahm pushed for policies that required landowners to sell or lease much of their land to peasants and created a system that favored wage labor over traditional labor dues (Brock 1997; Eellend 2007, pp. 24–26; Haltzel 1977, pp. 150–52; Plakans 1995, pp. 85–87).

Additional factors continued to encourage the Baltic Germans' agricultural scientific endeavors later in the nineteenth century. Agriculture faced several inherent obstacles in the Baltic provinces – a short growing season, a shortage of capital, relatively thin soils, and an abundance of forests, moors, and marshes that precluded intensive agricultural production. Other once-profitable endeavors, such as wool and flax production, suffered from declining markets, thus hurting farm incomes. By the end of the century, with grain prices and exports in decline, larger landowners were often in debt and pressured to sell their holdings as smaller parcels. The emergence of Estonian and Latvian landowners and farmers' organizations also challenged non-Germans. Thus the Baltic Germans sought ways to forestall even more drastic changes. Determined to maintain their privileged social position, many connected agricultural improvement with an ethos of honor, patriotism, and service to the state. The elite landowners may not have directly tilled their own soil, but, in the words of one scholar, they embraced a kind of 'planter agrarianism' that made them take their

leadership on agricultural matters quite seriously (Eellend 2007, pp. 24–9, 102–9; Whelan 1999, pp. 43–63, 83–102, 181–4, 190–2).¹

In this milieu, many Baltic German elites stepped into the public sphere and embraced the agricultural sciences as tools that could help them maintain political authority, economic influence, and social prestige. With the imperial government offering little support for agricultural improvement, several members of the Baltic German nobility and literati took matters into their own hands, embracing the agricultural sciences to help them adapt to a changing world. Through greater awareness of, and direct participation in, various branches of the agricultural sciences, many believed that they could bring improvement – social and cultural, as well as economic and agricultural – to their circumstances. The agricultural sciences also served political objectives beyond the Baltic region: by highlighting their agricultural achievements when compared with the rest of the Russian Empire, Baltic Germans could defend and justify their longstanding privileges in the existing political and socioeconomic systems. In all, this case shows that Baltic German agricultural sciences not only brought some changes to farm practice in the Baltic region in the late nineteenth century, but also fit within the European nobility's active confrontation with modernity.

This case corresponds with trends at the intersection of some rather different strands of historical scholarship. In recent decades, historians of science have moved beyond a past focus on the great men of science and their privileged academic institutions to look more at the production, dissemination, and popularization of scientific discoveries at a local level. Many scientists believed that their duties extended beyond seeking the latest discoveries in chemistry, biology, and the like; they also believed that they had a duty to help the state and serve the public through science. Spreading from Western Europe, scientific activity became an increasingly pertinent activity in the civil society and an important cultural practice in its own right (Broman 2002; Daum 1998; Hachten 2002).

The Baltic German elite's interest in the agricultural sciences also corresponds with recent interpretations of the European nobility. In contrast to past assumptions that the agricultural elite assumed their place in society was static and entrenched, recent scholarship demonstrates that some slave-owning planters in the American South, many in the country gentry in England, prominent Junkers of Prussia, and even some of the nobility in Russian interior were willing and able to confront the changing nature of agrarian capitalism through scientific inquiry and dialogue (Bailes 1990; Cohen 2009; Elina 2002, 2011; Föhr 1999; Heß 1990; Lieven 1992; Wilmot 1990). Similar circumstances occurred among the many Baltic German leaders who recognized that modernity forced them to modify their class elitism and to adopt various forms of scientific agriculture. Many stayed abreast of developments in the agricultural sciences at home and abroad through education, journal subscriptions, and travels. Some also engaged with scientific research themselves, dabbling in issues such as soil fertility, animal feeding, and crop rotations, both to extract more from their land and labor and demonstrate their value to the state and civil society.

The extant historical literature includes several favorable accounts of Baltic German agricultural research and farm practices. Histories of the University of Dorpat (now Tartu), the Riga Institute of Technology, the Peterhof experimental

farm, and the *Livländische Gemeinnützige und Ökonomische Sozietät* (Livland Public Benefit and Economic Society; hereafter LGÖS), a leading Baltic German agricultural society, all present flattering views of these institutions' modernizing impulses and contributions to improved science and practice on the manorial estates (Engelhardt & Neuschäffer 1983; Leimanis 1972; Siilivask 1985; Tankler 1999). In the 1980s, historian Elmar Järvesoo published several articles that offer a solid introduction to this topic. At that time, however, Järvesoo's access to primary source material was limited, and his writings are laced with a whiggish vocabulary rooted in celebratory sources. Employing adjectives like 'pioneering', 'farsighted', 'high level', 'very promising', 'rational thinking', 'novel', and 'energetic', Järvesoo favorably compares the Baltic German efforts with developments in Western Europe and Scandinavia 'in every respect' (Järvesoo 1980a, 1980b, 1987; see also Ilomets). Indeed, there is evidence that Baltic German agricultural leaders were well respected in other nations, and statistical measures offer testimony to steady improvements in the agricultural productivity of the Baltic provinces. As Heide Whelan's sophisticated study of the Baltic Germans' confrontation with modernity suggests, 'overall, the nobility responded successfully' (Henriksson 2009, pp. 3–5; Kahk 1994; Lust 2006, 2008; Whelan 1999, p. 298).

Other evidence indicates, however, that the application of science to agriculture in the Baltics was not as straightforward, inevitable, or triumphant as earlier histories suggest. Indeed, questions of how agricultural science would be defined, who would conduct it, where the research would take place, and whose interests it would serve became contentious issues in the Baltic provinces in the nineteenth century. Baltic Germans came to see that they could not introduce exact imitations of developments abroad, and what they did create were subjects of intense debate, scrutiny, and frustrations within the Baltic German community and beyond. As a consequence of these unique local circumstances, agricultural chemistry, agricultural experiment stations, soil analyses, and fertilizer inspections became politically charged topics in Russia's Baltic provinces. The controversies and ideological underpinnings that accompanied discussions over agricultural improvement, as well as the several phases in this history, show that neither a stereotypical view of the Baltic elite as resistant to change, nor a celebration of their achievements in the agricultural sciences strikes the right tone. Instead, a history of the region's agricultural sciences needs to be placed within the context of Baltic Germans' varying assumptions about their social, economic, and political identity, and their willingness to invest in institutions that would serve their broader goals.

Early Trials

As the Baltic German elite brought agricultural modernization into the public sphere, one of its principal questions was what institutional form would be the most appropriate for the Baltic provinces. Several kinds of agricultural research facilities had emerged from Western Europe over the course of the nineteenth century that could serve as models. In 1804, the agricultural writer and reformer Albrecht Daniel Thaer established an agricultural academy and model farm at Möglin near Berlin.

Similar privately funded experiment stations with professional chemists were founded in the 1830s at Bechelbronn in France and in the 1840s at Rothamsted in Britain. Beginning with a facility founded at Möckern in Saxony in 1851, the German states led efforts to create new agricultural experiment stations, many with substantial degrees of state support. These too came in various forms: some were model farms, where students might observe proper agricultural practices with some ancillary research; some were experimental farms, where laboratory analyses supplemented field experiments; some were urban or university-based research facilities that had little agricultural presence. These also had varying scientific agendas: some conducted basic research in chemistry, physiology, or botany; others were simpler facilities that merely tested the quality and purity of fertilizers and seeds and helped regulate markets. Baltic Germans became well aware of these European precedents, and advocates could find a model for whatever approach they deemed most appropriate among them (Finlay 1992; Schling-Brodersen 1989).

An early episode in this history occurred in 1829, when administrators at the University of Dorpat sought to create an imitation of Thaeer's Möglin academy. To that end, they recruited the Prussian agricultural reformer and educator Friedrich Schmalz to join the faculty and establish a research and educational farm at Alt-Kusthof (now Vana-Kuuste) near Dorpat (Schmalz 1830, p. 1; Stieda 1890, pp. 621–4). In his appeal to fund the facility, Schmalz spoke in terms of the estate owners' duty to lead a broader effort of economic improvement through an embrace of trends in scientific agriculture (Schmalz 1834, pp. 14–22; Schmalz 1835). Also during this era, the Baltic German agriculturist Carl von Hueck opened an agricultural educational facility on his estate. Like Schmalz, Hueck stressed his connections with Western European developments and argued that Baltic Germans needed a series of 'research estates' that would offer demonstrations of modern agricultural practice (Hueck 1845).

