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Necessary, not sufficient:

The circulation of knowledge about stained glass

in the northern Netherlands, 1650–1821[1]

Abstract (150 words)

The craft of making stained glass all but disappeared from the northern Netherlands in the long eighteenth century, but craft knowledge continued to circulate in texts and rare attempts at revival. This paper studies the role of artisans, natural historians and apothecaries and their use of texts in attempts to maintain and revive the knowledge of and techniques for the production of stained glass in the northern Netherlands between 1650 and 1821. I argue that their efforts contributed to the preservation of existing stained glass, and raised awareness about the cultural and historical value of stained glass and the knowledge and skills required to produce it. Although much tacit, practical knowledge was lost, basic technical knowledge circulated in a small number of texts. Combined with preserved stained glass, these texts served as the basis for reconstructive experiments that would lead to a revival of the art in the nineteenth century.

Key words: stained glass, circulation of knowledge, Netherlands

Main text

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Glass in the early modern period was made and used by hybrid experts: it was used widely for utensils and optic aids, in architecture, furniture, scientific instruments, anatomy, and for decorative art works ranging from stained glass windows to coloured mezzotints, artificial gems and ornamental glasses.[2] The production of glass was rooted in knowledge of materials and techniques covering a variety of fields, such as natural history, alchemy and optics. In the past decade, significant work has been done on the history of optics, microscopy and luxury glass.[3] The transmutation of source ingredients into glass through fire had been understood as an alchemical process for millennia. Therefore Beretta and Von Kerssenbrock-Krosig have paid attention to the role of alchemy in the development of glass before the eighteenth century in recent work.[4] Yet the production of stained glass, a flourishing trade in Western Europe in the early modern period and its decline in the eighteenth century have received relatively little

[2] I refrain from describing (stained) glass as a boundary object here, as the deviser of the term, Susan Leigh Star, has recently argued that it is frequently misused, focusing exclusively on the interpretative flexibility of objects while ignoring the structure of informatics and work process needs and arrangements, and the dynamic between ill structured and more tailored uses of the objects which were inextricable parts of the original framework describing of boundary objects. As the production of stained glass in the eighteenth century did not take place within the kind of organizational structure Star had in mind, the concept seems to have little value here. Susan Leigh Star, "This Is Not a Boundary Object: Reflections on the Origin of a Concept," *Science, Technology, & Human Values*, 2010, *35*:601–17.

[3] See i.e. Jutta Schickore, *The Microscope and the Eye: A History of Reflections, 1740-1870,* (Chicago: The University of Chicago Press, 2007), Sven Dupré, "Trading Luxury Glass, Picturing Collections and Consuming Objects of Knowledge in Early Seventeenth-Century Antwerp," *Intellectual History Review,* 2010, *20*, no. 1:53–78.

[4] Marco Beretta, *The Alchemy of Glass : Counterfeit, Imitation, and Transmutation in Ancient Glassmaking* (Sagamore Beach: Science History Publications, 2009), pp. 84, 96. Dedo von Kerssenbrock-Krosigk, "Introduction," *Glass of the Alchemists : Lead Crystal-Gold Ruby, 1650-1750*, (Corning, NY: Corning Museum of glass, 2008), p. 12.

attention in this context.

Stained glass windows were still produced in considerable numbers in the seventeenth-century northern Netherlands, but changing fashions and socio-economic development meant that by 1800, hardly any glass painting workshops were left, while a new glass industry was developing in Leerdam.[5] In the eighteenth century, because of the ready availability of cheap foreign glass, the overall production of glass in the Netherlands dwindled and the quality was so meagre that governments set import restrictions to protect local glassmakers.[6] Other factors played a part too in the diminishing production of glass paints and stained glass. Gemstones and imitations made from coloured glass, once routinely included in medical prescriptions for wealthy patients, increasingly fell out of favour with physicians and apothecaries.[7] Moreover, changing fashions saw a sharp decline in the demand for stained glass windows, in churches as well as public buildings and houses.[8]

The declining production and circulation of stained glass in the eighteenth-century northern Netherlands has been studied, but primarily from an art historical perspective.[9] However, almost continuously a variety of people made attempts to preserve this knowledge.

[5] The Leerdam glass industry mainly produced crockery and packaging glass. See Teunis Blom, *Van Pilgram Tot Jeekel: De Leerdamse Glasindustrie in de 18e En 19e Eeuw*, (Leerdam: Historische Vereniging Vrienden van Oud Leerdam, 2009).

[6] *Publicatie... het verval en de groote vermindering der glasfabricquen binnen deese provincien*, ('s Gravenhage: Isaac Scheltus, 1769).

[7] Marieke M.A. Hendriksen, "Researched and ridiculed? Gemstones in 18th-century Dutch medicine, chemistry and pharmacy," in *Gems in Transit*, edited by Michael Bycroft & Sven Dupré (forthcoming).

[8] Joost Caen, *The Production of Stained Glass in the County of Flanders and the Duchy of Brabant from the XVth to the XVIIIth Centuries: Materials and Techniques*, (Antwerpen: Brepols, 2009), p. 29.

[9] Ibidem, Zsuzsanna van Ruyven-Zeman, *Stained Glass in the Netherlands before 1795,* 2 vols., Vol. 1: The North. (Amsterdam: Amsterdam University Press, 2011).

These people and institutions, who receive little attention in the art historical approach, such as apothecaries, university professors and learned societies, played a role in the circulation and preservation of the knowledge and practices of a disappearing art. Remarkably, they seem not to have formed a network, but to have operated largely independently. This paper therefore focuses on their role in attempts to maintain and revive the knowledge of, and techniques and facilities for the production of stained glass in the northern Netherlands between 1650 and 1821. I argue that although their efforts could not prevent the almost complete disappearance of the production of stained glass in the Netherlands, they did contribute to the preservation of existing stained glass, and raised awareness about the cultural and historical value of stained glass and the knowledge and skills required to produce it. While this suggests a significant overlap in categories such as chemist, artist, and artisan, it raises the question how knowledge about making stained glass circulated both among these practitioners and over time, if at all.[10]

The circulation of knowledge has become a central paradigm in science and technology studies and the history of science alike over the past decade.[11] This paradigm has been developed in very different directions, and the focus of studies varies widely: some mainly study human actors or institutions, space and location, others focus on the circulation and reception of texts, taking a hermeneutic perspective, while historians of art and science in

[10] Also see Simon Werrett, "Green is the Colour," *Ambix*, 2013, *60*, nr. 2: 122-138.

[11] See i.e. Lit Verlag's *The Circulation of Material Objects of Knowledge in the Early Modern Low Countries* series, Bernard Lightman et al (eds.), *The Circulation of Knowledge Between Britain, India and China: the Early-Modern World to the Twentieth Century*, (Leiden: Brill, 2013), Marion Eggert (ed.), *Space and Location in the Circulation of Knowledge (1400-1800): Korea and Beyond*, (Frankfurt: Peter Lang GmbH, 2014).

particular target material hermeneutics.[12] It has become increasingly clear that it is nigh impossible to discuss the circulation of knowledge through material objects without discussing human actors and immaterial objects of knowledge like concepts and theories mediated in texts and drawings. Of course it can be argued that the latter are material objects of knowledge too, yet their immaterial content appears to be as important as the material carriers in many cases.[13] I argue that in the case of stained glass making in the long eighteenth century, although much tacit, practical knowledge was lost, basic technical knowledge circulated in a small number of texts. Combined with preserved samples of stained glass, these served as the basis for reconstructive experiments that would eventually form the basis for a revival of the art in the nineteenth century.

