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The Evasion of Dollond's Notorious Patent on the Achromatic Telescope by the Move to the Dutch Republic of the Instrument Makers Eastland and Champneys

Huib J. Zuidervart

Introduction

In the history of patents, the 1763-1766 lawsuit of the English instrument maker Peter Dollond (1731-1821) to implement his exclusive rights to manufacture achromatic telescopes, thanks to the fact that in 1758 his late father John Dollond (1706-1761) had patented the technique, is a well-known case. It is famous, not only because the achromatic telescope disproved Newton's celebrated theorem that the segregation of colours due to refraction cannot be reversed, but also because it is a classic example of a battle over priorities. The ins-and-outs of this lawsuit have been thoroughly investigated from the original documents by Brian Gee, in his recently (2014) published (but sadly also posthumously issued) book *Francis Watkins and the Dollond Telescope Patent Controversy*.¹ The upshot of this judicial battle was the verdict stating that what really mattered was not the person who first invented a process or piece of equipment, but the person who first made it publicly available and accessible.

The fact that this infamous jurisprudential struggle had a Dutch follow-up, with two of the five indicted English opticians², William Eastland (1702-1787) and James Champneys relocating to the Dutch Republic, has hardly been noticed before. This follow-up is also missing in Gee's book. How and why this came about will be explained in this paper.

The Achromatic Telescope

Even though the literature about the development of the achromatic telescope is not without its problems, in essence the story boils down to the following.³ In his *Opticks* of 1706, Isaac Newton had asserted that it was theoretically impossible to correct chromatic aberration using a colour dispersion-free - or so-called 'achromatic'

- telescope. In 1747 the Swiss mathematician Leonard Euler argued that Newton was wrong, since the human eye possessed such a lens. A combination of lenses with differing refractive indices would undoubtedly be able to correct chromatic aberration. However, this theoretical result was not in accord with the interests of the London instrument maker James Short. He had specialised in the manufacture of reflecting telescopes, whose system of mirrors was principally achromatic. Reflected light has a much lower intensity than transmitted light, and an achromatic lens telescope would constitute a major threat to his business. Short turned to his friend John Dollond, a silk weaver who had a great interest in mathematics and natural philosophy, and asked him to disprove Euler's theory and prove that Newton was right. Dollond set to work and in 1753 he published the article, 'Concerning a Mistake in M. Euler's Theorem for Correcting the Aberrations in the Object-Glass of Refracting Telescopes'.⁴ Here he defended Newton's theorem. But in 1755 Dollond was informed by the Swedish scholar Samuel Klingenstierna (1698-1765) that Newton's famous prism experiment, in which white light was first refracted into the spectrum and then, by passing through another prism, was reconfigured into white light, produced different results if larger prisms were used. According to Klingenstierna, Euler was essentially right in his critique of Newton. After carrying out further experiments Dollond had to admit that, contrary to what he had written in his earlier article, Euler indeed was right. In 1757, Dollond succeeded in manufacturing a telescope that was effectively achromatic, by using a combination of lenses with differing refractive indices, made from flint glass and crown glass. In 1758 Dollond's publication of the results made a considerable impact on the scientific community.⁵ The Royal Society award-

ed Dollond its greatest honour, the *Copley Medal*, and in 1761 he was elected a Fellow.

As John Dollond's son Peter had started an instrument-making business in 1750, in which John as father also participated commercially, Dollond Senior also applied for a patent for his invention. In those days a patent was of importance foremost as a way to improve the marketing of an instrument. After John Dollond's death in November 1761, Peter Dollond decided to use the 1758-patent to enforce a monopoly on the manufacture of the achromatic telescope. In a number of legal procedures he summoned to court a number of London-based instrument makers who, in the intervening years, had successfully manufactured and copied John Dollond's achromatic telescope. Dollond first sued his former business partner Francis Watkins (†1784), who in July 1764, after a legal procedure, was ordered to stop his production and selling of achromatic telescopes. A protest by almost all of the London instrument makers had no effect, as their document never was properly finalized (Fig. 1).⁶

Then, in August 1765, Dollond took legal action against the opticians William Eastland, Christopher Stedman and James Champneys. In their joint argument for the defence, submitted in October 1765, Eastland, Stedman and Champneys demonstrated a quite different perspective on the history of development of the achromatic telescope (Fig. 2).⁷ According to the accused instrument makers, the discovery had already been made much earlier, in the 1730s, by the lawyer and gentleman-scholar Chester Moor Hall (1703-1771), as an outcome of Hall's private research on the human eye. Several London opticians had been involved in the preparing of lenses for Hall. Among them were Edward Scarlett (†1743) and James Mann (†1756), who Hall had commissioned separately to grind for