Dorpat, 1845–1860

Upon Schmalz's retirement from the agricultural chair at Dorpat in 1845, a battle over his replacement emerged. The debates reflected the competing directions in scientific agriculture and the rising influence of the German chemist Liebig, and also were linked to increasing pressures for land reform (Kritzmann & Hoppe 2000). Native son Carl von Hueck was the initial favorite, but another candidate, Alexander Petzholdt, emerged with the strong support of Dorpat's professor of chemistry, Friedemann Göbel.² A native of Saxony, Petzholdt had experience combating potato diseases, a track record as a promoter of artificial fertilizers, and, perhaps most importantly, letters of recommendation from Liebig himself (Brock 1997, pp. 124–5; Petzholdt 1846; Pönicke 1959).³ In a close and tense vote, university administrators selected von Hueck.⁴ Yet that did not end the controversy. St. Petersburg editor Jakob Johnson was among those who objected, calling the vote as a victory for those who 'either know nothing about agriculture or nothing about the necessary connections with science'. Before long, the Russian agricultural ministry agreed to name Petzholdt, not von Hueck, to the position.⁵

Within three years of his appointment, however, Petzholdt told Liebig that he wished his 'exile' in Dorpat would soon end. He complained at length of unprepared students who did not attend class, the persistence of traditional crop rotation schemes, the remnants of serfdom, and what he considered an insincere commitment to agricultural improvement, most evident in the meager support for experimental fields and a poorly stocked chemistry laboratory.⁶ Soon, Petzholdt seemed to abandon local concerns and focused his academic energies on what he called 'scientific agricultural journeys' into both Western Europe and the Russian interior, excursions that highlighted the shortcomings of Russian agricultural practices. In an 1855 report on southern Russia, for instance, Petzholdt warned 'the generally poor preparation of Russian pupils makes one doubt if the seeds of science will fall on suitably prepared ground'.⁷ In all, Petzholdt's research trips yielded interesting travelogues and ethnographies, frank observations on the problems of Russian agriculture, and information useful for the development of agriculture in the empire's subtropical regions (Petzholdt 1854, 1864, 1866/7, 1877).⁸

But Petzholdt's research agenda did not answer local needs in an era when Baltic agriculturists faced some very real problems and challenges (*Vierter Bericht* n.d.; *Zweite Sitzung* n.d.). Indeed, Petzholdt bristled with his Baltic German benefactors throughout his career.⁹ Twice, in both 1857 and 1862, university administrators dismissed Petzholdt's recommendations for an agricultural experiment station as too elaborate and expensive.¹⁰ Even the celebration of his 25 years of service generated frank comments that 'some of the practical farmers' had his scant contact with them 'as a grievance'.¹¹ In all, the Petzholdt episode offers a sense both of the tensions over agricultural science in the public sphere, and of the problems associated with importing unfiltered versions of German agricultural science into the Baltic lands.

Despite tensions with Petzholdt, many Baltic German elites agreed that steps toward agricultural modernization remained imperative. In this milieu, another Dorpat chemist, Carl Schmidt, became the main link between the university and agricultural interests. In fact, Schmidt had secured his post in part due to his own experiences in Liebig's laboratory, and to his Liebigian promise to bring the application of organic chemistry into practical agriculture and physiology.¹² Some of Schmidt's earlier publications emerged from requests of the local agricultural union to investigate flax varieties, the sugar content of beets, and similar issues, while he offered local residents fee-based tests of soils, fertilizers, and foods 'in the interest of the agricultural and industrial progress of our Fatherland' (*Bekanntmachung* 1860).¹³ Schmidt also maintained a collection of teaching materials – samples of soils, fertilizers, and crops – which, notably, he divided into distinct 'Russian' and 'Baltic' categories.¹⁴ Schmidt made excursions abroad as well, calling himself a 'chemical tourist' seeking to learn more about Western European developments in applied chemistry and the chemical industries. (Ross 2005)¹⁵

Meanwhile, in 1859, Baron Carl von Ungern-Sternberg led a separate effort to establish an agricultural experiment station that would be under control of the members of the LGÖS rather than the professors at the university.¹⁶ To this end, the baron's LGÖS colleagues appealed to Julius Adolf Stöckhardt, the Saxon 'field preacher' well known for his popular lectures on the wisdom of agricultural chemistry and the value of agricultural experiment stations. Stöckhardt offered some advice to

the LGÖS that proved prescient: he stressed that the experiment should make direct service to local interests a priority, especially to 'generate trust in the goals and the mission of experimental agriculture'.¹⁷ Yet the LGÖS received conflicting advice from another German agricultural scientist, Wilhelm Knop, who warned that researchers should control the agenda, and not be disturbed by random queries from local farmers. To support this point, Knop pointed to an experiment station in rural Saxony, which had failed, he believed, because of too many demands from practicing farmers.¹⁸ In the end, this effort also came to naught, purportedly because the most suitable properties for an experimental farm near Dorpat were no longer available.¹⁹

Riga As a Liberal Center, 1860–1872

In the midst of the debates in Dorpat, the center of agricultural science in the Baltic provinces shifted to the industrializing commercial center of Riga. In the early 1860s, following the accession of Czar Alexander II, Riga's business elite adopted a more liberal ethos. In general, these reformers assumed that they could both solidify a Baltic German identity and control liberal reforms without reaching other classes (Henriksson 1983, pp. 25–6; Whelan 1999, p. 217). As part of these initiatives, Riga's elite founded a new institution for higher education in 1862, the Riga Institute of Technology (also known as the Baltic Polytechnic Institute), an institution that directly served the city's industrial and commercial interests. At about the same time, a new Baltic German agricultural journal, the *Baltische Wochenschrift für Landwirthschaft, Gewerbfleiß und Handel*, began publication. It too articulated a vision that stressed the common interests of German businessmen, industrialists, and estate owners throughout Estland, Livland, and Kurland. Editor August von Bulmerincq's opening editorial was particularly frank in addressing his subscribers' obligation to confront the 'beginning of a new era' in which material interests were paramount. The editor called for his readers vigorously to expand their participation in the 'public sphere' [*Öffentlichkeit*], and to increase the exchange of ideas for the benefit of our 'common homeland' [*gemeinschaftlichen Heimath*]. He stressed a special role for the literati, particularly the 'men of science' who had a 'the right and the duty to join in efforts to promote our material efforts'. Offering a significant challenge to the rural elite, Bulmerincq concluded: 'We devote ourselves to the professions, not to the *Stand*' (Bulmerincq 1863, pp. 1–6).

In connection with these developments, some of Riga's leaders saw an opportunity to respond to the perceived stagnation in Dorpat. Citing the increasing competition in agricultural markets, the expansion of trade and industry, and the need for a combined effort of all the Baltic provinces, educator Ernst Nauck and others proposed that the agricultural faculty chair be transferred from Dorpat to Riga, supplemented by a new agricultural experiment station that promised to increase the 'technical intelligence of our provinces'.²⁰ Officials in the agricultural organizations of Kurland, Ösel (now Saaremaa), and Pernau (now Pärnu) also pledged their support. Nauck's proposal hinted at Petzholdt's troubles in Dorpat, and also cited the conflicting advice received from German agricultural scientists Stöckhardt and Knop as signals that a third approach might be necessary. Nauck also appealed to 'the

patriotism of our farmers [*Landwirthe*]’ to support the cause of agricultural improvement. In the end, and although financial pledges fell short of the goal, the founders of the polytechnic went ahead to privately fund an experiment station within Riga’s city limits in 1863 (Johnson 1863; ‘Zur Errichtung’ 1863, p. 354).

But this station was quite different from the one that nobles and others in the rural elite might have created at Dorpat. Although the station’s first director, August Töpler, preferred Knop’s more research-oriented approach to the agricultural sciences, it soon became clear that industrial and commercial interests dominated the Riga facility (Töpler 1864). Indeed, the project fell well short of Stöckhardt’s model as well, for the experiment station’s stated goal was to help develop the Baltic provinces’ and Russia’s industrial potential and thereby reduce the empire’s dependence on imported goods. Experiment station scientists lacked the resources necessary to conduct serious research, and instead responded to individual requests for fee-based chemical analyses. Early tests included analyses of sediments in a local lake for possible cement production, studies on the purity of linseed oil, and routine purity tests of starch, olive oil, brandy, brown coal, clays, chemical dyes, malt, leather, and more. During these early years, the experiment stations conducted only a handful of soil and fertilizer tests (Recke 1863). Station director Töpler admitted that his work had a technical character, but offered hope that the future would bring ‘active participation from the agricultural public’. Some promoters urged their colleagues to take advantage of the station’s potential for agricultural investigations, but these appeals had little effect (Töpler 1866, p. 492; Weber 1868).²¹

The Nobility’s New Directions, 1873–1890

In this context, battles over the fate of the agricultural sciences in the region continued. Administrators of the Riga school admitted that financial contributions to the agricultural sciences had declined every year since 1863 and some Baltic German leaders studied their alternatives.²² In 1870, one baron offered his estate in rural Livland as the site for a new experiment station, while another countered that analyses should take place close to the fertilizer importers, and thus argued for keeping the project in Riga (‘Entwurf zur Gründung’ 1870). Another asserted that he was grateful for the sophisticated research on plant and animal physiology that came from the German stations, but there was ‘no need’ for such studies in the Baltic. Instead, he said, the station must focus on the ‘agricultural chemical circumstances of our own land’, through investigations of local soils, crops, and manuring practices. In concert with the Baltic Germans’ ethos of service to the broader society, supporters asserted that a revived experiment station could serve the ‘whole public’, not just the Baltic German elite.²³

Two very different facilities emerged from these discussions. In 1872, officials at the Riga Polytechnic hired a new experiment station director, Georg Thoms. Stepson of a Riga businessman of Scottish descent, Thoms had studied agriculture as a student at Dorpat in the mid-1860s, and then chemistry under Robert Bunsen in Heidelberg and August Kekulé in Bonn. He then spent three years in Texas as a pharmacist, railroad employee, and failed entrepreneur in the booming meat extract business.