In order to gain a better understanding of how the knowledge about and skills needed for making coloured glass, and particularly stained glass windows, were preserved in the northern Netherlands between roughly 1650 and 1800, I will first sketch the practice of and discourse on making stained glass before ca. 1700, before analysing the quickly changing situation in the eighteenth century. Finally, I will highlight two cases of eighteenth- and one

[12] Leandro Rodriguez Medina, "Conceptualizing Knowledge Circulation: Methods and Theories," in *The circulation of European knowledge: Niklas Luhmann in the hispanic Americas*, (Basingstoke: Palgrave Pivot, 2014), 6-28: pp. 13-16.

[13] David N. Livingstone, "Science, Text and Space: Thoughts on the Geography of Reading," *Transactions of the Institute of British Geographers*, New Series, (2005), *30*, 391–401: p. 391. Mária Luz López Terrada, "Flora and the Habsburgs Crown: Clusius, Spain, and American Natural History," in *Silent Messengers. The Circulation of Material Objects of Knowledge in the Early Modern Low Countries*, edited by Sven Dupré and Cristoph Lüthy, (Berlin: Lit. Verlag, 2011), 43-68. Henrike Haug, "Artificial Interventions in the Natural Form of Things: Shared Metallogenetical Concepts of Goldsmiths and Alchemists," in *Laboratories of Art : Alchemy and Art Technology from Antiquity to the 18th Century*, edied by Sven Dupré, (Cham [u.a.]: Springer, 2014), 79–104.

of early nineteenth-century artisans and apothecaries who actively tried to preserve or revive the practices and knowledge of making stained glass in different ways, before reaching some conclusions.

Documenting technical knowledge?

In the sixteenth and seventeenth centuries, the Netherlands were the main production centre of stained glass windows. Church windows, even in reformed churches, were routinely decorated with stained glass depictions of biblical scenes. In the northern Netherlands, these were often combined with commemorative windows with inscriptions and the coats of arms of donors. [Fig. 1 & 2] This was not, as thought by many foreign visitors at the time, a sign of religious tolerance, but a practice that contributed to the shaping of an urban identity. Stained glass windows depicted not only biblical scenes, but also the coat of arms of the donating town or province, and the order in which they were arranged within the church building reflected a political and economical hierarchy.[14] Moreover, as glass became more readily available in the course of the sixteenth century because of improved production techniques and the availability of coal instead of increasingly scarce wood to fire glass ovens, stained glass or small stained glass elements such as roundels with coats of arms were increasingly applied in the windows of homes and workshops, a decorative element that simultaneously told passers by something about the social status and profession of the owner.[15]

The stained and leaded glass seen in the Low countries from the sixteenth century

[14] Andrew Spicer, "'So Many Painted Jezebels' : Stained Glass Windows and the Formation of an Urban Identity in the Dutch Republic," in *Public Opinion and Changing Identities in the Early Modern Netherlands*, edited by Judith Pollmann and Andrew Spicer, (Leiden: Brill, 2007), 249–77, pp. 274-7.

[15] Van Ruyven-Zeman, *Stained Glass in the Netherlands,* (cit. note 9), p. 18, Caen, *The Production of Stained Glass*, (cit. note 8), pp. 226-9, 239.

onwards was generally made by tracing a paper design (a cartoon or vidimus) onto a slightly coloured sheet of glass, which was cut into panes and subsequently painted with coloured paints in several layers, after which the glass would be fired in an oven in one go, causing the paints to vitrify, or melt into the glass. That the sheet glass was slightly coloured was mainly unintentional; the greenish, yellowish or greyish hue was caused by small amounts of sulphur, manganese, or iron in various states of oxidation. Although it remains unclear how the activities of producing sheet glass, transferring a design, cutting the glass, painting, firing and leading were organized exactly, it is clear that many workshops bought sheet glass and also produced designs from other artists.[16] It is not unlikely that the various stages of production were divided over several specialist artisans in the bigger workshops, but in smaller workshops a single person must have managed them all. Another technique, less commonly used by the seventeenth century, consisted of the so-called *peinture en mosaique*, in which pieces of coloured glass were cut, shaded, and leaded together to create a mosaic-like window of coloured glass. The reasons that these windows were less common than the previously described *peinture en apret* stained glass windows by the seventeenth century were both a decline in production of coloured (pot-melt or flashed) glass because of heightened import taxes on coloured glass, and a greater demand for clear glass.[17]

Stained glass windows were mostly produced in specialist workshops, often run by a family.[18] The production of high-quality stained glass involves much specialist knowledge about the composition and cutting of glass, the composition of glass paints and their

[16] Caen, *The Production of Stained Glass*, (cit. note 8), p. 223, 230, 264. For a detailed study of various glass and vitreous paint production techniques see Ibidem, Part 4, "Integrated perspectives on materials and techniques," pp. 201-314.

[17] Ibidem, p. 231-2.

[18] Van Ruyven-Zeman, *Stained Glass in the Netherlands,* (cit. note 9), p. 28-29, 53-55.

application, the firing of the painted glass and leading. Although this knowledge is partly tacit and was often passed on orally within the workshop from one generation to the next, some of it was recorded in writing. Historian of stained glass Joost Caen has traced both guild guidelines for and technical manuscripts on the production of stained glass from the Netherlands from the fifteenth to the seventeenth century.[19] The guild documents did generally not specify techniques, but rather gave general guidelines that had to ensure a high-quality product – as Caen points out, guilds were not so much concerned with safeguarding their trade against new labour-threatening technologies or the safekeeping of secret techniques or recipes as with guaranteeing the quality and durability of their products.[20]

The technical manuscripts on making stained glass that remain today, Caen has argued, were produced by copyists who probably had no contact with the craft. These manuscripts were often a desired commodity of 'written knowledge' for wealthy patrons. Towards the eighteenth century manuscripts on making stained glass become more accurate, but these were still often partly copied from older recipes. Historians of stained glass therefore have serious doubts about the feasibility of many of the manuscript recipes and about the actual involvement of their authors in the production of stained glass, glass or glass paint.[21]

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[19] Joost Caen, B. De Munck, and V. De Laet. "Technical Prescriptions and Regulations for Craftsmen in the Southern Netherlands during the Sixteenth, Seventeenth and Eighteenth Centuries. A Confrontation of Archival and Material-Technical Information Regarding Glazing and Stained-Glass Windows," *Verre et Fenetre de L'antiquite Au XVIIIe Siecle*, 2005: http://www.verre-histoire.org/colloques/verrefenetre/pages/p404_01_caen.html, (accessed 14 Sept. 2015), Caen, *The Production of Stained Glass*, (cit. note 8), p. 236.

[20] Ibidem.

[21] Ibidem, 39.

Yet even if the author in question appears to be reliable and knowledgeable, there are other factors that complicate the reproduction of recipes, such as the difficulty of capturing makers' knowledge in text, and serendipity.[22] This, for example, is the recipe Kunckel gave in 1689 for making stained red glass:

To burn red on glass.

Take Crocum Martis, or rust from old iron and yellow-red Vitrum Antimonii, also yellow lead glass/ the same amount of everything; and a little of an old coin/ which you must burn and calcinate with sulfur; grate and mix everything together very finely/ and so/ that when you put it between your teeth/ it no longer grinds/ then it is right; draw with it on glass to your liking/ and burn it / and you will have a beautiful red.[23]

Crocus martis is calcined copperas or vitriol (iron sulphate); vitrum antimonii is a brittle reddish glass-like substance made from antimony that was also used as an emetic medicine.[24]

[22] Pamela H. Smith and Tonny Beentjes, "Nature and Art: Making and Knowing: Reconstructing Sixteenth-Century Life-Casting Techniques," *Renaissance Quarterly*, 2010, *63*:128–79, p. 130.

