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Imaging Medieval Livonian Seals: Techniques and Technologies in the History of Sigillography

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Abstract. This article reviews different techniques for rendering images of medieval Livonian seals from the eighteenth century to the present. The first Baltic collectors made freehand drawings and took moulds of originals to cast copies of seals. In the 1860s Baron Robert von Toll introduced an engraving machine into Baltic sigillography to transfer seal reliefs to printing plates. Photography and the digital turn have boosted the number of images, and large databases have emerged, but the creation of metadata has not kept pace. While some older imaging technologies were quickly abandoned, others continued to be used alongside newer ones.

Keywords: sigillography, historiography, relief copying, engraving technology, photography

INTRODUCTION

Seals represent not only a fascinating form of medieval miniature art, used to authenticate or close documents, but also the attributes and insignia of authority. Seals also carry meanings and communicate the self-perception and self-representation of their owners. Sealing is a universal cultural practice, and thus sigillography is an important auxiliary science in general. The extensive use of sealing in medieval European legal

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contexts makes sigillography especially relevant to medieval studies.[1] In Livonia, from the thirteenth century onwards, sealing was among the standard procedures of clerical and secular overlords and institutions, as well as towns; over the course of the following centuries, numerous nobles and town burghers likewise adopted private seals.[2]

Seal impressions are the result of mechanical reproduction, made by applying a harder matrix to a softer material, mainly wax.[3] Impressions vary in quality, and although the overall number of preserved specimens is immense, they remain very fragile and pose a continuing challenge for conservators. Some seal matrices, especially those of institutions, were in use for a very long time; others, most notably personal seals, were used for a shorter time and were usually destroyed after the death of their owner. In general, matrices rarely survive, and researchers have to use impressions to reconstruct the matrix, the very heart of the *hic et nunc*[4] of sealing.

As with every type of visual source, adequate reproduction of preserved specimens is also crucial in sigillography.[5] Images in publications provide an important tool for historians in various fields. They not only enable the identification and study of seals and sealing practices but also contribute to their preservation. The aim of this article is to give an overview of imaging techniques used in the history of Livonian sigillography. Recent research has pointed out that scientific images participate in discourses of power and help to produce, assert and sustain power relations.[6] As seals themselves are, among other things, attributes of power, the effort put into their study is strongly motivated by the wish to sustain this power, to trace its origins or, in the event of its loss, to recover it.[7] But in discussing technical solutions for imaging, authenticity and precision re-emerge as central endeavours, which are essential to every kind of scientific imaging (drawings, photographs, etc.).

1 A. Stieldorf. Siegelkunde. Hahnsche Buchhandlung, Hannover, 2004, 11.
2 Est- und Livländische Brieflade. Vierter Theil. Siegel und Münzen der weltlichen und geistlichen Gebietiger über Liv-, Est- und Curland bis zum Jahre 1561 nebst Siegeln einheimischer Geschlechter. Aus dem Nachlasse von Baron Robert von Toll hrsg. von J. Sachssendahl. Kluge & Ström, Reval, 1887.
3 For multilingual terminology see: Vocabulaire international de la sigillographie. Conseil International des Archives, comité de sigillographie, Roma, 1990.
4 W. Benjamin. The Work of Art in the Age of Mechanical Reproduction. Transl. by J. A.Underwood. Penguin, London, 2008.
5 T. Diederich. Sphragistik. – Historische Hilfswissenschaften. Stand und Perspektiven der Forschung. Hrsg. von T. Diederich, J. Oepen. Böhlau, Köln, 2005, 35–59, here 55–58.
6 The Technical Image. A History of Styles in Scientific Imagery. Ed. by H. Bredekamp, V. Dünkel, B. Schneider. University of Chicago Press, Chicago, 2015; Kunst või teadus = Art or science. Ed. by L. Kaljundi, K. Polli, K. Tiideberg. Tartu Ülikooli Kirjastus, Tartu, 2022.
7 E. Hagström Molin. Colonisation, Decline and Loss: Making Livonian Time in Nineteenth-Century Russia. – Time & Society 2026, 35, 2, 236–255.

Rather than constituting a linear progression towards ever greater fidelity, the history of seal imaging reveals a recurrent tension between accuracy, legibility, reproducibility and the preservation of the original object.

FIRST SOLUTION: FREEHAND DRAWING

A basic way to represent a seal's appearance is through verbal description, but a drawing is in many ways better and was used very early on.[8] The quality of drawings could of course vary from crude sketches to impeccable facsimiles. Richard von der Hardt (d. 1714), a German-born book auctioneer and bibliographer active in Stockholm and Uppsala, is known to have made several pictures of Livonian coins and seals, some of which were published by Johann Michael Heineccius (d. 1722) in his ground-breaking scholarly treatment of sigillography in 1709.[9] When Johann Gottfried Arndt (1713–1767) was compiling a set of seal descriptions in Livonia for the appendix to the second part of his Chronicle, he could rely on these rather clumsy images.[10]

In the late eighteenth century, freehand drawing was the main method used by the great recorders of Baltic heritage, such as Joachim Christoph Brotze (1742–1823) and Eduard Philipp Körber (1770–1850). Both scholars collected drawings and watercolours of antiquities and exchanged images, including drawings of seals.[11] The results are a series of manuscript volumes preserved, in Brotze's case, in the University of Latvia Library in Riga and, in Körber's case, in the Estonian Literary Museum in Tartu. Brotze's seal images are above all to be found in his *Sylloge Diplomatum Livoniam illustrantium*,[12] and Körber's in the second volume of his *Vaterländische Merkwürdigkeiten* (see Fig. 1).[13]

8 For example O. D. Harris. Fragments of the Past: The Early Antiquarian Perception and Study of Seals in England. – Companion to Seals in the Middle Ages. Ed. by L. J. Whatley. Brill, Leiden, Boston, 2019, 129–154, here 148.