Upon his return to Riga, he quickly secured the vacant post with the Polytechnic, perhaps aided because his stepfather was an influential politician and president of the Institute's Board of Directors (*Düna Zeitung* 1902; Henriksson 1983, p. 154; *Riga Stadtblätter* 1902; Schindler 1903). Thoms quickly won promotions, the doubling of his salary, and considerable praise for quickly making the Riga station a worthwhile addition to the region's civil society.²⁴

Meanwhile, members of the Riga Polytechnic board developed plans to convert an estate at Peterhof in rural Livland into a different kind of center for agricultural improvement. Indeed, one of its founders, Alexander von Keyserling, wrote openly on two issues he believed were related: the importance of promoting agricultural science, and the need for Baltic Germans to serve the empire in ways that would diffuse the mobilization of groups along nationalist and ethnic lines (Whelan 1999, p. 60). For some, this facility, not the earlier ones founded by Schmalz, Petzholdt, or Toepler, was the 'first step to the establishment of an agricultural experiment station, which is among the most vital necessities of the university and of our country'.²⁵

Woldemar von Knieriem, the son of a Livlandian estate owner, was hired to direct the facility. Knieriem had received his advanced education at Heidelberg, and returned to Dorpat as a *Privatdocent* in 1873, where he worked to revive agricultural chemistry studies after they had lagged during Petzholdt's tenure there (Knieriem 1931, pp. 11–19; Lenz 1998, p. 391; *Rigaschen Rundschau* 1935).²⁶ Peterhof differed considerably from the academic facilities in Dorpat – a well-equipped 'research estate' that eventually boasted 30 buildings that supported a working and profitable farm operation. Knieriem's mission at Peterhof was to expose students to the many facets of practical agricultural education, with intense work in the fields, granaries, and swine stalls used to supplement the scientific instruction. For graduation, students were required to demonstrate mastery of several fields of applied research: to complete scientific feed or fertilizer research, to submit an architectural plan for a farm building, and to describe a detailed management plan for a working estate. Knieriem also embraced a substantial outreach mission, receiving numerous visitors and observers, establishing a network of agricultural middle schools that offered lectures in the Latvian language, publishing an annual farm almanac (also available in a Russian translation that was common throughout the empire), and leading a large program of seed and fertilizer testing, both in conjunction with agricultural societies in Kiev and beyond. The majority of Peterhof's students were Russian, and most moved on to careers in the interior of Russia. In all, the facility, which Knieriem described as an idyllic, 'self-sufficient agricultural organism', had a broad significance (Armistead Neu-Mocken & Tobien 1900; Järvesoo 1980a, pp. 245–50; Knieriem 1912, pp. 141–54; Knieriem 1931, pp. 11–19).²⁷

Back in Riga, experiment station director Thoms pushed for a different kind of scientific agriculture that often clashed with his rural clients' intentions. For instance, in 1880, Thoms urged his benefactors to create a facility that was capable of research at a level rivaling those in Western Europe. Despite the barons' impression that they were already scientifically advanced, Thoms argued that the Baltic provinces lacked an agricultural experiment station deserving of the name. His own station in Riga did not qualify, he said, because its support came almost entirely from urban interests and its work of routine chemical analyses served only private clients. There could be no

greater form of 'patriotism' than serving the improvement of agriculture, Thoms claimed, and he asked for someone from 'our homeland' [*unserer Heimat*] to step forward with the necessary financial support (Thoms 1880). Thoms also rejected the premise that an agricultural experiment station should be located in a rural area – like Peterhof and most of those in the Russian interior. Answers to scientific questions were not found in the quiet of nature, he argued, but through hard work in the laboratory (Thoms 1883, pp. 30–42).

Compounding these disputes, both of Thoms's major initiatives faced opposition and eventual failure. The first was an attempt to bring Riga's fertilizer trade under regular quality-control inspections as a means to raise the experiment station's status in the public arena and to encourage wider use of artificial fertilizers. In 1876, eight Riga fertilizer manufacturers funded a trip for Thoms to investigate the leading German, English, and Swedish fertilizer plants and agricultural experiment stations. Thoms returned dazzled by Western European advances in that industry and convinced of the 'enormous importance of commercial fertilizers for our modern life'. His published report pushed strongly for Baltic agriculturists to increase their fertilizer consumption. Following the model of several German experiment stations, the Riga station implemented a policy of fertilizer testing, requiring dealers to pay for analyses that confirmed the quality and content of their commercial fertilizers ('*Einige neuere*' 1876; Thoms 1876). This system soon broke down, however, because customers in the Baltic chose not to pay the 1% surcharge associated with inspected fertilizers. In an era when Baltic agriculturists faced competition from the Russian interior and pressure from the Russian government to lower fertilizer tariffs, minimizing fertilizer costs was a higher priority. In 1881, several Riga fertilizer merchants jointly declared that they would sell their products without the experiment station's stamp of approval. Other firms negotiated new rates that declined steadily over subsequent years. Despite occasional cases of fertilizer fraud, sales of uncertified fertilizers increased. By the turn of the century, some 31 of the 35 firms once under the experiment station's control had stepped out, signaling that the Riga station had failed to establish its legitimacy as arbiter of useful agricultural scientific information ('*Die Dünger-Controle*' 1881; Thoms 1902).

Tensions over Microscientific Soil Testing, 1883–1899

Meanwhile, Thoms launched another initiative that consumed his energies and his benefactors' finances for nearly 20 years. These were a complex series of investigations of the phosphoric acid content of Baltic soils, which he always described with the French word *Enquête*.²⁸ Agricultural chemists had long connected the Baltic soils' low phosphorus content with poor crop yields and high fertilizer expenses, while some physicians linked low phosphorus intake with tendencies to bone brittleness among the rural population. Tensions also arose over whether phosphate fertilizers should be imported or manufactured from domestic raw materials (Elina 2011, pp. 36–9). To get to the heart of this issue, Thoms proposed to test multiple soil samples from scores of Baltic manors, and then publicize the high-, low-, and mid-range quantity and solubility of phosphoric acid found on each.

Thoms saw these as far more than routine soil tests, for he believed they fit into the broader context of public science and civic improvement. Geology, chemistry, pedology, and economy were all interconnected; a deep knowledge of the soil, he believed, would benefit 'our Baltic provinces' as a whole, not just the individual landowners.²⁹ Ultimately, he hoped that the phosphoric acid data could become the basis for new 'scientific' tax tables and land appraisal systems. The Dorpat geologist Constantin von Grewingk concurred, promising that the analyses would provide a 'scientific understanding of *our* soils and practical considerations of *our* agriculture' ('Die öff. Jahres-Sitzungen' 1884, p. 88).³⁰ Thoms anticipated that these studies would give him the chance to establish 'much closer' ties with the landowning elite and to learn 'their wishes, hopes and expectations'.³¹ He added that his effort would highlight the German barons 'whose value for the nation is not regarded highly enough' and he hoped Baltic noblemen would reconsider their 'rather indifferent view' of the Riga station. Despite some resistance from several members who questioned the necessity and validity of Thoms's approach, the LGÖS granted funding for the project.³²