[23] "Roth auff Glas zu brennen. Nimm Crocum Martis, oder Roſt von alten Eyſen und gelbrothes Vitrum Antimonii, auch gelbes Bleyglas/ iedes gleich viel; und ein wenig alte Müntz/ welche du mit Schwefel brennen und calciniren muſt; reibe es alles zuſammen untereinander auffs kleinſte/ und alſo/ daß wan man es unter die Zähne nimmt/ es nicht mehr knirſche/ ſo iſt es recht; mahle damit nach Gefallen auff Glas/ und brenne es/ ſo wirſt du ſchön Roth haben." Johann Kunckel, *Ars Vitraria Experimentalis*, (Frankfurt & Leipzig: Chr. Riegel, 1689), p.19: XLIV.

[24] Marieke M.A. Hendriksen, 'Strange Glass: Vitrium Antimonii', *The Medicine Chest*, 2014: https://themedicinechest.wordpress.com/2014/11/26/strange-glass-vitrium-antimonii/, (accessed 14 Sept. 2015). Vitrium Antimonii is the glassy phase of antimony oxide; although the substance is described as 'glass-like' in many sources it is something very different than silica window glass, i.e. it is very brittle and can never be clear.

Other recipes for red stained glass also mention ingredients like litharge, gum Arabic, shells, red chalk, borax and arsenic, copper and brass in various proportions. In order to find out which ones give the desired result and which ones do not, one would have to test them all – a rather arduous task given the ingredients. Yet it would be necessary to try and reproduce some of these old recipes, as they are so complicated that only reproduction can give insight in their accuracy. This clearly shows from the work Lawrence Principe has done on antimonial glass, which proves that the bright red glass-like substance described in chymical handbooks can be produced from antimony ore, but that the result depends on the composition of the ore, as there are many chemical variations of glassy antimony. Within the parameters of the recipe Principe reproduced, the glassy phase only emerged with the addition of small amounts of quartz—

a fact unknown to early modern artisans.[25] Kunckel himself was an experienced maker of glass paints and coloured glass, but a historical sample of antimonial glass suggests that many chymists were not aware of this, and instead of with a bright red substances ended up with something murky grey.[26] [Fig. 3][27] It is not clear whether Kunckel's recipe for red glass paint containing glassy antimony oxide was ever really used for creating stained glass, but it is clear that using grey glassy antimony oxide to create red glass paint may give very different results than the red variety, and something similar probably goes for many other ingredients.

Notwithstanding the doubts regarding the usefulness and reproducibility of stained and coloured glass recipes, the increasing availability of manuscripts and later printed works on making stained and coloured glass suggests an increasing intellectual interest in these

[25] Lawrence M. Principe, *The Secrets of Alchemy*, (Chicago: University of Chicago Press, 2012), p. 90, 142-3.

[26] Von Kerssenbrock-Krosigk, *Glass of the Alchemists*, (cit. note 4), pp. 16-19.

[27] http://www.provinz.bz.it/katalog-kulturgueter/de/neu-erfasste-objekte.asp?kks_priref=80004236, (accessed 14 Sept. 2015).

practices that forms a sharp contrast with the quickly declining production in the Netherlands. We need to see these publications in the context of developments in the glass industry, society and universities.

The first author to publish a printed tractate on making coloured and stained glass in Dutch was Simon Witgeest (a pseudonym), who included a summarizing translation of Antonio Neri's 1612 *De Arte Vitraria* in his 1679 *New Theatre of Arts*, a book that is part of the early modern genre of books of secrets.[28] Judging by a 1668 Amsterdam reprint of Neri's book, there was a market for a Latin edition in the Netherlands too.[29] However, Witgeest apparently felt a Dutch translation was a valuable addition to his book. Apart from the section on glass, his book contained tricks, and sections on painting, drawing, etching, making fireworks, and cures. Given the complicated nature of the recipes for glass painting, these will only have been feasible for those with a lot of time, space and money. Whereas earlier books of secrets were tied to notions of religious esotericism and magical arcana, for enterprising editors and printers, 'secrets' became a commodity: marketable instructions for producing particular effects.[30] In this light, it is no surprise that in the subsequent editions that appeared in Dutch and German throughout the seventeenth and eighteenth century, the sections on glass, drawing and etching were deleted and replaced with more magic tricks, practical jokes,

[28] Simon Witgeest, *Het Nieuw Toneel Der Konsten* (Amsterdam: Jan ten Hoorn, 1679), Antonio Neri, *L'arte Vetraria Distinta in Libri Sette, Nequali Si Scoprono Effetti Maravigliosi et Insegnano Segreti Bellissimi Del Vetro Nel Fuoco et Altre Cose Curiose,* (Firenze: Giunti, 1612). On books of secrets see a.o. Allison Kavey, *Books of Secrets : Natural Philosophy in England, 1550-1600* (Urbana: University of Illinois Press, 2007).

[29] Antonio Neri and Christopher Meret, *Antoni Neri Florentini, De Arte Vitraria Libri Septem, : & in Eosdem Christoph. Merretti ... Observationes & Notæ* (Amsterdam: Andreas Frisius, 1668).

[30] William Eamon, *Science and the Secrets of Nature : Books of Secrets in Medieval and Early Modern Culture* (Princeton, NJ: Princeton University Press, 1994), p. 82, 176-7.

and entertainment with mathematical and astronomical brainteasers, as well as small chemical and physics experiments.

Yet even if one of the buyers of the first edition would have wanted to use the book to try and make stained glass, it would have been quite a challenge. Witgeest did not distinguish clearly between transparent glass paints and pigments to stain entire batches of glass, and to complicate things even further, Witgeest omitted the instructions supplied by Neri for the application of enamel glass paints and the firing them. Meanwhile, in the course of the seventeenth century, the abundant production of stained glass started to change in the Netherlands. While regents and noblemenin the northern Netherlands in the first half of the seventeenth century would donate a commemorative stained glass window to the local church and successful citizens and craftsmen would have some form of stained glass in their home, by the mid-seventeenth century, this started to change. Clear glass windows became fashionable, even in churches, especially with the invention of the sash window in the late seventeenth century.[31]

In the first half of the eighteenth century, the production of stained glass windows al but disappeared from the province of Holland and moved to the northern provinces of Friesland, Groningen, and Drenthe. By the mid-eighteenth century, the northern provinces were virtually the only ones where stained glass was still produced on a regular basis, albeit on a small scale.[32] As stained glass became increasingly unfashionable, authors from the fields of art and chemistry tried to preserve knowledge about making stained glass in writing, which can partly

[31] Van Ruyven-Zeman, *Stained Glass in the Netherlands,* (cit. note 9), pp. 1-20.

[32] Ibidem.

be explained by the rise of the new encyclopaedic ideal.[33] Some of them were academics - academically trained apothecaries or even professors of chemistry - yet most were apothecaries and artisans who wrote in the vernacular. It is no coincidence that authors of books on making coloured and stained glass were predominantly artisans and apothecaries, as apothecaries often sold pigments and prepared paints and inks, and the two groups had long been intimately connected through a mutual interest in nature and alchemical knowledge.[34]

The quality and detail of the works on stained glass that appeared in the Netherlands in the eighteenth century varied wildly. Some were extremely detailed and would have made a good starting point or book of reference for an informed reader with access to materials and an oven or laboratory, whereas others were so brief and general that they clearly cannot have been of much use for anyone wanting to try making stained glass – informed or not. However, that was not the aim of all authors either. The first new work with a section on stained glass to appear in the Netherlands after the seventeenth-century recipes that Witgeest drew from Neri's work was Boerhaave's 1732 *Elementa Chemiae*. This chemical handbook in Latin advocated the academic study of chemistry –i.e. performing chemical experiments to gain a

[33] Caen, *The Production of Stained Glass* (cit. note 8), p. 82. As Ann M. Blair has pointed out, before the eighteenth century, the term "encyclopedia", coined in the early sixteenth century, designated the philosophical ideal of the interconnection between the disciplines. Ann M. Blair, *Too Much to Know. Managing Scholarly Information before the Modern Age,* (New Haven, CT: Yale University Press, 2010), pp. 168-9. Only in the eighteenth century it came to reflect the ideal of the encyclopaedia as seen with Diderot and d'Alembert, namely a combination of a concise summation of all theoretical knowledge and a practical manual of concrete 'how-to-do-it' advice of use to every worker in his shop. Paul F. Johnson, "Encyclopaedists," in *The Oxford Companion to Philosophy*, edited by Ted Honderich, (Oxford: Oxford University Press, 2005), p. 245.