9 J. M. Heineccius. Syntagma historicum de veteribus Germanorum aliarumque nationum sigillis. Sumtibus Nicolai Foersteri, Frankfurt, Leipzig, 1709, Tab. XI 6–10, Tab. XIII 9, Tab. XV 13.

10 J. G. Arndt. Der Livländischen Chronik anderer Theil von Liefland unter seinen Herren Meistern welche die alte Geschichte des Ordens und der benachbarten Völker erleutert. Johann Justinus Gebauer, Halle, 1753, 303, Tabelle II. Von den Sigillen der Ordens- und anderer geistlichen Personen nebst den ältern und neuern Sigillen und Wappen der Städte.

11 A. Taimiņa. Johana Kristofa Broces (Brotze, 1742–1823) dzīvesgājums un viņa rokrakstu kolekcija LU Akadēmiskajā bibliotēkā, Diss. Riga, 2013, 115–127, 251–256.

12 Latvijas Universitātes Akadēmiskā bibliotēka (LUAB), Johana Kristofa Broces (Brotze) rokrakstu kolekcija, inv. Nr. R4979, R4980: Brotze, Johann Christoph, Sylloge diplomatum Livoniam illustrantium. Tomus primus, Tomus secundus. https://dspace.lu.lv/handle/7/61386 (accessed 28/08/2026).

13 Eesti Kultuurilooline Arhiiv (EKLA), f 192, m 57:1(M.B): Eduard Philipp Körber.

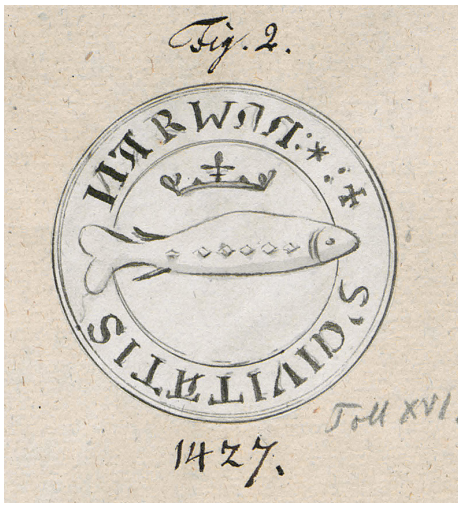


Figure 1. Narva seal by Eduard Philipp Körber. Eesti Kultuurilooline Arhiiv (Tartu), ÕES, MB 57, fol. 276



Figure 2. Narva seal by Johann Naha. – A. Süvalep. Narva ajalugu. Narva Ajaloo Selts, Narva, 1936, p. 268

These collections, although they remained in manuscript, became the basis for a major publication on Baltic seals, discussed below.[14]

Freehand drawing depends on the attentive eye and skill of the illustrator but offers no guarantee of exact resemblance. For coins, Brotze suggested a method for achieving greater precision, which was also used by Körber: wet paper had to be pressed over the coin and rubbed with an ivory stick, and the imprint then drawn over and painted.[15] Not all coins could be copied in this way, especially very thin bracteates. Applying this method to seals was out of the question because of the softness of the wax impressions.

Freehand drawing remained competitive with other methods of imaging throughout the nineteenth and twentieth centuries. For example, for the history of Narva published in 1936, seal images were drawn directly from originals in the Tallinn City Archives, with the scale also indicated, and printed as woodcuts by the Estonian artist Johann Naha (1902–1982) (Fig. 2).[16] Freehand drawings of seals continue to appear in publications in the twenty-first century.[17]

Vaterländische Merkwürdigkeiten II. Beyträge zur Kenntnisz der Liefländischen Diplomatie mit 260 Original Siegel Abbildungen… https://kivike.kirmus.ee/index.php?pid=EKLA-11278-43212-77047&oid=0&t=1&module=400&op=3#EKLA-11278-43282-07977 (accessed 28/08/2026).

14 J. Sachssendahl. Vorwort. – Est- und Livländische Brieflade. Vierter Theil, p. IX–XVII, here p. XII–XIII.

15 V. Dāboliņš. New footprints of Eduard Philipp Körber's (1770–1850) numismatic research. – From Hoard to Archive. Numismatic Discoveries from the Baltic Rim and Beyond. Ed. by E. Russow, V. Dāboliņš, V. Lang, Tartu UP, Tartu, 2023, 17–36, here p. 23. On Körber see: I. Leimus. Zu den Anfängen der Numismatik in Estland: Eduard Philipp Körber (1770–1850). – Geisteswissenschaften und Publizistik im Baltikum des 19. und frühen 20. Jahrhunderts. Hrsg. von N. Angermann, W. Lenz, K. Maier. LIT, Berlin, 2011, 43–63.