The *Enquêtes* became Thoms's passion and life work; he called it the 'quintessence' of his career. Over a period of several years, Thoms visited hundreds of Baltic German estates, secured thousands of soil samples, and subjected each to a complex, ten-step, analytical process (Thoms 1886, 1889).³³ Perhaps unsurprisingly, however, the project proved to be expensive, tedious, and ultimately unsuccessful. Critics openly complained that Thoms's studies did not really address landowners' more immediate questions: which fertilizers did local crops actually need, and in what quantities? The matter soon deteriorated into a struggle, evidenced by Thoms's repeated excuses for delays in completing the study, and his continual pleas to the LGÖS for additional funds to expand the project.³⁴ In 1887, the LGÖS asked Thoms to postpone publication of his lengthy and detailed reports that had 'limited value for the agricultural public' until more comparative data were available.³⁵ In 1890, nearly five years after he collected data from thousands of soil tests, Thoms still wondered how he might best present his findings.³⁶ As tensions intensified, LGÖS secretary Gustav von Stryk and others repeatedly asked Thoms to bring the *Enquêtes* to some kind of conclusion.³⁷ One nobleman condemned the Riga experiment station for having 'absolutely no' connection with practice and explicitly attacked Thoms for treating 'abstract science' as the landowners' ruler, not their assistant. In view of 'countless absolutely unsuccessful experiments', Baron Dellingshausen-Kattenack asserted that there was no alternative but to abandon the Riga station and reinvigorate research that focused on the untapped natural resources of the Baltic soil. Baron Alexander von Stryk-Kibbijerw joined in, ridiculing the Riga station for its overpriced and under-utilized laboratory facilities; according to him, nearly one-seventh of the Riga station's tests involved the chemistry of human urine, a topic of little interest to the rural elite. Even though the current station was little used, von Stryk argued that practical needs justified the creation of a new station ('Die Aufgaben' 1897; Stryk-Kibbijerw 1895, 1896).³⁸

Thoms repeatedly defended his work against these charges. First, he scolded his benefactors as the system of fertilizer control collapsed. 'It is incomprehensible', he asserted, 'how local farmers [*einheimischen Landwirthen*] fully disregard' the objectives

of fertilizer control. Had agriculturists simply agreed to boycott the firms not under control, fertilizer firms would have had to capitulate.³⁹ In responses to complaints about the *Enquêtes*, Thoms fretted over 'a certain impatience' among the landowners who did not recognize or appreciate that his approach to land appraisal was path-breaking science.⁴⁰ By 1896, Thoms published the complaint that 'I have heard so much indifference and misunderstanding of our *Enquêtes*' that 'I cannot be astounded any more' (Thoms 1896, pp. 33–4).

Thoms also turned to colleagues abroad who could validate his work. In one report, Thoms quoted Ferdinand Wohltmann, an agronomist from Germany's sophisticated experiment station at Halle, who declared the *Enquêtes*' results as 'tangible and valuable for practice' and 'extraordinarily commendable' guides for land valuations (Thoms 1892, pp. 354–5). Thoms took his cause to the United States as well, presenting a paper on 'The Valuation of Arable Lands on a Scientific and Statistical Basis' before a group of chemists at the 1893 Chicago World's Fair (Thoms 1895).⁴¹ Elsewhere Thoms declared 'if not today or tomorrow, or even ten years, I am nevertheless convinced that our soil appraisals will have value lasting one hundred or more years'.⁴² Moreover, Thoms repeatedly insisted, 'if Thaer and Liebig were still alive, they would consider our *Enquêtes* the realization of their greatest hopes for soil analysis'.⁴³ As a parting shot, Thoms submitted his final report on the *Enquêtes* to the LGÖS with a curt note indicating that his duties to the Society had been fulfilled. He then offered his soil analysis services for those estate owners who remained interested for the 'paltry sum' of ten rubles, one-third his normal fee.⁴⁴

A Period of Reorientation and Decentralization, 1895–1905

Meanwhile, the barons' dissatisfaction with Thoms was exacerbated in the mid-1890s, as political tensions and hard economic times intensified pressures upon the Baltic German minority. The rise of agricultural organizations that directly served the interests of rural Estonians and Latvians certainly played a role. Indeed, the Estonian nationalist leader Carl Robert Jakobson explicitly argued that agricultural prosperity was a necessary first step toward Estonian civil rights and liberty, and, through the Estonian Agricultural Society, he pushed for small-scale dairying and other forms of agriculture that would free Estonians from Baltic German hegemony (Eellend 2007, pp. 55–56; Eellend 2009, pp. 28–29; Raun 1991, pp. 64–66; von Stryk & von Essen 1880). In response, LGÖS president August von Oettingen urged his German colleagues to step forward and combat the 'dominant crisis' of his era. In view of the Riga faculty's 'limited understanding of the interests of the land', as well as bureaucrats' 'stubborn' insistence on the use of the Russian language for instruction, some LGÖS members decided they needed new facilities of their own.⁴⁵ Another writer addressed the LGÖS with a proposal that explicitly articulated that Baltic Germans' connections with their past dominance were ever 'more distant' and their connections with Western Europe 'ever thinner'. Employing the language of a threatened class, this speaker asserted, 'our self-sufficiency is fundamental'. This objective could be reached through new approaches in the agricultural sciences, focusing on the 'concrete needs' of the local region rather the

'abstract disciplines' of science. To direct such an experiment station, the writer explicitly stated that hiring a 'son of the homeland [*Heimat*]' would be 'better than an outsider'.⁴⁶

Thus Baltic Germans again took the matter of cultural and agricultural improvement into their own hands (Eellend 2007, pp. 100–7; Eellend 2009, p. 43; Hamburg 1984). Although some complained that such moves would not serve 'all Baltic' interests, the German elite cut funding for the Riga station, built closer connections with village-level agricultural societies, and established new experimental facilities on various landowners' private estates (Thoms 1896). Others followed the steps of local and private researchers, such as the Baltic Dairy Union and the Union of Baltic Cattle Breeders, both of which had hired instructors and researchers who directly served members' needs for chemical and bacteriological investigations. Once again, members of the LGÖS proposed the creation of a new agricultural experiment station while admitting that they had not been supporting the existing one. In one case, Friedrich von Berg, one of Livland's most prominent Baltic German estate owners and agricultural reformers, offered the facilities of his Sagnitz (now Sangaste) estate as a new station. To direct the facility, von Berg insisted on his estate's chemist, Konrad Sponholz, a native son who had been educated at Dorpat, where he had fought to defend the interests of German-speaking students (Henriksson 2009, pp. 90–1). According to von Berg, Sponholz knew 'the entirety' of the agricultural sciences; he could build bridges between theory and practice, and could offer landowners more than routine chemical analyses. In his report to the LGÖS, von Berg underlined each of these points in red pencil, perhaps another sign of his frustration with Thoms and his initiatives. While von Berg supplied all of the facilities, a subscription list reveals that 57 Germans agreed to contribute from five to 50 rubles each to support this new endeavor.⁴⁷ Similarly, in Estland, in 1896, the agricultural union established a new facility at the Dehn family's estate Weltz near Wesenberg (now Rakvere) with Konrad von Dehn himself agreeing to conduct investigations (Rechenschaftsbericht 1898). Tellingly, von Dehn treated his work as that of informal public service, rather than professional science, and he took months and even a year off from his duties, when he urged his clients to direct their queries to Sponholz instead (Sponholz 1905b). These new stations' research agendas suggest an outright rejection of previous approaches. One author, for instance, insisted that the new experiment stations should not focus on commercial fertilizer issues, but also search for applications of locally available resources such as marl, lime, and peat ('Die Aufgaben' 1897). In place of Thoms's complex microanalyses of cultivated soils, the new stations conducted broader surveys of meadows, pastures, forests, and moors. The Baltic German agricultural societies soon supported 18 new experimental meadows scattered across southern Livland, another sign of their increasingly decentralized and practical approach to agricultural science (Asper 1907).

Over the next decade, von Dehn (in Estland) and especially Sponholz (in Livland) conducted thousands of simple fertilizer, feed, and seed purity tests that won the approval of local agriculturists. Von Dehn and his assistants also visited dozens of estates with the aim of improving distillery operations, while Sponholz traveled to other Russian provinces to observe advances in moor culture ('Litteratur' 1904).⁴⁸ Sponholz's productivity increased each year, and in 1904 he could justify hiring a

scientific assistant, again a member of the Baltic German society. In contrast to Thoms, who had to be pestered to write for the *BWLGH*, Sponholz assumed an editorial role with the journal and published dozens of signed and unsigned articles each year. Tellingly, many of his contributions were general and qualitative surveys of agricultural trends and conditions, unlike Thoms's technical and data-driven reports on the phosphoric acid content of the soils of specific estates. Indeed, Sponholz proposed that the society sponsor cost-free analyses of feeds and fertilizers, in order to openly demonstrate the risk of fraud and the value of his services. Sponholz also worked to coordinate research methodologies among several Baltic experimental facilities, and he took the lead in disseminating and publicizing the experimental results from the dozens of experiment stations that had arisen in the rest of Russia by the turn of the century.⁴⁹ In another contrast to Thoms's claims that he was unable to initiate control of seed quality, the Estonian Agricultural Union established seed control operations in Reval (now Tallinn) by 1905, at about the time similar work began at the von Dehn estate (Dehn 1906; Ferle 1905). Another privately funded endeavor, the Baltic Seed Association, offered members facilities to test their seeds for purity and market control, and employed seed experts to visit members' estates upon demand (*Entwurf zur Geschäftsordnung* 1899). Also significant, Sponholz warned his colleagues to beware of buying seeds and fertilizers from rural dealers who seemed 'noble and innocent' but were actually deceitful (Sponholz 1901, 1905a, p. 105).