[34] Patrick Wallis, "Consumption, Retailing and Medicine in Early Modern London," *The Economic History Review*, 2008, *61*:26–53, p. 36. Paula de Vos, "Apothecaries, Artists, and Artisans: Early Industrial Material Culture in the Biological Old Regime," *Journal of Interdisciplinary History*, 2015, *45*: 277–336.

thorough understanding of the properties of substances, rather than that it was intended at practical applications or as an artist's manual. Boerhaave discussed glass more generally and listed works by Neri, Merret, and Agricola as the most important books on the subject.[35] About the production of stained glass, Boerhaave noted:

There is [also] a [third] kind of painting [glass], which represents things on glass in the most beautiful yet transparent colours: the wonders of this art we see in great perfection in the windows of a church at Gauda [sic] in Holland; which no modern performance can come up to. By means of this art they lay colours on the surface of glass, which being baked by force of fire, their former lustre improved, and their substance diffused to a perfect transparency, penetrates the body of the glass, yet without passing a hair's breadth beyond their assigned limits, or blending with the adjacent ones. I scarce know of any thing more curious and beautiful, or that contributes more to the ornament of churches, halls, and other buildings. The recovery of this art, now almost lost, is hardly to be expected, except **from some chemist** who should apply the discoveries of his art to this use.[36]

However heartfelt this call to recover the art of making stained glass sounds, Boerhaave did not attempt to contribute to the cause by discussing recipes and techniques for making stained glass in detail, noting only that stained glass is made "by smearing the[m] [rich tinctures of

[35] Herman Boerhaave, "Part III, Containing the Processes, or the Operations of the Art, section III. Chemical Operations upon Minerals," in *A New Method of Chemistry,* 2 vols., Vol. II, (London: T. Longman, 1741), p. 184. This is a translation of Herman Boerhaave, *Elementa Chemiae*, (Leiden: Isaac Severinus, 1732). Unlike Neri and Agricola, Merret was a physician and librarian with no direct knowledge of glassmaking. His only connection was the translation of Neri into English at the behest of Robert Boyle, yet his academic standing made him a reliable source for Boerhaave.

[36] Ibidem, 180.

metals] on the surface of the glass, and making them penetrate by fire, if the ancient art should ever be restored."[37]

Boerhaave's interest in the role of metals in glass production surfaces again in one of the many chemical processes he described: the creation of 'The glass of Lead,' a concoction of red-lead (a lead oxide now known as minium) and sand, optionally combined with nitre and sea salt to speed up the vitrification process. As Kerssenbrock-Krosigk and Brain have pointed out, early modern glassmakers were interested in lead glass because it made a clear, faultless crystal, but alchemists were interested in another kind of lead glass, a brittle substance with a very high lead content, also known as *vitrum saturni*, because they thought it useful in distinguishing base and pure metals.[38] It is indeed the latter form of lead glass Boerhaave was discussing; he spoke of "...a brittle, yellow, transparent, inodorous, insipid mass (...) that proves hard in the cold, and melts in the fire, passes through all known vessels, as water thro' a sponge, and converts almost all bodies into glass, with itself in fusion, carrying them thro' the pores of the vessels, except gold and silver."[39]He concluded the discussion of lead glass by noting its usefulness in assaying and thus in 'civil affairs' without referring to the use of lead glass in making crystal.[40]

Judging by this discussion of stained and coloured glass, it clearly was not the aim of Boerhaave's work to instruct on making stained and coloured glass, but on chemistry in general. His chemistry was a philosophical system illustrated with practical descriptions of the most important chemical processes, aimed primarily at physiological and pharmaceutical applications, rather than an encyclopaedic technical manual. We can only guess at

[37] Ibidem, 186.

[38] Von Kerssenbrock-Krosigk, *Glass of the Alchemists*, (cit. note 4), p. 19, 120.

[39] Boerhaave, *A New Method of Chemistry,* (cit. note 35), p. 292.

[40] Ibidem, p. 293.

Boerhaave's motives for the aesthetic admiration expressed for the Gouda windows in his otherwise rather technical book, but possible explanations include his devoutness and his lack of a frame of reference - despite his fame, he himself never travelled further than Harderwijk, a mere eighty kilometres from Leiden.[41] Another motive may have been the desire to preserve or even revive heritage in the face of a declining empire. Boerhaave may have felt like he was crying in the wilderness with his call to practically oriented chemists though, given the increasing unpopularity of stained glass windows.

This hypothesis is supported by a manuscript written by the Dutch engineer Adriaan Bommenee around roughly the same time as Boerhaave's book. In it, stained glass windows are discussed as a sixteenth- and seventeenth-century phenomenon, which although it could be beautiful, was vulnerable and often of low quality. Even about Boerhaave's beloved Gouda windows, Bommenee remarks that although their colours are splendid, they are painted stiffly and the clothing appears to him not to be painted upon the windows, but made from coloured glass.[42] This remark confirms that by the eighteenth century, the *peinture en mosaique* method was regarded as old fashioned and less sophisticated than *peinture en apret* windows.

In the decades after Boerhaave's remarks, at least two artist handbooks including sections on making coloured and stained glass were published or republished in French, and one in English, but although the French works were translated into German and one even into Spanish, only one book saw a Dutch translation.[43] The Dutch edition of Florentyn le Comte's

[41] Rina Knoeff, *Herman Boerhaave (1668-1738): Calvinist Chemist and Physician* (Amsterdam: Edita, 2002), p. 18.

[42] MS Leiden University Library, BPL 3481, Adriaan Bommenee, *Testament*, folio 197-8.

[43] Florent le Comte, *Cabinet des singularitez d'architecture, peinture, sculpture et graveurs*, (Paris : Nic. Le Clerc, 1699), was translated a.o. as *Historische Und Technologische Nachricht von Der Kunst Auf Glas Zu Malen / Aus Herrn Florent Le Comte Cabinet Des Singularitez d'Architecture*, (Berlin, 1763).

1699 artist handbook, including a section on glass painting, first appeared in Utrecht in 1745, and was reprinted in Dordrecht 1761.[44] The French guide by the Parisian glass painter Pierre le Vieil (1708-1772) originally published posthumously in 1774 gives recipes that are quite different from those in other books, and his is the most detailed of these books.[45] This suggests that there were more families and workshops that had their own distinct recipes for making stained glass. Le Vieil states that he is not interested in glassblowing techniques, and that "we will avoid any speculative or philosophical research," focussing on the practical techniques of making coloured glass.[46] Although some of these books, especially Le Vieil's work, seem to have been reliable resources for glass painters, it remains unclear whether anyone in the Netherlands actually used them in their attempts to revive the art of making stained glass.[47]

The same goes for the only other two works including sections on making stained glass that appeared in Dutch in the eighteenth century. Albertus Frese (1714-1788) published a small manual on various methods of colouring and painting glass, including stained glass in 1780. Once more, the Gouda windows are the main point of reference for the author, and the

[44] Florent le Comte, *Het konst-cabinet der bouw-, schilder-, beeldhouw- en graveerkunde, of, Inleiding tot de kennis dier fraaije weetenschappen, vervat in de schilderyen, stand-beelden en prenten : behelzende, behalven een beknopte leevensbeschryving der aloude schilders en beeldhouwers ... bennevens de catalogi hunner werken : verrykt met een verhandeling over het glas-schilderen, een vertoog over het etzen, en wat tot het leeren en oeffenen dier kundigbeid vereist word en andere weetenswaardige zaaken.* 2 vols., (Utrecht: Arnoldus Lobedanius, 1744-1745).