16 A. Süvalep. Narva ajalugu. Narva Ajaloo Selts, Narva, 1936, 35, 38, 268, 269, 327.

17 Eesti ajalugu II. Eesti keskaeg. Koost. ja toim. A. Selart. Tartu Ülikool, Tartu, 1012, 30, 55; Tallinna ajalugu I. 1561. aastani. Koost. ja peatoim. T. Kala, toim. T. Tamla. Tallinna Linnaarhiiv, Tallinn, 2019, 79–80.

MECHANICAL COPIES

Different materials can be used to mechanically copy seals, but in principle the technique remains the same: one has to take a mould from the original to cast the image in positive.[18] Brotze had already collected copies of seals in sealing wax made in this way,[19] but the greatest contribution in this field was made by Robert von Toll (1802–1876), a former soldier who in 1851 dedicated himself to the study of history and the collection of medieval documents and seals. An important milestone in his career was a journey to Stockholm in 1860 with Professor Carl Schirren (1826–1910), where they searched for the remains of the archives of the Teutonic Order.[20] While Carl Schirren worked on the first register of Livonian sources in Sweden,[21] Toll was busy making moulds of seals in gutta-percha, a high-quality latex sourced from the Malaysian tree *Palaquium gutta*. This material is rigid, naturally biologically inert, resilient, electrically non-conductive and thermoplastic, and was used extensively instead of rubber until synthetic materials became available.

The result of Toll's work was a collection known as the Kukruse (Ger. Kuckers) collection, after the manor in Estonia where it was originally located. In 1910 the Toll family deposited it in the Archives of the Estonian Noble Corporation in Tallinn.[22] When the Corporation was dissolved in 1920, the Kukruse collection was relocated by its owner to the Library of the Estonian Literary Society (*Estländische Literärische Gesellschaft*). Only in 1935 did the Republic of Estonia purchase it for 5,000 crowns, making it part of the collection of the State Central Archives in Tartu.[23] Toll's seal collection was inventoried in the archives

18 The practice was widespread and has not been entirely abandoned even today. See e.g. M. Libert. The seal casts collection and the digitisation of the sigillographic collections of the national archives of Belgium. – Vestnik of Saint Petersburg University. History, 2017, 62: 2, 255–266, here 256–258 https://doi.org/10.21638/11701/spbu02.2017.203 (accessed 09/09/2026).

19 LUAB, Inv. nr. R4104, Brotze, J. Chr. Siegel in Siegellack, adliche.

20 J. Götz. Das Archiv des livländischen Deutschordenszweiges. Eine archivgeschichtliche Untersuchung. – Die Kirche im mittelalterlichen Livland. Hrsg. von R. Biskup, J. Götz, A. Radzimiński. UMK, Toruń, 2019, 9–77, here 10–11.

21 C. Schirren. Verzeichniss livländischer Geschichts-Quellen in schwedischen Archiven und Bibliotheken. Dorpat, 1861.

22 P. Osten-Sacken. Bericht über das Estländische Ritterschaftsarchiv. – Jahrbuch für Genealogie, Heraldik und Sphragistik 1909 und 1910, 311; P. Osten-Sacken. Bericht über das Estländische Ritterschaftsarchiv fürs das Triennium 1911–1913. – Jahrbuch für Genealogie, Heraldik und Sphragistik 1914, 39; See also K. Neitmann. Ständisches Archivwesen: Aufstieg und Fall der deutsch-baltischen Ritterschaftsarchive (ca. 1880–1920). – Estonian Archives in the European Context. Papers of the Conference in the Tallinn City Archives on September 15–16, 2005. Ed. by L. Kõiv and P. Pillak. Estonian Society of Archivists, Tallinn, 2012, 15–73.

23 O. Liiv. The Central State Archives 1 IV. 1932–1. IV 1937. – Riigi keskarhiiv 1932–1937 ja arhiivinduslikke eriküsimusi = The Central State Archives 1932–1937 & Special Archival Questions. Eesti Riigi Keskarhiiv, Tartu 1937, 43–54. Estonian National Archives (RA),



Figure 3. Seal of Christoph I, King of Denmark, sealing wax copy, Eugen von Nottbeck collection. RA, EAA.2071.1.10

after World War II in three phases. The first inventory was made in 1971 and contains 599 items from the special cabinet commissioned by Toll for storing his seal copies.[24] Two other inventories, compiled in 2003 (478 items) and 2006 (462 items), cover objects that Toll himself had already separated from the main collection.[25]

Apart from the Kukruse collection, the Estonian National Archives holds the collection of seals and seal copies assembled by the lawyer and historian Eugen von Nottbeck (1842–1900).[26] Nottbeck criticised the use of gutta-percha and gypsum in making moulds because of the potential damage to the seal. He used a mixture of bread and talc to make the mould, which he then used to press a new image into sealing wax (Fig. 3).[27] Nottbeck's widow donated the collection to the Archives of the Estonian Noble Corporation,[28] from where it passed directly into the custody of the Estonian state and is now held in the National Archives. Finally, there is a seal collection created in the National Archives in 1980 by bringing together seals and matrices of various provenances, including

EAA.661.1.217, fol. 148 (contract); EAA.R-271.1.1287.13 (photo of the collection).