Tensions surrounding the agricultural sciences manifested themselves again in the revolutionary year of 1905. As mentioned above, the Peterhof experimental farm was one of the many Baltic German manors that came under direct attack. The uprisings shattered the elite's complacency and impelled renewed efforts to consolidate their position in society. In their response, however, Baltic Germans did not abandon their commitment to the agricultural sciences; as von Dehn put it, agricultural improvements could not be stopped by the 'difficult storms that have shaken our poor land' (Dehn 1907, p. 289). Also pertinent, Sponholz cited the 1905 events as a justification for an effort to unify the agendas and experimental methodologies of the four Baltic experiment stations.⁵⁰ Nevertheless, just as throughout the Baltic society as a whole, there were clear signs that the Baltic Germans' dominance of public agricultural science was near its end. For instance, when the Lutheran pastor Carl Kundsinn suggested that Latvian farmers create an agricultural education facility operated through the German-controlled LGÖS, a congress of Latvian farmers rejected the proposal almost unanimously. Latvians were ready to stand 'fully on their feet', a local newspaper declared, asserting that the interests of the rural Latvians had nothing in common with the Baltic Germans (Engelhardt & Neuschäffer 1983, pp. 108–9; *Rigaer Tagesblatt* 1900). According to another observer both Estonian and Latvian farmers were beginning to heed the slogans 'knowledge pays' and 'ability nourishes' (Rathlef 1909, pp. 47–8). As other scholars have noted, Baltic Germans were forced to share their leadership in the public sphere after 1905, and many retreated from public affairs altogether. As the gulf between Germans and non-Germans widened, a 'new agrarian elite' of the majority populations began to take the ownership of the agricultural sciences in the Baltic (Eellend 2009, pp. 38–41; Henriksson 2009, 106–11).

Conclusion

In all, the complex and contentious history of the agricultural sciences in the Baltic provinces in the late nineteenth century challenges traditional assumptions regarding the German 'barons' presumed stubborn resistance to change. Just as portrayals of southern plantation owners as marching blindly toward the American Civil War, of Prussian Junkers as being responsible for the crimes of National Socialism, and of a Russian aristocracy absolutely dominating a static and premodern countryside are no longer in favor, this case demonstrates that many Baltic German noblemen were continually engaged with the many issues that surrounded agricultural modernization. Like elites elsewhere in Russia and beyond, Baltic Germans participated in a transnational dialogue among elite landowners who learned to use the agricultural sciences as tools to help in the transition toward agrarian capitalism. Many were well attuned to international discussions regarding agricultural improvements, convinced that publicly accessible and locally applicable forms of science were necessary for the region's adaptation to modernity. Largely due to its attention to the agricultural sciences, the Baltic German elite was crushed neither by 'Russification' decrees, nor by peasant unrest, nor by an international agricultural depression (Haltzel 1974, 1977; Weeks 1996).⁵¹

Yet this study also challenges earlier scholars who have celebrated the Baltic German leaders as creators of scientific institutions that mirrored and equaled those of Germany and elsewhere. Indeed, scholars of the agricultural sciences in other lands have questioned an older narrative that stresses professional scientists' inevitable triumph over reluctant farmers and other defenders of traditional practice (Finlay 1992; Harwood 2004; Marcus 1985). This did not play out in the Baltic provinces either, for it is clear that efforts to bring the agricultural sciences into the region generated public debates and encountered controversy and resistance. Baltic German institutions devoted to the agricultural sciences did not fall under the control of professional scientists and national bureaucracies, and the rural elite did not wait in the wings for science to arrive fully packaged from faraway university laboratories. Rather, the bureaucrats, intellectuals, and landowners actively shaped and reshaped the funding, research agendas, and public outreach of the experiment stations, model farms, and agricultural teaching facilities that they created. Others brought agricultural research directly onto their manorial estates, and several non-scientists embraced projects that required attention to quantitative measurement, careful observation, and attention to scientific developments abroad. In general, the Baltic German leaders resisted efforts to bring academic research and sophisticated science to their agricultural institutions; instead, they preferred facilities that served as information bureaus committed to improvements that served the Baltic provinces and the rest of the Russian Empire. In the face of political and demographic forces that increasingly marginalized its position, and with little help from institutions or bureaucracies of the Russian Empire, the German elite found links between the norms and values of agricultural science and its aims to maintain social, economic, and political influence. Under the circumstances, this self-directed and localized ethos of service to the civil society approach may have been, at least for their purposes, the Baltic Germans' best option.

Acknowledgements

I would like to thank Olavi Arens, Andrejs Plakans, Birgit Kirbal, Hain Tankler, Mare Luuk, Erki Tammiksaar, Margaret Harcourt Williams, Hamilton Cravens, Fredrik Eriksson, Johan Eellend, and Anders Henriksson for their assistance with this project.

Notes

- 1 'Planter agrarianism' is from Eellend, 2007, p. 104.
- 2 Indeed, Göbel had already launched his own efforts to disseminate advances in the agricultural sciences through a lecture series, which he claimed attracted an audience of two hundred persons. See F. Göbel, 'Bericht an den Conseil der Universität über gehaltene populäre Vorträge für das gewerbtreibende Publikum aus dem Gebiete der technischen Chemie' (1837–1851), Tartu Ülikooli Raamatukogu Arhiiv/Tartu University Library Archives [hereafter cited as TURA], 24/68.
- 3 Petzholdt had studied medicine, geology, and chemistry at German universities in the 1830s. He then gained some prominence for publishing a popularized version of Liebig's teachings on agricultural chemistry, and for promoting the manufacture Liebig's Patent Manure in the German states. Additional Petzholdt information is from a letter of Vello Kaavere to E. Patrick Munday, 11 February 1988. I thank Dr. Munday for a copy of this correspondence.
- 4 See Göbel to University Conseil, 23 March 1846, Fond 402, Nimitsu 3, Sätlik 1317, Eesti Ajalooarhiiv/Estonian National Archives, Tartu, Estonia [hereafter cited as EA, Fond #/Nimitsu #/Sälik #]. Note too that Petzholdt also applied for two previous openings at Dorpat, and lost votes for both of them as well. See Petzholdt to Göbel, 1 July 1841, TURA, 24/28; and Report of the University Conscils, 8 December 1845, EA, 402/3/1317.
- 5 J. Johnson to Friedemann Göbel, 20 April 1846, TURA, 24/21. Sources indicate that Petzholdt's appointment was made official by 7/19 September 1846.
- 6 Alexander Petzholdt to Justus von Liebig, 10/22 February 1853, Liebigiana II.B. Bayerisches Staatsbibliothek, München. This letter includes a curriculum vita dated 3/15 May 1849, which is the source of the cited comments.
- 7 'Systematischer Bericht über die südlichen Gouvernements des europäischen Russland (vom 20. Mai bis 19. Septbr [1855]), unternommene wissenschaftliche Reise des Professors Dr. Alexander Petzholdt,' EA, 402/3/1317.
- 8 In addition, a few unpublished reports on scientific agricultural journeys are found in EA, 402/3/1317.
- 9 Petzholdt's files at the Estonian National Archives contain many rejections of his requests for leaves of absence, supplemental expenses, and travel funds, disagreements about his fees for popular lectures, disputes about deliveries of wood that he failed to pay for, and even a trial that apparently centered on Petzholdt's alleged threats against a faculty colleague.
- 10 Alexander Petzholdt, 'Antrag', 8 November 1857; Alexander Petzholdt to Conseil, 28 March 1859, both in EA, 402/4/793; and Petition to Conseil, [May? 1862], EA, 402/4/852. See also Alexander Petzholdt to Conseil, 9 November 1857, EA, 402/3/1317. The 1857 trip was not funded, although in 1859 Petzholdt used his own monies to visit leading agricultural experiment stations in

England, Belgium, and Germany. Alexander Petzholdt to Joseph Henry Gilbert, 13 October 1859, Archives of the Rothamsted Experimental Station, Harpenden, England.