[45] Pierre le Vieil, *L'art de la peinture sur verre et de la vitrerie : Par feu M. Le Vieil,* (1774), was translated by Johann Conrad Harrepeter as *Die Kunst Auf Glas Zu Malen Und Glasarbeiten Zu Verfertigen*, (Nürnberg: G.P. Monath, 1779).

[46] Le Vieil, *L'art,* (cit. note 45), p. 174.

[47] Caen, *The Production of Stained Glass* (cit. note 8), pp. 82-3.

section on making stained glass, he readily admits, has been taken from Le Comte's earlier work. Yet Frese stresses that it were the Dutch who were great glass painters in the previous centuries, and that there still glass painters today in Germany, France, Brabant, and "even here in Holland," who have created stained glass church windows.[48] It appears that Frese did not create stained glass himself and had primarily economic motives for his publication. In his younger years, Frese worked as writer of farces, portrait painter and printer. At the time he published his booklet he seems to have been no longer active in painting and writing, and worked as a dealer in painters' materials, maybe because old age or diminished eyesight troubled him. His booklet probably served as an advert in disguise, or was something he sold with his wares.[49] Frese does not in any way refer to Boerhaave's call, and although his motives were most likely mostly economic in nature, his insistence on the historical importance of Dutch glass painters hints at a desire to revive a disappearing art and thereby a bygone age.

Of an entirely different order is a three-volume chemistry handbook published by Petrus Kasteleyn between 1786 and 1794.[50] Kasteleyn (1746-1794) was a Dutch chemist and

[48] Albertus Frese, *Proefkundige Verhandeling van Wit En Gecouleurd Platiel Verglas En Schilderwerk; Benevens Eene Duidelyke Onderrichting van Het Glas-Schilderen: / Aangetekend Door Een Liefhebber Der Wetenschappen; En Uit Deszelfs Schriften by Een Verzameld; in 'T Licht Gegeven Door A.F*, (Dordrecht: Joh. Philip Streccius, 1780), pp. 31-32.

[49] David C. Preyer, *The Art of the Netherland Galleries*, (Boston : L.C. Page, 1908), p. 158. Many Dutch visual artists in the eighteenth century worked in a variety of disciplines and mediums. For example, Leendert Overbeek (1752-1815), of whom the Rijksmuseum has two reverse glass painted landscapes in its collection, was not only a reverse glass painter, but also had a shop in brightly coloured ribbons, painted interior and stage decorations, and made verres eglomises, book illustrations and etches.

[50] Petrus Johannes Kasteleyn, *Beschouwende En Werkende Pharmaceutische, Oeconomische, En Natuurkundige Chemie*. 3 vols., (Amsterdam: Willem Holtrop, 1786-1794).

man of letters, trained as an apothecary, active member of four Dutch and two foreign learned societies, and devoted to giving chemistry the status of independent discipline it lacked yet deserved in his eyes. Kasteleyn's work reflects the great encyclopaedic projects of the eighteenth century, and his chemical theory focussed more on practically oriented ideas and generalizations than on the fundamental claims of philosophical chemistry.[51] Kasteleyn's approach of glass production and glass painting reflects this practical focus as well as changing fashions. For example, whereas the famous seventeenth-century German glass maker, chemist and apothecary Kunckel, to whom Kasteleyn refers at the beginning of his section on glass, still gave each colour of glass paint a separate heading and listed a number of recipes for, say, yellow glass paint, Kasteleyn only mentions glass paint in relation to the painting of Reaumur porcelain, a glass porcelain invented in 1739. He also lists all colours under one heading, not mentioning which paint can be used to depict skin, nor how to create a wash-out, a technique very important for making traditional stained glass.[52]

Meanwhile, a different category of glass painting became popular in the eighteenth century. Publications appeared in Dutch on other glass painting techniques than making stained glass in the course of the eighteenth century, reflecting new fashions such as imitating gemstones behind glass and the transfer of coloured etches onto glass.[53] Painted glass was

[51] Lissa Roberts, "P. J. Kasteleyn and the 'Oeconomics' of Dutch Chemistry," in *Ambix : The Journal of the Society for the Study of Alchemy and Early Chemistry*, 2006, *53*: 255–72, p. 255.

[52] Kasteleyn, *Beschouwende Chemie*. (cit. note 50), Vol. 3, pp. 299-300.

[53] François Tiquet, *Korte Onderrigting En Leer, van Zeer Fraaye Geheymen. Diverse Edel-Gesteentens Daar Men de Natuur in de Steenen Vind of Ziet, Na Te Bootzen, Als Lapis La-Zuli, Jaspis... Etc.* ('s Gravenhage, 1741), A.P.S., *Naauwkeurige Beschryving van Het Schilderen Der Zwarte Konstprinten, : Waarin de Verschillende Wyzen, Om Dergelyke Printen Doorschynende Te Maken, Op Het Glas Te Brengen, En Te Schilderen, Aan de Hand Worden Gegeeven. : Beneffens Den Aart En Bereiding van Zommige Verwen*

used artistically in new ways, like in reverse glass painting or *verre eglomise*, in which oil paint and engraved gold and silver leave were applied to the back of a sheet of glass, and not fired afterwards, or painted for magic lantern and camera obscura slides.[54] Another popular eighteenth-century technique consisted in colouring mezzotints and then transferring them to a sheet of glass, the so-called reverse mezzotint glass prints. However, the works produced by these techniques were much smaller and less durable than stained glass windows, and their makers did not have to think about the effect of natural light falling through the finished product.

What appears from this survey of the discourse of eighteenth-century Dutch publications on stained, painted and coloured glass is that the knowledge recorded in academic and encyclopaedic sources such as the chemical handbooks of Boerhaave and Kasteleyn is almost useless without prior knowledge of glass making, painting and firing. These books were not aimed at instructing artisans to make stained or otherwise coloured glass, but included some brief notes and occasionally some recipes as part of a much bigger overview of chemical theories and practices. Yet even the artist handbooks that were intended as instruction manuals were useless without access to professional (glass) ovens and the space, time, and materials to try out the recipes. Developing the basic skills and knowledge to successfully master glass working techniques takes years of practice, as various contemporary

(Groningen: Petrus Doekema, 1770), J.B. Pictorius, *De Geheime Illumineer-Konst : Behelzende: Hoe Men Allerlei Zoorten van Verwen Konstig Bereiden En Nuttig Gebruiken Zal ... / Alles Met Groote Moeite En Vlyt by Een Verzamelt, En ... in Het Licht Gegeven, Door Een Liefhebber Der Konsten* (Amsterdam, 1770).

[54] A well-known Dutch reverse glass painter was Jonas Zeuner (1727-1814): https://rkd.nl/explore/artists/86329, (accessed 14 Sept. 2015).

glass artists have also assured me.[55] This also appears from the fact that when discussing the technique used to create glass beads, Kasteleyn remarks that "this happens with incomprehensible skill."[56] Yet however bleak the landscape of stained glass making may have looked in the eighteenth-century Netherlands, some individuals were actively trying to preserve and revive the practice.