24 The cabinet is currently in the custody of the Estonian Government Office.

25 RA, EAA.2069.3, 4, 5.

26 RA, EAA.2071.

27 E. von Nottbeck. Siegel aus dem Revaler Rathsarchiv nebst Sammlung von Wappen der Revaler Rathsfamilien. H. G. Rahtgens, Lübeck, 1880, 7.

28 I. Jürjo. Die Reformen im Estländischen Ritterschaftsarchiv am Vorabend des Ersten Weltkrieges. – Estonian Archives in the European Context, 74–111, here 96.

those from the collection of the Estonian Noble Corporation.[29] All these collections in the National Archives of Estonia, which contain matrices as well as seal copies, comprise 7,658 units. They have been photographed and have been digitally available online since 2012.[30]

WAGNER'S ENGRAVING MACHINE

In publishing images of seals, the main problem was transferring three-dimensional images to two-dimensional paper. A solution was actively sought in the 1830s.[31] In 1830 the French industrial designer Achille Collas (1795–1859) invented a mechanical engraving machine, a pantograph, which enabled printing plates to be engraved with mathematical exactness, and he presented his prints at the Paris Salon in 1833.[32] This so-called numismatic engraving was first used to reproduce coins,[33] but the new method was quickly introduced for the reproduction of seals as well.[34] Although the method has since been widely associated with the name of Collas, other inventors were also working in the field, for example Christian Gobrecht (1785–1844) and Joseph Saxton (1790–1873) in America and John Bate in England (who called his machine an anaglyptograph).[35]

In the German-speaking world, a *Relief-maschine* for a similar purpose was designed and described in a publication in 1836 by Karl Karmarsch (1803–1879), director of the Polytechnic School in Hanover.[36] In Berlin, however, the academic artist Friedrich Gottlieb Wagner Jr.

29 RA, EAA.2077.

30 https://www.ra.ee/pitserid/ (accessed 28/08/2026). Unfortunately, only about one quarter of the images are described in the database (1,852 units). The remaining images have only brief references from the inventory.

31 T. Fawcett. Plane Surfaces and Solid Bodies: Reproducing Three-Dimensional Art in the Nineteenth Century. – Art History through the Camera's Lens. Ed. by H. E. Roberts. Gordon and Breach, Amsterdam, 1995, 59–85.

32 See also: V. Nolte. Memorial of Facts Connected with the History of Medallic Engraving and the Process of M. Collas. – Museum of Foreign Literature, Science, and Art, 1838, 32, 1, 113–119.

33 Trésor de numismatique et de glyptique, ou Recueil général de médailles, monnaies, pierres gravées, bas-reliefs tant anciens que modernes... gravés par les procédés de M. Achille Collas. Paris, 1834–1850.

34 The Great Seals of England from the Time of Edward the Confessor to the Reign of His Majesty William the Fourth: Illustrated by Thirty-eight Plates, Containing Exact Fac-similes of the Seals in their Present Condition, Engraved by the Process of Achilles Collas; with Historical and Descriptive Notices. Henry Hering, London, 1837.

35 Handbuch der Schriftgiesserei und der verwandten Nebenzweige. Hrsg. von A. Henze. Voigt, Weimar, 1844, 276–278; Handbuch der Litographie. Nach dem Gegenwartigen Stande der Technik. Hrsg. von G. Fritz. W.Knapp, Halle, 1901, 282–286.

36 K. Karmarsch. Beschreibung einer Relief-maschine zur getreuen bildlichen Darstellung von Münzen, Medaillen und anderen Reliefs, auf ganz mechanischem Wege. Helwingsche Hof- Buchhandlung, Hannover, 1836.

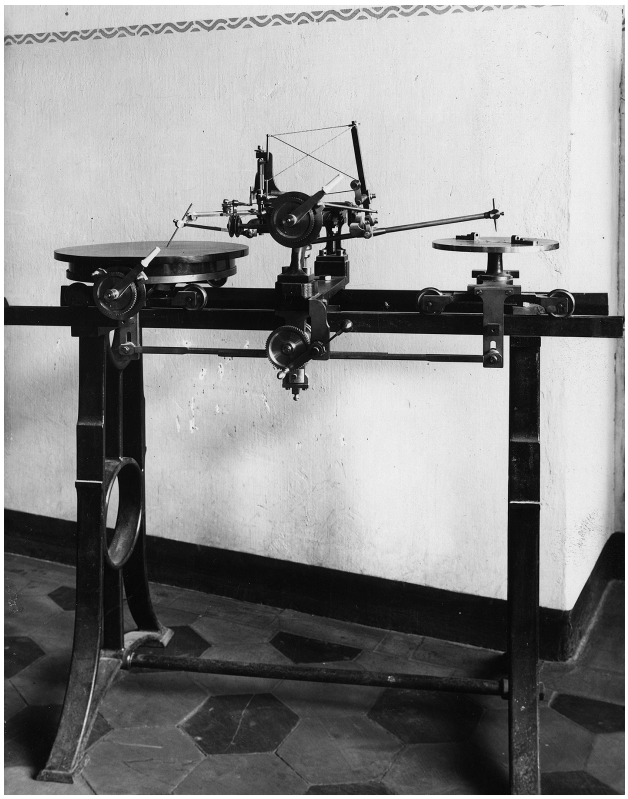


Figure 4. Wagner's engraving machine in Estonian State Central Archives in the 1930s. RA, EAA.R-271.1.1287.30