- 11 Untitled report, 23 November 1871, EA 402/3/1317.
- 12 Carl Schmidt to Justus von Liebig, 29 October/11 November 1845, in Ross 2002, pp. 57–8.
- 13 Schmidt to Liebig, 25 May/6 June 1852, in Ross 2002, p. 61.
- 14 Erläutern der Catalog der agriculturchemischen Sammlung als Lehrhülfsmittel, zusammengestellt und analysiert von Prof. Dr. Carl Schmidt, 20 July 1871, TURA, F22/2.
- 15 Schmidt to Liebig, 23 January/4 February 1856, in Ross 2002, p. 75.
- 16 Carl von Ungern-Sternbrg to LGÖS, 12 January 1859, EA, 1185/1/341.
- 17 W. v. Hehn to Julius Adolf Stöckhardt, 27 Janury/8 February 1859; and Julius Adolf Stöckhardt to LGÖS, 6 March 1859, both in EA, 1185/1/341.
- 18 Anon., Untitled History of the LGÖS, EA, 2489/1/13. For more on Knop's vision of keeping agricultural chemists free from local demands, and on the troubles at the Saxon experiment station, see Finlay, 1992, pp. 169–71, 216–17.
- 19 Petition to Conseil, 1 June 1862, EA, 402/4/852.
- 20 LGÖS to the Russian Agricultural Ministry, 23 February 1863, EA, 1185/1/396.
- 21 A shortage of funds and staff also limited the station's capabilities, for they at times had to use students to conduct the analyses.
- 22 Administration of the Riga Polytechnic to the LGÖS, 4 December 1871, EA, 1188/1/505.
- 23 Anonymous letter to the Plenar-Conferenz des Baltischen Polytechnikums, [1871 or 1872], EA, 1185/1/505.
- 24 Fond 175, Apraksta1, Lietas 271, Latvijas Valsts Vēstures Arhīvs/Latvian State Historical Archives, Riga, Latvia. [hereafter cited as LVVA, Fond #/Apraksta #/Lietas#]".
- 25 Helmling to Conseil, 9 April 1877, EA, 402/3/808.
- 26 See also Helmling to Conseil, 17 December 1874, EA, 402/3/808.
- 27 See also W. v. Knieriem to Administration, 29 April 1897, LVVA, 7175/1/170. Among his many specific research reports, see Knieriem 1877, 1883, 1885.
- 28 G. Thoms to Administration of the Riga Polytechnic Institute, 29 December 1883, LVVA, 7175/1/271.
- 29 Carl Schmidt to Georg Thoms, 18 May 1883, EA, 1185/1/607.
- 30 Emphasis in the original.
- 31 Georg Thoms to Carl Schmidt, 9 May 1883, EA, 1185/1/607.
- 32 Georg Thoms to Carl Schmidt, 9 May 1883; Thoms to LGÖS, 9 January 1884, both EA, 1185/1/607.
- 33 See also Georg Thoms to Gustav v. Stryk, 19 January 1884, EA, 1185/1/607.
- 34 For instance, Thoms asked for 1824 rubles for 532 test analyses in 1884 and 6275 rubles for 2705 analyses in 1885. Georg Thoms to Gustav von Stryk, 26 December 1885, EA, 1185/1/607. For his request for additional staff, see Georg Thoms to Administration, 17 September 1884, LVVA, 7175/1/220; and Thoms to LGÖS, 7 January 1889, EA, 1185/1/607.
- 35 LGÖS to Georg Thoms, 11 April 1887, EA, 1185/1/607.
- 36 Georg Thoms to Georg von Stryk, 20 November 1890, EA, 1185/1/607.

- 37 For instance, Georg von Stryk to Georg Thoms, 3 December 1890, EA, 1185/1/607.
- 38 Stryk-Kibbijerw, 1895, p. 685, quotes an 'old Livlandian saying' that expressed skepticism over scientific agriculture: 'alchemy has often failed, [but] cow manure always brings money' [*Alchymisterey hat oft gefehlt; Kuhmisterey giebt immer Geld*].
- 39 Georg Thoms to Eduard von Oettingen, 20 June 1894, EA, 1185/1/607.
- 40 Georg Thoms to G. von Stryk 16 December 1890, EA, 1185/1/607.
- 41 Thoms also visited several agricultural experiment stations as part of this trip, including those in Indiana, New York, and Wisconsin.
- 42 Georg Thoms to Gustav von Stryk, 16 December 1890, EA, 1185/1/607. For more of Thoms's defense of his work, see Georg Thoms to Gustav von Stryk, 2 June 1892, and Georg Thoms to Gustav von Stryk, 24 January 1895, both in EA, 1185/1/807.
- 43 Georg Thoms to LGÖS, 8 January 1899, EA, 1185/1/607. A very similar quotation appears in Thoms 1892, p. 355.
- 44 After the LGÖS halted funding for the *Enquêtes* in 1896, Thoms was rescued by a 1000 ruble grant from the Imperial Agricultural Ministry. Thoms called the minister 'a savior in our time of need that arose from the limited understanding of the value of such inquiries'. See Thoms 1898, pp. vi–x; and Georg Thoms to LGÖS, 8 August 1899, 1185/1/607.
- 45 August von Oettingen to unidentified, 15 June 1894, EA, 1185/1/714.
- 46 Anonymous, 'Zur Frage der Errichtung einer Versuchstation der ökonomischen Societät', undated [1894?], 1185/1/714/1–6.
- 47 Graf von Berg to the LGÖS, 26 January 1895; von Berg to LGÖS, 3 February 1896; Alexander von Stryk to LGÖS, 17 January 1896, and undated subscription list, all in EA, 1185/1/714. Total donations were 735 rubles. On von Berg, see Lenz 1998, pp. 50–1. *Deutschbaltisches Biographisches Lexikon*, pp. 50–51.
- 48 See also Sponholz to LGÖS, Report for 1902, EA 1185/1/719.
- 49 Sponholz to unidentified, 1 November 1902, EA 1185/1/714. See also Sponholz 1902; K. Sponholz to the Konferenz der Baltischen Landwirtschaftlichen Gesellschaften, July 1903; and K. Sponholz to LGÖS, 10 July 1909, latter two both in EA, 1185/1/714.
- 50 K. Sponholz to LGÖS, 10 July 1909, EA, 1185/1/714.
- 51 The primary sources consulted for this study suggest that agricultural leaders such as Georg Thoms and Woldemar von Knieriem found the 'Russification' decrees to be a nuisance, but not a hindrance. For instance, see Waldeny to Administration, 28 May 1902, LVVA, 7175/1/170.

References

- Armistead Neu-Mocken, G. & Tobien, A. (eds) (1900) *Ergebnisse und Kritik nebst den Verhandlungen der V. Versammlung baltischer Land- und Forstwirthe* (Riga, Häcker).
- Asper, J. (1907) 'Die ersten Resultate der Versuchswiesen in Süd-Livland', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 45, p. 18.
- Bailes, K. E. (1990) *Science and Russian Culture in an Age of Revolutions: V.I. Vernadsky and His Scientific School, 1863–1945* (Bloomington, Indiana University Press).
- Baltische Revolutions-Chronik, I. bis zum Oktober 1905* (1907) (Riga, Jonck & Pliewsky).

- 'Bekanntmachung' (1860) *Livländische Jahrbücher für Landwirtschaft*, 14, pp. 108–11.
- Brock, W. H. (1997) *Justus von Liebig: The Chemical Gatekeeper* (Cambridge, Cambridge University Press).
- Broman, T. H. (2002) 'Introduction: Some Preliminary Considerations on Science and Civil Society', *Osiris*, 17, pp. 1–21.
- Bulmerincq, A. v. (1863) 'An unsere Leser und Mitarbeiter', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 1, pp. 1–6.
- Cohen, B. R. (2009) *Notes from the Ground: Science, Soil, and Society in the American Countryside* (New Haven, Yale University Press).
- Daum, A. (1998) *Wissenschaftspopularisierung im 19. Jahrhundert: Bürgerliche Kultur, naturwissenschaftliche Bildung und die deutsche Öffentlichkeit, 1848–1914* (Munich, Oldenbourg).
- Dehn, K. v. (1906) 'X. Rechenschaftsbericht der Versuchsstation des Estländischen Landwirthschaftlichen Vereins', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 44, p. 441.
- Dehn, K. v. (1907) 'Rechenschaftsbericht der Versuchsstation des Estlandischen Landw. Vereins vom 1. Januar 1906 bis 31. December 1906', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 45, p. 289.
- 'Die Aufgaben der landwirthschaftlichen Versuchsstation der K. L. G. u. Ö. S.' (1897) *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 35, pp. 111–14.
- 'Die Dünger-Controle der Versuchsstation am Polytechnicum zu Riga und die 1% Steuer' (1881) *Beilage zur Neue Zeitung für Stadt und Land* (17/29 May).
- 'Die öff. Jahres-Sitzungen der K. Liv. Gem. und ökonomischen Societät' (1884) *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 22, pp. 85–90.
- Düna Zeitung* (1902) 9 November.
- Düna Zeitung* (1905) 1/14 August.
- Düna Zeitung* (1905) 2/15 August.
- Eellend, J. (2007) *Cultivating the Rural Citizen: Modernity, Agrarianism, and Citizenship in Late Tsarist Russia* (Stockholm, Studia Baltica).
- Eellend, J. (2009) 'Unity through Modernity: The Agrarian Media and the National Question in Estonia at the Turn of the 20th Century', *Nordost Archiv*, 18, pp. 25–43.
- 'Einige neuere Specialisierungen auf dem Gebiete landwirthschaftlicher Versuchsstationen' (1876) *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 14, pp. 674–78.
- Elina, O. (2002) 'Planting Seeds for the Revolution: The Rise of Russian Agricultural Science, 1860–1920', *Science in Context*, 15, 2, pp. 209–37.
- Elina, O. (2011) 'Private Initiatives, Public Support, and War Practices: Development of Fertilisers in Russia', *Ambix*, 58, 1, pp. 29–61.
- Engelhardt, H. D. v. & Neuschäffer, H. (1983) *Die Livländische Gemeinnützige und Ökonomische Sozietät (1792–1939)* (Köln/Wien, Böhlau).
- Entwurf zur Geschäftsordnung des baltischen Samenbauverbandes* (1899) (Jurjew). Pamphlet (K. Mattisena).
- 'Entwurf zur Gründung einer Landwirthschaftlichen Versuchsstation in Livland' (1870) *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 8, pp. 545–8.
- Ferle, F. (1905) 'Über Samenkontrolle', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 43, pp. 225–6.