Preserving stained glass and techniques

A case in Alkmaar in the 1760s suggests that people without much prior knowledge of making stained glass but with access to this basic infrastructure tried to revive the art, even if they did not stem from a family of glass painters, albeit with limited success. Abraham Washuizen, an apothecary, actively tried to revive stained glass making.[57] Although we know hardly anything about him, two independent sources show that he made attempts to revive stained-glass making. In 1767, Washuizen made two windows for the remonstrant church in Alkmaar, which are now lost. He asked for a large fee, 485 guilders, arguing that he had to build a kiln in order to make the windows. However, he was only paid 200 guilders and some small change for his children.[58] If we take the instructions for building a kiln, for example as given by Le Vieil, this would have been quite an investment indeed. [Fig. 4] However,

[55] Many thanks to Nadania Idriss (founder/artist/glass blower/researcher), Jesse Gunther (artist/glass blower) and Ruth Oliphant (artist/glass painter) at Berlin Glas for answering my questions regarding glass work techniques.

[56] Kasteleyn, *Beschouwende Chemie*. (cit. note 50), Vol. 3, pp. 284

[57] The name is also occasionally spelled Washuijsen or Washuisen. Washuizen married Cecila Kuiper on 20 May 1753, became a member of the guild of St Luke on 12 December 1769, and left Alkmaar with an unknown destination in 1782. Pieter Scheen, "Washuysen, Abraham," in *Lexicon Nederlandse Beeldende Kunstenaars, 1750-1880*, (Den Haag: Scheen, 1981).

[58] Van Ruyven-Zeman, *Stained Glass in the Netherlands,* (cit. note 9), p. 301.

Washuizen was an apothecary, and it is very well possible he was able to adapt one of his kilns for the firing of the glass.[59] Probably the church authorities knew he already had a kiln, because a year before, Washuizen had already produced another object from stained glass, although it was not a church window.

Although this object is now lost, a detailed description remains, giving us insight in Washuizen's attempt to revive the art of making stained glass. In 1766, William V, Prince of Orange Nassau (1748-1806), turned eighteen and took up reign as the last stadholder of the United Provinces. His father William IV had died when little William was only three years old, and a series of regents had acted as his agents in the intermediate fifteen years. The event of William V's inauguration was celebrated with feasts and decorations in the cities and towns of the United Provinces, which were chronicled in a series of books. It is in the first volume of this series, in the chapter on the "festivities, illuminations and decorations on 8 March 1766 in the towns and villages of North Holland," that we find a description of a ingenious work of stained glass made by Abraham Washuizen in Alkmaar: an irregular octagonal leaded glass pyramid, consisting of three layers of eight panels of stained glass, connected by two sloping layers of eight panels, and topped off with another sloped layer of eight panels, a crown of glass beads and an octagonal cupola consisting of 24 panels of coloured glass. The biggest panels, on the bottom, were approximately 12 thumbs (ca. 30 cm) in width and 10 thumbs (ca. 25 cm) in height, suggesting the entire thing must have been at least seventy-five centimetres wide and high.

The construction was lighted from the inside by a stand with oil lamps, and the cupola

[59] Dupré has pointed out the remarkable similarities between the workplaces of early modern apothecaries, metalworkers and glassmakers. Sven Dupré, "Introduction", in *Laboratories of Art : Alchemy and Art Technology from Antiquity to the 18th Century*, edited by Sven Dupré, (Cham u.a.: Springer, 2014), p. x.

with a wax candle. The entire thing, except for the wooden stand, was made of painted, leaded glass. The glass panels depicted allegories glorifying the United Provinces and the young stadholder. According to the report, the pyramid was illuminated continuously from half past seven in the evening until half past midnight, yet the glass kept its complete shine, glow, and colour despite the heat of the lighting.[60] Even if the account is exaggerated, this stained glass creation sounds rather inventive and laborious.

Maybe both the celebratory 'lamp' and the church windows were some kind of step in qualifying for guild membership, as Washuizen entered the artist's guild St Luke in 1769. Whether Washuizen intended to change his profession from apothecary to (glass) painter remains a mystery, but it cannot have been much of a success in Alkmaar: no other work by his hand is known, and in 1782 he left the town for an unknown destination. It is more likely that Washuizen, from his interests as an apothecary and learned man, was trying to preserve and revive the art of making stained glass by creating a new object from a material that was associated with the heyday of the Dutch Republic, and that stood in the northern-Netherlandish tradition of commemorative church windows. Early modern chymists, apothecaries and artisans shared common ground—often literally, as they worked side-by-side in workshops and laboratories under royal patronage and within religious institutions.[61] As an apothecary, Washuizen had access to materials and equipment, such as metals, pigments, and an oven, and knowledge about chemical and technical processes that were

[60] C. van Hoogeveen, *Verlicht En Juichend Nederland, of Vaderlandsche Geschiedenissen; van Het Tijdstip, Dat [...] Den Heere Prinse van Oranje [...] Digniteiten [...] Heeft Aenvaerd*, 2 vols., Vol. 1. (Leiden: C. van Hoogeveen, 1776), pp. 342–48.

[61] Sylvie Neven, "Transmission of Alchemical and Artistic Knowledge in German Mediaeval and Premodern Recipe Books," in *Laboratories of Art : Alchemy and Art Technology from Antiquity to the 18th Century*, edited by Sven Dupré (Cham u.a.: Springer, 2014), pp. 23-52.

useful in the creation of stained glass. His case demonstrates that the interconnectedness of ideas, materials, texts and practices seen in early modern artisanal workshops and alchemical laboratories occasionally continued well into the eighteenth century.[62]

Zsuzsanna van Ruyven-Zeman in her encyclopaedic work on stained glass in the Netherlands before 1795 gives another interesting example of an attempt to preserve historical stained glass and the techniques for creating it.[63] In the northern Netherlands, two sets of glass painting brothers made attempts to preserve glass painting practice and heritage in the late eighteenth century, although their competing with one another did little to further their cause. The province of Friesland had a strong tradition of glass painting from the sixteenth century onwards, but in the eighteenth century the stronghold of glass painting within the province shifted from Leeuwarden to Sneek. The two major studios in the eighteenth century in Sneek were those of the brothers Staak and Gonggrijp. Of the Staak brothers, a number of windows remain in situ today. What is remarkable about their work is the fact that it is so colourful; the few remaining eighteenth-century stained glass windows by other painters are largely monochromes. Of the Gonggrijp brothers' work, only a few in situ windows remain, plus a number of cartoons or vidimus drawings, and a glass panel depicting a sea battle by Tjalling Gonggrijp. Although the Staak and Gonggrijp studios produced many more stained glass windows than now remain, there is proof that glass painting alone was not enough to sustain them, even though they belonged to the ruling classes in their city—all served as burgomasters and city architects. Portraits and other non-glass paintings by both Ype Staak and Thomas Gonggrijp show that these last northern-Netherlandish glass painters supplemented their income with other artisanal activities, as does the fact that Ype Staak

[62] Dupré 'Introduction,' (cit. note 59), p. xv-xvi.

[63] Van Ruyven-Zeman, *Stained Glass in the Netherlands,* (cit. note 9), pp. 52-5.

gilded the weathercock on the church tower in a nearby village.