(1803–1875) developed his own version (Fig. 4).[37] Very little is known of Wagner's life. He seems to have made his first adaptations of Collas's method in 1834.[38] In 1836 he published his first successful prints[39], for which he was awarded a gold medal by the crown prince of Prussia.[40] The next year he was granted the title of *Hofmechanicus*.[41] A catalogue of the Berlin industrial exhibition of 1844 claims that he had already been developing the machine for 15 years and had by then exported 150 machines, large and small, to St Petersburg, Moscow, Kyiv, Warsaw, Prague, Stuttgart, Switzerland and Sweden; the prices of Wagner's machines depended on their size and ranged from 50 to 500 *Reichsthaler*, with the 150-*Thaler* model being the most sought after.[42] Wagner's prints were also praised by the Polytechnic Society in Berlin.[43] In 1860 the Swedish Royal Archivist Emil Hildebrand (1806–1884)[44] introduced Robert von Toll to Wagner's

37 Neues allgemeines Künstler-Lexicon. Bearb. v. G.K.Nagler. Bd 21. E.A. Fleischmann, München, 1851, 54.

38 A. Raczynski. Geschichte der neueren Deutschen Kunst. Aus dem Französischen übersetzt von F. H. von der Hagen. Bd III. Berlin, 1841, 418.

39 Abbildungen geschnittener Steine und Medaillen, ausgeführt durch F. G. Wagner d. jüngern. Steger, Berlin 1836.

40 Morgenblatt für gebildete Stände / Kunst-Blatt, Nr. 52, 30. Juni 1836, 220 (news from 25 May).

41 Allgemeine Preußische Staats-Zeitung, Nr. 96, 7. April 1837, 385: *Se. Majestät der König haben dem akademischen Künstler Friedrich Gottlieb Wagner jun. das Prädikat eines Hof-Mechanikus und Optikus beizulegen geehrt.*

42 Amtlicher Bericht über die allgemeine Deutsche Gewerbe-Ausstellung zu Berlin im Jahre 1844, zweiten Theils erste Abtheilung. Carl Reimarus, Berlin, 1846, 531–532.
A commemorative medal from this exhibition is preserved in the Kukruse collection: EAA.2069.3.598.

43 Bericht über die Verhältnisse und die Wirksamkeit der Polytechnischen Gesellschaft in Berlin, zweites Heft. (vom März 1841 bis Februar 1843). Moeser und Kühn, Berlin, 1846, 69.

44 On him see: E. Norberg. Emil Hildebrand. Langenskiöld, Stockholm, 2018.

engraving machine, and Toll subsequently travelled to Berlin to acquire one.[45]

The problem with this kind of image transfer was that the relatively soft wax seals were not suitable for the pointer of the engraving machine. Thus, a copy in a harder material was needed first. For this purpose, Toll prepared galvanoplastic (electrotype) positive images from his gutta-percha moulds (Fig. 5). In very many cases, both versions are still preserved in the Kukruse collection and can be matched through close study.[46] An example of a copper printing plate[47] and a test print have also been preserved.[48] Furthermore, evidence of experimentation with different materials, as well as failed attempts, can be found in the Kukruse collection.[49] Although the electrotype copies are hard, their use in the engraving machine has nevertheless left thin lines on their surfaces, which can be seen under magnification.[50]

From 1866 Toll suffered from deteriorating eyesight, and in 1876 he handed his work over to Johannes Sachssendahl (1851–1903),



Figure 5. Seal of the Master of the Teutonic Order, gutta-percha mould and galvanoplastic cast, Kukruse collection. RA, EAA.2069.3.13, 12



Figure 6. Seal of the Master of the Teutonic Order, printing plate engraved with Wagner's machine. Brieflade, Tafel F (fragment)

45 Sachssendahl, Vorwort, X.
46 For example RA, EAA.2069.3.13 gutta-percha, 12 galvanoplastic, 11 galvanoplastic on a metal base (Master of the Teutonic Order in Livonia); EAA.2069.3.116, 115 (Vogt of Karkus); EAA.2069.3.124, 123 (Vogt of Oberpalen); EAA.2069.3.126, 125 (Land Marschal).
47 RA, EAA.2069.3.34.
48 RA, EAA.2069.3.4.
49 RA, EAA.2069.3.4; EAA.2069.3.5, EAA.2069.3.32.
50 For example RA, EAA.2069.3.30.

who published the seals together with extensive descriptions in 1887 as the fourth volume of *Est- und Livländische Brieflade*, which remains the central publication on medieval Livonian seals to date. In the publication, however, only plates D, E and F, with 22 seal images in total, were produced using Wagner's machine (Fig. 6). The overall number of electrotype copies in the Kukruse collection is much larger; they simply have not been used in the engraving machine. The reason for abandoning this method was probably that the results remained less than satisfactory. Although the printed image was mathematically exact, it was difficult to read, and not all the details of such small objects were rendered visible. Wagner's machine seems to have seen little use in sigillography; nevertheless, it was widely employed, for example, in engraving banknote printing plates.[51]