- Finlay, M. R. (1992) 'Science, Practice and Politics: German Agricultural Experiment Stations in the Nineteenth Century', unpublished PhD dissertation (Ames, Iowa State University).
- Föhr, S. (1999) 'Modernization for the Honor of the Estate: The Deutsche Landwirtschafts-Gesellschaft, 1884–1914', unpublished PhD dissertation (Washington, Georgetown University).
- Hachten, E. A. (2002) 'In Service to Science and Society: Scientists and the Public in Late-Nineteenth-Century Russia', *Osiris*, 17, pp. 171–202.
- Haltzel, M. H. (1974) 'The Russification of the Baltic Germans: A Dysfunctional Aspect of Imperial Modernization', in Ziedonis, A., Winter, W. L. & Valgemäe, M. (eds) *Baltic History* (Columbus, Ohio State University), pp. 143–52.
- Haltzel, M. H. (1977) 'National Elites and Russification in the Baltic Provinces of the Russian Empire, 1861–1914. The Case of the Baltic Germans', in Rowney, D. K. & Orchard, G. E. (eds) *Russian and Slavic History* (Columbus, Slavica Publishers), pp. 148–63.
- Haltzel, M. H. (1981) 'The Baltic Germans', in Thaden, E. C. (ed.) *Russification in the Baltic Provinces and Finland, 1855–1914* (Princeton, Princeton University Press, 1981), pp. 111–204.
- Hamburg, G. M. (1984) *Politics of the Russian Nobility, 1881–1905* (New Brunswick, Rutgers University Press).
- Harwood, J. (2004) *Technology's Dilemma: Agricultural Colleges between Science and Practice in Germany, 1860–1934* (Bern, Peter Lang).
- Henriksson, A. (1983) *The Tsar's Loyal Germans. The Riga German Community: Social Change and the Nationality Question, 1855–1905* (New York, Columbia University Press).
- Henriksson, A. (2009) *Vassals and Citizens: The Baltic Germans in Constitutional Russia, 1905–1914* (Marburg, Verlag Herder Institut).
- Heß, K. (1990) *Junker und bürgerlicher Großgrundbesitzer im Kaiserreich. Landwirtschaftlicher Großbetrieb, Großgrundbesitz und Familienfideikomiß in Preußen, 1867/71–1914* (Stuttgart, Franz Steiner).
- Hueck, C. F. v. (1845) *Das Gut Munnalas in Ehstland, und meine Bewirthschaftung desselben in den Jahren 1838 bis 1845* (Reval, Kluge).
- Ilomets, T. 'Chemistry and Chemistry Related Sciences at Tartu (Dortpat) [sic] University in 1802–1919', available at: http://mega.chem.ut.ee/obki/keemia1/TU1802_1919.htm, accessed 6 July 2010.
- Järvesoo, E. (1980a) 'Agricultural Program at the Riga Polytechnic Institute, 1863–1919', *Journal of Baltic Studies*, 11, 3, pp. 238–53.
- Järvesoo, E. (1980b) 'Early Agricultural Education at Tartu University', *Journal of Baltic Studies*, 11, 4, pp. 341–55.
- Järvesoo, E. (1987) 'The Role of Tartu University and Riga Polytechnic Institute in Introducing Rational Agriculture into the Baltic Provinces and Russia', in Pistohlkors, G. v., Raun, T. U. & Kaegbein, P. (eds) *The Universities Dorpat/Tartu, Riga, and Wilna/Vilnius, 1579–1979: Papers on Their History and Impact on the Borderlands between East and West* (Köln/Wien, Böhlau), pp. 197–215.
- Johnson, J. (1863) 'Ueber die Errichtung einer landwirtschaftlichen Lehranstalt und einer Versuchsstation beim Rigaschen Polytechnicums', *Mittheilungen der kaiserlichen freien ökonomischen Gesellschaft zu St. Petersburg*, 20, pp. 321–36.
- Kahk, J. (1994) 'Grain and Potato Production in 19th-Century Estonia', *Historical Social Research*, 19, 2, pp. 64–9.

- Knieriem, W. v. (1877) 'Die Errichtung einer Samencontrollanstalt in Dorpat', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 15, pp. 38–41.
- Knieriem, W. v. (1883) 'Mittheilungen aus der Versuchsstation Peterhof, I', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 21, pp. 289–306.
- Knieriem, W. v. (1885) 'Mittheilungen aus der Versuchsfarm Peterhof, II', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 23, pp. 189–90.
- Knieriem, W. v. (1912) 'Die landwirtschaftliche Abteilung, speziell die Lehr- und Versuchsfarm Peterhof, am Rigaschen Polytechnikum', In: Bucholtz, F.V. (Ed), *Festschrift zum fünfzigjährigen Jubilean des Rigaschen Polytechnischen Insituts, 1862–1912* (Riga, Häker), pp. 141–54.
- Knieriem, W. v. (1931) *Meine Lebenserrinerungen* (Riga, Plates).
- Kritzmann, V. A. & Hoppe, B. (2000) 'Justus von Liebig's Role in the Early Development of Russian Chemistry and Chemical Education in the 19th Century', *Archives Internationales d'histoire des sciences*, 50, pp. 103–29.
- Kroeger, G. (1968) 'Zur Situation der baltischen Deutschen um die Jahrhundertwende', *Zeitschrift für Ostforschung*, 17, pp. 601–32.
- Leimanis, E. (1972) 'The Polytechnical Institute of Riga and Its Role in the Development of Science', *Journal of Baltic Studies*, 3, pp. 113–22.
- Lenz, W. (ed.) (1998) *Deutschbaltisches Biographisches Lexikon, 1710–1960* (Wedemark, Harro von Hirschheydt).
- Lieven, D. (1992) *The Aristocracy in Europe, 1815–1914* (New York, Columbia University Press).
- 'Litteratur' (1904) *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 42, p. 244.
- Lust, K. (2006) 'Die Innovationsbereitschaft der livländischen Bauern und die Agrarreformen im 19. Jahrhundert', *Zeitschrift für Ostmitteleuropa-Forschung*, 55, 4, pp. 510–25.
- Lust, K. (2008) 'Kiselev's Reforms of State Peasants: The Baltic Perspective', *Journal of Baltic Studies*, 39, 1, pp. 57–71.
- Marcus, A. I. (1985) *Agricultural Science and the Quest for Legitimacy: Farmers, Agricultural Colleges, and Experiment Stations, 1870–1890* (Ames, Iowa State University Press).
- Petzholdt, A. (1846) *Lectures to Farmers on Agricultural Chemistry* (New York, Greeley and McElrath).
- Petzholdt, A. (1854) *Beiträge zur Kenntniss des Innern von Russland, zunächst in landwirthschaftlicher Hinsicht* (Leipzig, Weber).
- Petzholdt, A. (1864) *Reise im westlichen und südlichen europäischen Russland im Jahre 1855* (Leipzig, Fries).
- Petzholdt, A. (1866/7) *Der Kaukasus: Eine naturhistorische so wie land- und volkswirtschaftliche Studie (ausgeführt im Jahre 1863 und 1864)*, Vol. 2 (Leipzig, Fries).
- Petzholdt, A. (1877) *Umschau im Russischen Turkestan (im Jahre 1871), nebst einer allgemeinen Schilderung des 'Turkestanischen Beckens'* (Leipzig, Fries).
- Plakans, A. (1995) *The Latvians: A Short History* (Stanford, Hoover Institution Press).
- Pönicke, H. (1959) 'Georg Paul Alexander Petzholdt: Ein mitteldeutscher Naturforscher und Lehrer in Russland', *Hamburger Mittel- und Ostdeutsche Forschungen*, 2, pp. 47–70.
- Rathlef, H. v. (1909) 'Aufforderung der Versuchsfarm Nömmiko (Samen- und Sortengutwirthschaft), Saatgutproben zu Anbauversuchen einzusenden', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 47, pp. 47–8.