Another source that is telling of the difficulty of selling stained glass in the eighteenth century are the adverts the Staaks and Gonggrijps published in the local newspaper, the Leeuwarder Courant.[64] On July 29, 1758, Thomas Gonggrijp, then 28 years old, advertised:

Thomas Gongryp, Master painter in Sneek, and [his] Brother, message: That the almost lost art/knowledge [kunde] of glass-painting and –firing is not only restored to its former level by him, but that it has even obtained a more perfect Colour, than has been known before in Friesland; equally as can be seen with the Art-Painters R. Keyert and R. Jelgerhuis in Leeuwarden, and also with F. van der Elst at Dockum: this is why these Brothers recommend themselves to the favours of all, and especially to those of the Regents of Churches and Places of Worship.

Keyert, Jelgerhuis and Van der Elst were famous Frisian glass painters from the late seventeenth and early eighteenth century; Keyert had been Thomas Gonggrijp's teacher. Although Gonggrijp's painting *Gallant Company* suggests he was indeed the more talented painter, the Staak brothers could of course not ignore this claim. Ype was thirteen years older than Thomas Gonggrijp and had more experience, in situ work, and a long family tradition to rely on, and so he replied with an advert in the Leeuwarder Courant of August 16:

Ype Staak, Master Painter in Sneek, hereby lets everyone know, so no one will be deceived by the announcements of Thomas Gongryp and his Brother, that the old art of Glass-Painting and –Firing, was practiced continuously by his ancestors for over a hundred, and by himself

[64] Via http://www.delpher.nl (accessed 14 Sept. 2015).

for over twenty years, and is continued today, wherefore he recommends himself to the favour of all, with the promise of the most courteous treatment, his work can be seen in the Church-windows of Stavoren, Engwierum, Oldeschoot, Dragten, Oldeboorn, Heeg, Oudega, Egten, and more other Churches and Houses, both in- and outside this province.

So where Thomas Gonggrijp relied on references to the great glass masters of old, Staak cunningly replied with a list of his own oeuvre, for all to see in churches around Friesland. The question remains whether any of this advertising made much of a difference, as an advertisement for new apprentices by Staak in the Leeuwarder Courant, in 1794, apparently attracted no candidates, and it appears no more stained glass was produced after this date by either the Staaks or the Gonggrijps.[65]

Neither the Staaks nor the Gonggrijps appear to have made attempts to register their knowledge about making stained glass windows in writing when it became clear they would not find successors. However, Thomas Gonggrijp did restore and preserve old stained glass, as appears from a number of fragments kept in the Frisian Maritime Museum. He etched the provenance of the glass on the fragment, for example on a piece of stained glass depicting a sheaf of wheat: "From an old house on Marketstreet. Made 1610, acquired by Thomas Gonggrijp 1760."[66] [Fig. 5] The use of old fragments of stained glass as stopgaps in glass painter's workshops was common, and broken glass was routinely collected for recycling in

[65] Ype Staak died in 1808, Tjalling Gonggrijp in 1823. Although it is theoretically possible that they did produce stained glass after 1794, there are no records of this, nor do any windows remain from this period.

[66] "Uit een oud huis op de Marktstraat. 't Jaartal was van 1610 tot Sneek Tomas Gonggrijp vergaerdert 1760." Also see Van Ruyven-Zeman, *Stained Glass in the Netherlands,* (cit. note 9), p. 54.

the eighteenth century.[67] Yet this is of a different order: from the etchings on the fragments Gonggrijp collected it appears that he tried to preserve both historical stained glass and practical knowledge about making stained glass, motivated by a passion for his trade, or even some kind of cultural-historical awareness, despite a lack of interest from his contemporaries.

As far as we know, no stained glass was produced at all in the northern Netherlands for about twenty-five years, until 1815, the year the United Kingdom of the Netherlands was established. The Society for Husbandry (Huishoudelijke Maatschappij) in Haarlem, which had been established as the *oeconomical* branch of the Royal Holland Society of Sciences and Humanities (KHMW) in 1777, started a new program to improve the applied sciences and artisanal industry in the young nation, such as engraving, painting and pottery manufacture through prize competitions and the establishment of art academies. In 1815, the Society issued a prize consisting of a gold medal or twenty-five ducats for the first inhabitant of the Kingdom of the Netherlands who could revive the ancient art of glass painting. If the samples had lost nothing of their luster after ten years, the winner or his heirs would receive another fifty ducats. Competitors could obtain a copy from the Society of a manuscript describing a certain means of painting glass with a paint that did not fade after baking, left by 'an eminent national scholar of yore.' This clearly was a difficult call, as it long remained unanswered and was repeated verbatim in 1819.[68]

The Nijmegen house and carriage painter Francis Peters (1787-1867) was the first respondent, and he had some success in reviving the old techniques of glass painting. Although the quality of the work he sent in did not equal that of the ancients, the Society

[67] Simon Werrett, "Recycling in Early Modern Science," *The British Journal for the History of Science*, 2012, *46:2*, no. 168:1-20, pp. 4, 14.

[68] *Prijsvragen, Voorgesteld Ter Beantwoording Door de Nederlandsche Huishoudelijke Maatschappij, Te Haarlem, 1815-1826,* (Haarlem: P. Loosjes, 1815), pp. 61-2, 186-7.

found his samples not without merit and awarded him a prize of eight ducats in June 1721.[69] The main problem Peters had encountered in his attempts to make stained glass, according to later sources, was that most of the colours he produced based on the old recipes charred, disappeared, or changed when he tried to burn them on the glass.[70]

The poet and novelist W.H. Warnsinck, who visited Peters' workshop in 1827, stated that Peters had based his earliest experiments on an old manuscript with paint recipes that he bought from a Jew around 1817.[71] Given Peters' participation in the Society's competition it is much more likely that he based his first experiments with glass painting on the copy of the manuscript mentioned in the call though. Unfortunately it remains unclear who the author of that manuscript, the 'eminent national scholar of yore' was.[72] Other sources Peters may have had access to include the printed works by Kasteleyn and Frese, yet the time it took him to produce an acceptable result strongly suggests that whatever written sources he had may have been a necessary starting point for the revival of the art, but that they were insufficient. In the end, only repeated trial and error and adjusting of recipes and techniques could help him master the art of glass painting.

Peters' perseverance seems to have had some result: unlike the Society for Husbandry,

[69] Ibidem, p. 249, 277.

[70] Carine Hoogveld, "De Ontwikkeling van de Glasschilderkunst in de Negentiende Eeuw," in *Glas in Lood in Nederland, 1817-1968*, edited by Carine Hoogveld and Ellinoor Bergvelt ('s-Gravenhage: SDU Uitgeverij, 1989), 14–53: p. 24.

[71] W.H. Warnsinck, 'Iets, betrekkelijk de door Peter Francis Peters, te Nijmegen, wedergevondene kunst van glasschildren,' in *Vaderlandsche Letteroefeningen*, edited by G.S. Leeneman van der Kroe en J.W. IJntema, (Amsterdam: 1827), pp. 732-5.

[72] No trace of the manuscript was found in the society's archives, kept in the Noord-Hollands Archief, entry no. 609.

Warnsinck stated that he had recovered the lost art of glass painting. He compared him to the Crabeth brothers, the sixteenth-century glass painters responsible for the majority of the stained glass windows in Gouda's St. John's church, and mentions that Peters had been given an assignment for a set of commemorative windows by the king.[73] Although probably far from perfect, Peters' work was the beginning of a revival of the appreciation and production of stained glass in the northern Netherlands.[74] Eventually this would culminate in the Catholic building boom and its neo-Gothic architectural program in the second half of the nineteenth century.[75] Interestingly, one of the Gonggrijp brothers, Tjalling, did not die until 1823, but it appears both Peters and the Society were unaware of this.