The overwhelming majority of the plates in *Brieflade* once again rely on freehand drawing. Toll had started ordering lithographic images from the Tallinn lithographer F. W. Macdonald as early as 1857,[52] using both original seals and freehand drawings by Brotze, Körber and others.[53] On his journey to Berlin, Toll commissioned the seal carver Carl Julius Milde (1803–1875) in Lübeck to make him three plates (A, B, C), which were printed in Lübeck by H. G. Rahtgens.[54] In the course of editing the whole book, Sachssendahl based his descriptions of the seals, wherever possible, on the originals in various Tallinn archives and copies in the Kukruse collection. He was fully aware of the limitations of freehand drawings and regarded them as only general sketches; he appreciated the results of Wagner's machine but above all stressed the quality of Milde's work.[55]

Wagner's machine was still in the House of the Knighthood when the building was inventoried during the dissolution of the Noble Corporation in 1920.[56] When the collection was purchased for the State

51 A. Heinonen. Vom Zettel zum Geldschein: Deutsche Einflüsse auf das Design und den Druck von Banknoten im Großfürstentum Finnland. Suomen Pankki, Helsinki, 2024, 65.

52 He had his workshop in Tallinn between 1838 and 1861, see: H. Treumann. Kivitrükikodade ajaloost Eestis 1818–1958. – H. Treumann. Vanemast raamatukultuuriloost. Eesti Raamat, Tallinn, 1977, 92–102, here 94.

53 Sachssendahl, Vorwort, XII–XIII.

54 Sachssendahl, Vorwort, X.

55 Sachssendahl, Vorwort, XVI: *Die Siegelabbildungen müssen als gute Skizzen angesehen werden, da sie aus technischen Schwierigkeiten nicht mit der Treue angefertigt werden konnten, wie es an sich wünschenswerth gewesen wäre. Es ist daher in denselben eine genaue Wiedergabe der kleinen Trennungszeichen, Buchstabenformen, Perlenkreise und dergleichen mehr nicht zu erwarten*.

56 RA, EAA.854.1.475, on the ground floor in the dark room between the Archives and Library: *graweerimise masin, Hermann Tolli omandus* (Engraving machine, property of Hermann Toll). The inventory is not dated, but as it is in Estonian, it must have been compiled by the authorities of the newly established Republic of Estonia.

Archives in 1935, it also included the engraving machine.[57] Although hopes were expressed that the machine could be put into use,[58] these seem not to have been realised.[59] At some point during or shortly after World War II, the machine disappeared from the archives, most probably having been scrapped. In contrast, photographs of the galvanoplastic copies made by Toll remain popular as book illustrations. For example, in a recent treatment of medieval Livonian seals, five of the 16 illustrations depict galvanoplastic copies rather than originals.[60]

PHOTOGRAPHY AND BEYOND

At the time when Toll was putting much effort into making galvanoplastic copies and using them for engraving, another invention with a much brighter future began to be implemented: photography.[61] It took some time for photography, and especially the printing of photographs, to become sufficiently developed for use with small objects.[62] In Estonia, there is evidence from 1875 of the first photographs of archaeological objects in the Learned Estonian Society (*Gelehrte Estnische Gesellschaft*).[63] Although the collection of Eugen von Nottbeck in the National Archives contains early photographs of seals,[64] he does not appear to have used them in his publication on Tallinn seals in 1880. The images in his publication were drawn from the sealing-wax copies by the lithographer Hermann Viegelmann in Lübeck and printed by H. G. Rahtgens, just like some of Toll's plates.[65] Nevertheless, while textual descriptions remained paramount, by the end of the nineteenth century the use of photographs to present seals in catalogues had become established.[66]

57 It is not mentioned in the contract, but in the receipt (*akt*) RA, EAA.661.1.217, p. 149. A photograph was also taken at that time: EAA.R-271.1.1287.30. See also: Haruldasim Eesti eraarhiiv riigi keskarhiiwile. – Päevaleht. 30. Oct. 1935, 4.
58 RA, EAA.661.1.217, 154.
59 J. Lehtaru. Arhivaalide säilitamine Rahvusarhiivis läbi sajandi I. – Tuna 2020, 4, 60–81, here p. 72–73.
60 I. Leimus. Pitserid. – Eesti kunsti ajalugu 1 (1100–1520). Koost. toim. K. Markus. EKA, Tallinn, 2023, 447–455.
61 G. Batchen. Desiring Production. – Each Wild Idea: Writing, Photography, History. MIT Press, Cambridge, Mass., London, 2001, 3–24.
62 Fawcett, Plane Surfaces and Solid Bodies, 67–71.
63 T. Liibek. Fotograafiakultuur Eestis 1839–1895. Diss. Tallinna Ülikool, Tallinn, 2010, 231.
64 RA, EAA.2071.1.1889.
65 Nottbeck, Siegel aus dem Revaler Ratsarchiv, 7.
66 Katalog der Ausstellung zum X. Archäologischen Kongress in Riga 1896. W. F. Häcker, Riga, 1896, Tafel 32; Geschichte des Siegels der Stadt Dorpat. Aus dem Nachlass des weil. Stadtarchivar H. Lichtenstein; bearb. und hrsg. von A. Feuereisen. C. Mattiesen, Dorpat, 1907, Tafel 1–5.