- Raun, T. U. (1984) 'The Revolution of 1905 in the Baltic Provinces and Finland', *Slavic Review*, 43, 3, pp. 453–67.
- Raun, T. U. (1991) *Estonia and the Estonians* (Stanford, Hoover Institution Press).
- 'Rechenschaftsbericht über die Thätigkeit des Laboratoriums des Estländischen Landwirtschaftlichen Vereins' (1898) *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 36, pp. 161–63.
- Recke, W. (1863) 'Zur Frage der Versuchsstation beim Riga'schen Polytechnicum', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 1, pp. 435–8.
- Rigaschen Rundschau* (1935) 13 January.
- Riga Stadtblätter* (1902) 7 November.
- Rigaer Tagesblatt* (1900) 20 April/3 May.
- Ross, R. S. (ed.) (2002) *Carl Schmidt (1822–1894): Tagebuchaufzeichnungen, Briefe und wissenschaftliche Reiseberichte des Dorpater Chemikers Carl Schmidt aus den Jahren 1842 bis 1881* (Aachen, Shaker).
- Ross, R. S. (2005) 'Carl Schmidt – A Chemical Tourist in Victorian England', *Endeavour*, 29, 1, pp. 33–7.
- Schindler, F. (1903) 'Professor Dr. Georg Thoms', *Landwirtschaftliche Versuchsstationen*, 58, pp. 315–19.
- Schling-Brodersen, U. (1989) *Entwicklung und Institutionalisierung der Agriculturnchemie im 19. Jahrhundert: Liebig und die landwirtschaftlichen Versuchsstationen* (Braunschweig, Braunschweiger Veröffentlichungen zur Geschichte der Pharmazie und der Naturwissenschaften).
- Schmalz, F. (1834) *Versuch zur Beantwortung der Frage: Ist es gut, oder wohl gar nothwendig, daß die Landwirtschaft wissenschaftlich behandelt werde?* (Riga/Dorpat, Franzen).
- Schmalz, H. (1835) *Keine Nation kann ohne Ackerbau reich werden, aber auch keine kann durch der Ackerbau reich werden* (Dorpat, Schünmann).
- Siilivask, K. (ed.) (1985) *History of Tartu University, 1632–1982* (Tallinn, Periodika, 1985).
- Sponholz, K. (1901) 'Bericht über die Thätigkeit der Versuchsstation', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 39, pp. 104–6.
- Sponholz, K. (1902) 'I. Jahrbuch der russischen landwirtschaftlichen Versuchsstationen', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 40, p. 132.
- Sponholz, K. (1905a) 'Kunstdüngerschwindel', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 43, pp. 93–94.
- Sponholz, K. (1905b) 'Öffentliche Jahressitzungen der K.L.G.u.Ö.S.', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 43, pp. 179–180.
- Stieda, L. (1890) 'Johann Leberecht Friedrich Schmalz', *Allgemeine Deutsche Biographie*, Vol. 31 (Leipzig, Duncker & Humblot), pp. 621–4.
- Stryk-Kibbijerw, G. v. (1895) 'Landwirtschaftliche Versuchs- und Kontrollstationen und ihre Bedeutung für die Praxis', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 33, pp. 681–90.
- Stryk-Kibbijerw, G. v. (1896) 'Landwirtschaftliche Versuchs- und Kontrollstationen', *Baltische Wochenschrift für Landwirtschaft, Gewerbleiß und Handel*, 34, pp. 89–94.
- Tankler, H. (1999) 'Die Universität Tatu/Dorpat in den Wissenschaftsbeziehungen zwischen Ost und West', in Meissner, B. & Eisfeld, A. (eds) *Der Beitrag der Deutschbalten und der städtischen Rußlanddeutschen zur Entwicklung des Russischen Reiches von den zweiten Hälfte des 19. Jahrhunderts bis zum Ersten Weltkrieg* (Köln, Verlag Wissenschaft und Politik), pp. 267–79.

- Thoms, G. (1876) 'Consum und Fabrikation von käuflichen Düngstoffen in Norddeutschland, England, und Schweden', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 14, pp. 9–15.
- Thoms, G. (1880) 'Die Acker-Böden des Krons-Gutes Peterhof', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 18, pp. 369–93.
- Thoms, G. (1883) 'Die landw.-chemische Versuchsstation am Polytechnikum zu Riga in den Jahren 1864–1872, Historische Skizze', in *Die landwirtschaftlich-chemische Versuchs- und Samencontrol Station am Polytechnikum zu Riga* Heft V (Riga/Moscow, Deubner), pp. 30–42.
- Thoms, G. (1886) 'Aus dem Laboratorium der Versuchsstation Riga', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 24, pp. 408–19.
- Thoms, G. (1889) 'Die 3. Livländische Enquête-Reise durch die Kreise Werro, Walk, und Wenden', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 27, pp. 521–30.
- Thoms, G. (1892) 'Besitzt die Agrar- (Phosphorsäure-) Enquête wissenschaftlichen und praktischen Werth?', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 30, pp. 354–5.
- Thoms, G. (1895) 'Das Landwirthschaftliche Versuchs- und Unterrichtswesen der Vereinigten Staaten Amerikas', in *Die landwirtschaftlich-chemische Versuchs- und Samencontrol Station am Polytechnikum zu Riga*, Heft VIII (Riga/Moscow, Deubner), pp. 292–378.
- Thoms, G. (1896) 'Die Begründung von Versuchs- und Kontrollstationen', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 34, pp. 29–34.
- Thoms, G. (1898) 'Vorwort', *Die landwirtschaftlich-chemische Versuchs- und Samencontrol Station am Polytechnikum zu Riga*, Heft IX (Riga/Moscow, Deubner), pp. v–x.
- Thoms, G. (1902) 'Die Ergebnisse der Dünger-Kontrolle, 1901/1902', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 40, pp. 459–61.
- Töpler, A. (1864) 'Beitrag zur Frage der landwirthschaftlichen Stationen in Rußland', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 2, pp. 683–90.
- Töpler, A. (1866) 'Bericht über die diesjährige Thätigkeit der chemischen Versuchsstation in Riga', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 4, pp. 489–92.
- Untitled (1896) Baron Dellingshausen-Kattenack quoted in an untitled and undated speech, published in the *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 34, p. 26.
- Vierter Bericht des Ehstländischen landwirthschaftlichen Vereins vom 10. November 1853–1854* (Reval, Kelchen, n.d.).
- von Stryk, G. & von Essen, N. (1880) *Umfang und Absatz von Molkereiprodukten in Estland und dem nördlichen Livland* (Dorpat, Laakmann).
- Weber, F. (1868) 'Bericht über die Thätigkeit der chemischen Versuchsstation am Polytechnicum zu Riga', *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 6, pp. 631–6.
- Weeks, T. R. (1996) *Nation and State in Late Imperial Russia: Nationalism and Russification on the Western Frontier, 1863–1915* (DeKalb, Northern Illinois University Press).
- Whelan, H. W. (1999) *Adapting to Modernity: Family, Caste, and Capitalism among the Baltic German Nobility* (Köln/Weimar/Wien, Böhlau).
- Wilmot, S. (1990) 'The Business of Improvement': *Agriculture and Scientific Culture in Britain, c. 1770 – c. 1870* (Bristol, Historical Geography Research Series).

‘Zur Errichtung einer agricultur-chemischen Versuchsstation bei der landwirthschaftliche Abteilung des Polytechnicums’ (1863) *Baltische Wochenschrift für Landwirthschaft, Gewerbleiß und Handel*, 1, pp. 349–54.
Zweite Sitzung des Ehstländischen landwirthschaftlichen Vereins im Jahre 1856, am 28. Juni (n.d.) (Reval, Kelchen).

Mark Finlay has taught at Armstrong Atlantic State University since 1992. He has published several articles on Justus von Liebig and on the history of agricultural science in Germany and the United States. His book *Growing American Rubber: Strategic Plants and the Politics of National Security* won the Saloutos Prize as the best book published in the field of agricultural history in 2009.