These cases of Dutch artisans and an apothecary trying to preserve and revive practical knowledge about making stained glass suggest that they and most of their eighteenth-century counterparts made no structured attempts to preserve theoretical knowledge about and recipes for making stained glass in writing, even though they seem to have been very much aware of the fact that the craft was rapidly disappearing. The most likely explanation for the lack of effort in preserving craft knowledge in written form is the fact that creating high-quality stained glass windows is a highly complex process that can only partly be recorded in writing. By the late eighteenth century a limited number of texts on

[73] W.H. Warnsinck, 'Iets, betrekkelijk,' (cit. note 71).

[74] The Society for Husbandry reissued the call for stained glass after awarding Peters the partial prize, and received other samples, but none met the requirements entirely. *Prijsvragen,* (cit. note 68), p. 308, 342, 382.

[75] Carine Hoogveld, "Verantwoording," in *Glas in Lood in Nederland, 1817-1968*, edited by Carine Hoogveld and Ellinoor Bergvelt ('s-Gravenhage: SDU Uitgeverij, 1989), 9–13. A similar revival was seen in the surrounding countries. See i.e. "Stained and Painted Glass 1770-1870," Victoria and Albert Museum, http://www.vam.ac.uk/content/articles/s/stained-and-painted-glass-1770-1870/ (accessed 14 Sept. 2015), Jim Chesire, "Stained Glass," *Victorian Review*, 2008, *34*, no. 1: 71–75.

the production of coloured glass in general, such as those by Neri and Kunckel, and on making stained glass in particular, such as those by Le Vieil and Le Comte, contained most of the written craft knowledge available.[76] As the early nineteenth-century work of Peters shows, only when a renewed interest in the old craft emerged, it appeared that written sources provided only clues to the precise techniques and knowledge needed to successfully produce stained glass windows.

Conclusions

Although the production of stained glass came to a halt almost completely in the eighteenth-century Netherlands, the preservation of knowledge about making stained glass in writing and sometimes in practice was almost a continuum. Various professionals played a part in this process, although they did not necessarily interact much with one another. It appears from the remaining stained glass samples and textual sources that different groups of professionals dealt with knowledge about making stained glass in different ways. Glass painters, practitioners of a dying profession by the eighteenth century, sometimes attempted to document their knowledge in writing, but more frequently tried to preserve the craft by searching for successors and preserving old stained glass. Often they were unsuccessful, and had to branch out into related disciplines, such as printmaking, portrait painting and selling art supplies in order to sustain themselves.

The Frisian glass painters discussed here stressed the uniqueness of their skill as much as possible and tried to preserve their skills and knowledge by seeking apprentices, while someone like Washuizen tried to recycle the art of making stained glass into something new

[76] The possibility remains that people like the Gonggrijps and Washuizen did also keep written records of their craft, but that these were never published and were lost over time.

with his lamp. Learned men such as Kasteleyn, fascinated with the possibilities of the new oeconomic chemistry and inspired by the encyclopaedic projects of the century, played a role in documenting knowledge about all aspects of glassmaking for a learned and academic audience, without being of much use to artisans.[77] Moreover, it is impossible to see these developments outside the context of a declining empire, the formation of a new nation after the French-Batavian period and a growing national identity and awareness of material cultural heritage.[78]

The same intimate connection between commerce and natural and artisanal knowledge in the early modern period that has been signalled in recent work meant that the circulation of knowledge about making stained glass increasingly became a theoretical affair with the dwindling popularity and production of stained glass in the eighteenth century.[79] Knowledge about making stained glass was essentially still knowledge emerging from bodily experience and a detailed acquaintance with objects, not obtainable from books.[80] The early modern

[77] Roberts, "P. J. Kasteleyn," (cit. note 51), Lissa Roberts, "Practicing Oeconomy during the Second Half of the Long Eighteenth Century: An Introduction," in *History and Technology: An International Journal*, 2014, *30*:133–48.

[78] Auke van der Woud, *De Bataafse Hut.* (Amsterdam / Antwerpen: Uitgeverij Contact, 1998).

[79] Lissa Roberts, "Introduction," in *Centres and Cycles of Accumulation in and Around the Netherlands During the Early Modern Period*, edited by Lissa Roberts, (Berlin: Lit Verlag, 2011): p. 5.

[80] Harold Cook, Sven Dupré and Cristoph Luthy call this 'objective' knowledge, but Lorraine Daston and Peter Galison have convincingly argued that this is an anachronistic use of the word 'objective' – between 1650 and 1850, the terms 'objectivity' and 'subjectivity' had turned 180 degrees in meaning. Harold Cook, *Matters of Exchange: Commerce, Medicine and Science in the Dutch Golden Age.* (Yale: Yale University Press, 2007), pp. 39, 57, Sven Dupré and Christoph Lüthy (eds), "Introduction. Silent Messengers. The World of Goods and the Circulation of Knowledge in the Early Modern Netherlands," in *Silent Messengers. The Circulation of Material*

intellectual ideal of *truth to nature*, a value associated with careful descriptive information about objects combined with appreciation, selection, and accentuation, still was part of the ideological foundation on which the encyclopaedic collections that included descriptions of techniques were build. However, the dwindling commercial value of knowledge about making stained glass meant it was eventually preserved and recycled mainly in writing, and became increasingly bookish and separated from practice.

This article has shown how the decline of a craft can give us insights in the intermittent and changing character of the circulation of knowledge. Whereas craft knowledge about making stained glass was circulated predominantly through on-the-job instruction for centuries, the imperfect means of written instructions and recipes, recorded in both artist handbooks and encyclopaedic natural philosophical works, became increasingly important when the craft went through a period of decline in the eighteenth century. Human actors and their attempts to preserve, maintain and revive stained glass making knowledge did not form networks—although they were connected in a sense because they partly had access to the same texts containing the most basic technical and practical knowledge. Texts and preserved samples of stained glass, although insufficient, formed a necessary and important starting point for the revivers who had to interpret the texts; they formed the basis for their experiments, and thus in a sense for the revival of the art. Finally, the discourse and case studies discussed here strongly suggest reproducing recipes for making stained glass from seventeenth- and eighteenth-century sources would provide us with an even better understanding of their epistemic and practical value, and will give us insights in the difficulties faced by early craft revivers relying on these sources, such as Abraham Washuizen

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Objects of Knowledge in the Early Modern Low Countries, (Berlin: LIT Verlag, 2011), p. 4, Lorraine Daston and Peter Galison, *Objectivity* (New York: Zone Books, 2007), pp. 29-30, 104.

and Francis Peters.[81]

[81] On the value of reproducing recipes also see Lawrence M. Principe, "Apparatus and Reproducibility in Alchemy," in *Instruments and Experimentation in the History of Chemistry*, edited by Frederic L. Holmes and Trevor Levere, (Cambridge, MA: MIT Press, 2000), pp. 55–74, Smith and Beentjes, "Nature and Art," (cit. note 22), Marieke M.A. Hendriksen, *Elegant Anatomy. The Eighteenth-Century Leiden Anatomical Collections,* (Leiden: Brill, 2015), pp. 1-8.

Figure captions

Fig. 1: Chr. Piersson, *John in prison*, stained glass window no. 18, St. John church, Gouda, 1674. Creative Commons.

Fig. 2: Ype Staak, commemorative church window, Idaard, 1774. Creative Commons.

Fig. 3: Sample of antimonial glass, inventory number 04264, Pharmaziemuseum Brixen.

Fig 4: Plan for a glass-firing kiln, from Le Vieil, Pierre, *L'art de la peinture sur verre et de la vitrerie : Par feu M. Le Vieil,* 1774.

Fig. 5: Stained glass fragment with a wheat sheaf, carved in the blue surface: "Uit een oud huis op de Marktstraat. 't Jaartal was van 1610 tot Sneek Tomas Gonggrijp vergaerdert 1760." Inventory number U-007, Frisian Maritime Museum.