Although much has happened since the invention of photography, most notably the shift from chemical to digital recording, the basic elements of the imaging chain (the subject, capturing device and display) have remained the same. Lighting conditions are crucial when capturing small three-dimensional seals made of wax whose colour is indistinct. It is the shadows that make the relief of the seal visible. As examples of high-quality images, the photographs of seals on parchment charters from the Tallinn City Archives taken in the early 1980s at the *Geheimes Staatsarchiv* in Berlin must be singled out (Fig. 7).[67] These charters were lent to Berlin by the Federal Archives of Germany (Koblenz), where part of the City Archives was deposited at that time.[68] A number of high-quality reproductions of the Teutonic Order's seals from this collection were also published in the exhibition catalogue commemorating the 800th anniversary of the Order in 1990.[69] The negatives made in Berlin and the catalogue compiled during this project by Ursula Benninghoven were given to the Tallinn City Archives in 2021. Another project, carried out by the Estonian National Archives and Tallinn City Archives at the Kanut conservation and digitisation centre between 2010 and 2012, aimed to digitise parchment charters.[70] As the focus was on the text of the charters and the light was directed more or less straight at the parchment, the images of seals came out not as clear as in the older Berlin photographs.[71]



Figure 7. Seal of the Master of the Teutonic Order, photograph from the 1980s. TLA.230.1-I.178

67 Available on the platform Digital Livonia. https://dl.tlu.ee/en/objects/Pitserid (accessed 28/08/2026).

68 L. Biewer. Pergamenturkunden des Stadtarchivs von Reval/Tallinn. Erinnerungen an eine unvollendete archivarische Arbeit und einige biographische Bemerkungen. – Archivalische Zeitschrift, 2022, 98, 331–351, here p. 346–347.

69 800 Jahre Deutscher Orden. Ausstellung des Germanischen Nationalmuseums Nürnberg in Zusammenarbeit mit der Internationalen Historischen Kommission zur Erforschung des Deutschen Ordens. Hrsg. von G. Bott, U. Arnold. Bertelsmann, Gütersloh, 1990, 380–383; 800 Jahre Deutscher Orden. Ausstellung des Germanischen Nationalmuseums 1990. Ergänzungen und Korrekturen. Zusammengestellt von I. von Andrian-Werbung. – Anzeiger des Germanischen Nationalmuseums 1992, 7–50, here p. 43.

70 https://www.ra.ee/apps/pargamendid (accessed 28/08/2026).

71 See also: Pitsereid Tallinna Linnaarhiivist = Siegel aus dem Tallinner Stadtarchiv = Seals from Tallinn City Archives. Koost. M. Habicht, J. Kreem, S. Feldberg. Tallinna Linnaarhiiv, Tallinn 2013.

One of the limitations of photographic images is that light can come from only one direction at a time to create shadows in an image. RTI (Reflectance Transformation Imaging) allows the user to change the apparent light direction as needed.[72] In preparation for the Digital Livonia project, RTI photography was undertaken in the Tallinn City Archives in 2020.[73] The effort put into this method of imaging pays off especially in the case of seals pressed through paper, which have traditionally been difficult to read or photograph. The quality of the original nevertheless remains crucial. In the case of clearly readable originals, RTI does not add much extra value; in the case of poor impressions, RTI may reveal details that the naked eye cannot easily register. There remain, however, cases where even RTI cannot reveal much new information. Photogrammetry and other forms of three-dimensional surface recording offer a complementary strategy by capturing the geometry of the object itself and allowing the relief to be examined independently of a single photographic viewpoint or lighting condition. Their implementation in Estonia lies in the future.

Internationally the digital turn in sigillography extends beyond the production of better images.[74] Recent projects combine computational imaging with structured data, standardised vocabularies and searchable digital corpora, enabling researchers not only to inspect individual seals but also to compare impressions across collections and repositories. The emerging field of digital sigillography thus shifts attention from the reproduction of single objects towards the integration of images, descriptions and contextual information.[75] This development also makes the quality of metadata increasingly important: large collections of digital images remain only partly useful for research if the objects cannot be reliably identified, described and linked to their documentary contexts.

72 For an overview of the RTI workflow, see: M. Schaeben, M. T. Catalano. Byzantine Sigillography and RTI: Insights from the DigiByzSeal Project in Cologne. – Digital Medievalist, 2024, 17. http://journals.openedition.org/digitalmedievalist/418 (accessed 28/08/2026).

73 RTI imaging was carried out by Hembo Pagi (Archeovision). https://archaeovision.eu/en (accessed 28/08/2026).

74 See e.g. M. Filosa, C. Neuefeind, C. Sode. Digital Approaches to Medieval Sigillography: An Introduction. – Digital Medievalist, 2025, 18.1, 1–16. https://doi.org/10.16995/dm.18559.

75 See e.g. J. McEwan. New Approaches to Old Questions: Digital Technology, Sigillography, and digisig. – Digital Medieval Studies: Practice and Preservation. Ed. by L. K. Morreale. Arc Humanities Press, Amsterdam, 2022, 33–48. For the DIGISIG project, see: https://www.digisig.org/ (accessed 14/09/2026).

CONCLUSION

The imaging of seals has been a continuous quest for authenticity and precision of representation. Throughout history, different technologies have been applied, but while some have been quickly abandoned, others have remained in use alongside newer ones. Dissatisfied with the arbitrariness of freehand drawing, Robert von Toll introduced Wagner's engraving machine into Livonian sigillography in the 1860s. The results were not entirely satisfactory, and freehand drawing retained its position. Photography has enabled better documentation, but freehand drawing has continued to play a role in seal depictions because the material of seals is difficult to capture and reproduce in a clearly readable image. Digital imaging techniques such as RTI have increased the possibilities for examining and representing poorly preserved seal impressions, while searchable databases and structured metadata have begun to transform the ways in which larger bodies of sigillographic evidence can be compared and analysed.

Sigillography has not been a very active research field within the study of medieval Livonia. The Toll–Sachssendahl *Brieflade* volume remains the central reference work, despite the fact that most of its plates feature freehand drawings. Although the number and quality of available images have increased tremendously in the meantime, the development of metadata for these images has lagged behind. Catching up with metadata would be a major challenge for the future.

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KESKAEGSE LIIVIMAA PITSERITE KUJUTAMINE: TEHNIKA JA TEHNOLOOGIA SIGILLOGRAAFIA AJALOOS

Juhan Kreem

Pitserite sõnalise kirjeldamise kõrval on sigillograafias alati olnud tähtis ka pitserite pildiline edasiandmine. Vaba käega tehtud pitserjoonistusi leidub hulgaliselt juba esimeste suurte Balti antikvaaride, Joachim Christoph Brotze ja Eduard Philipp Körberi kogudes. Ülesjoonistamise kõrval valmistati pitseritest koopiaid ka originaalist vormi võtmise teel. Suurimad teened selles on parun Robert von Tollil, Kukruse isandal, kelle *gutta-percha* vormide kogu on tänapäeval hoiul Rahvusarhiivis. Teine suur pitserite koguja, tallinlane Eugen von Nottbeck, kasutas vormi võtmiseks peenleiva ja talgi segu ning ei soovitanud *gutta-percha*'t ega kipsi, sest need kahjustavad liialt originaale. Võetud vormi järgi sai pitserist teha kas kipsivalandi või pressida kujutis pitserilaki sisse.

Et reljeefsete pitserite kujutisi tasasele paberile trükkida, võttis Robert von Toll 1860. aastatel kasutusele Wagneri graveerimismasina. Kuna graveerimismasin nõudis tugevast materjalist originaali, valmistas Toll *gutta-percha* negatiivis vormidest galvaanoplastilised positiivid. Rahvusarhiivi pitserite lähemal vaatlemisel on võimalik ka tänapäeval kokku viia samale pitserile tagasiviidav vorm ja galvanoplastika. Kukruse kogus on säilinud ka mõned prooviplaadid ja mõned praakeksemplarid galvanoplastikast. „Est- und Livländische Brieflade" neljandas köites ilmunud tahvlitest on siiski vaid kolm valmistatud Wagneri koopiamasina abil. Tulemus annab pitseri suuruse ja kujutise edasi küll täpselt, kuid ebapiisava detailsusega, mistõttu on arusaadav, et masina kasutamisest edaspidi loobuti.

Enamik Tolli avaldatud pitseritest on vabakäejoonistused, mida ei tule võtta enama kui skemaatilise kujutisena. Vaid Lübeckis Carl Julius Milde poolt tehtud kujutised kolmel pilditahvlil vastavad originaalile paremini. Ümberjoonistamine jäi uute tehnoloogiate kõrval konkurentsivõimeliseks pitseri kujutamise viisiks ka 20. sajandil, mõnikord kohtab selliseid kujutisi ka päris viimase aja publikatsioonides. Joonistuste põhiprobleemiks jääb, et miski ei garanteeri nende sarnasust originaaliga.

19. sajandi lõpul võimaldas fotograafia areng teha pitseritest juba päris kvaliteetseid ülesvõtteid ja pitserite fotod hakkasid ilmuma

kataloogides, kuigi pitseri sõnaline kirjeldus püsis endiselt kesksena. Kvaliteetse pitseriülesvõtte saamisel on otsustav valgus, mille oskuslikust kasutamisest on hea näide Berliinist, kus 1980. aastate alguses pildistati üles Tallinna Linnaarhiivi pitserid. Tulemus on kohati kvaliteetsem kui 2010–2012 pärgamentürikute digiteerimise käigus Tallinnas tehtud ülesvõtted. Digiteerimise tulemusel on sündinud ulatuslikud pildipangad, milles metaandmed on jäänud kahjuks vaeslapse ossa. Liivimaa sigillograafia keskseks käsiraamatuks jääb ka täna Robert von Tolli ja Johannes Sachssendahli publikatsioon 1887. aastast.