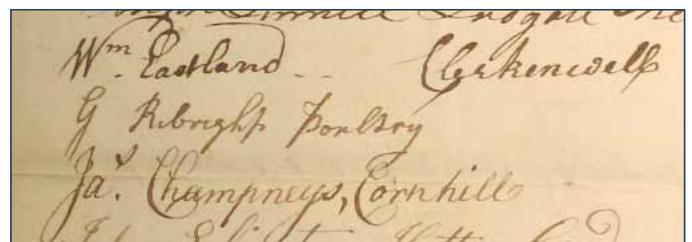
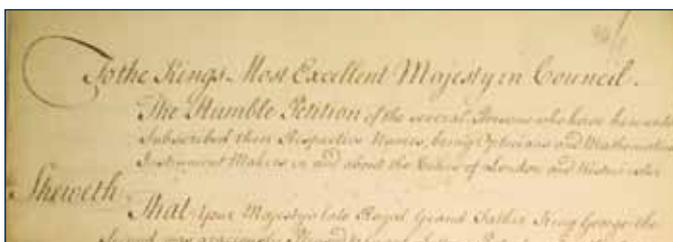


Fig. 1 (left): The beginning of the petition of 35 protesting opticians and other scientific instrument makers for the revocation of John Dollond's patent of 1758. (right): the signatures of William Eastland, [George Ribright] and James Champneys below this petition. (National Archives, Kew Richmond, London, Privy Council Papers, ref. PC 1/7 no. 94, 22 June 1764).



Fig. 2 The signatures of William Eastland, James Champneys and Christopher Stedman below their testimonies, dated 29 October 1765 (National Archive, Kew Richmond, London, Chancery Court, PRO C12/1956/19).

him a lens according to some precise specifications: one made of flint glass and the other of crown glass. Both opticians, however, subcontracted the grinding of these lenses to another optician, George Bass, who realized that the two lenses fitted together, to constitute a combined lens with almost achromatic achievements. According to a statement made much later – in 1789 – by Jesse Ramsden, the former brother-in-law of Peter Dollond, it was Mann's former apprentice and business partner James Ayscough (†1759) who had informed John Dollond of these developments.⁸

In his sworn testimony of October 1765 the optician William Eastland declared that it was indeed Ayscough, who in 1752 had subcontracted another order from Hall to him. On this occasion Ayscough had given him written instructions, specifying how to make the lenses according to Hall's design.⁹ From then on both Ayscough and Eastland had made and sold telescopes with these doublet lenses, to be followed in later years by other opticians, among which Christopher Stedman and James Champneys.

In his testimony Eastland also declared that in 1758, not long after the patent to John Dollond had been issued, the latter had visited Ayscough's shop where, in Eastland's and Stedman's presence, Dollond had said that "he had got a patent for Mr. Hall's Invention".¹⁰ A few days later Eastland had met John Dollond again, on which occasion Eastland had told him that he "had made and sold many such telescopes and should continue to make and sell the same as usual". In reply John Dollond would have said that "he did not care who made them, or used words to that or the like effect".¹¹ In his testimony Eastland argued further

that he had already displayed an achromatic telescope in his shop as early as 1753.¹² He even named one of his early customers, a certain "Captain Richard Prideau".¹³ However, in court none of the opticians involved were able to present the judge an achromatic telescope that pre-dated Dollond's patent and that had been made public by an actual sale. They also could not prove they had ground lenses for others than solely for Moor Hall. The latter even seems to have shown to the judge several of his lenses, in order to demonstrate his priority of the invention.¹⁴ However, it was not the question of priority

that was at stake. In the 1763-trial Dollond versus Watkins and Smith, the judge, Lord Mansfield, already had ruled that even if Moor Hall had made the discovery earlier than John Dollond, this should be deemed to be without meaning:

*for if a man has ever [made] so useful an invention, and he kept it locked up in his scrutoire, it was the same thing to the world, as if he had never known it.*¹⁵

However, the significance of this ruling seems to have escaped the three opticians who faced the second trial in 1765-1766. The youngest of them, James Champneys (see Fig. 3), was the most fiercely in his opposition against Dollond. In August 1765, immediately after Dollond had brought charges against him, Champneys started an advertising campaign in the *Gazetteer and New Daily Advertiser*. Working as an independent optician only since 1760¹⁶, and making achromats only since 1764¹⁷, Champneys was rather new in the optical business and he probably expected that his public outreach would strengthen his defence. The campaign ended at the eve of Champneys' trial, in February 1766. In these advertisements Champneys stated that in his workshop "facing Tom's coffee house" in Cornhill, he constructed and sold:

refracting telescopes with a compound object glass constructed upon the principles of Chester More [sic!] Hall, Esq; whose invention of the compound object glass has so much improved this telescope, as renders it far superior to any of its kind.

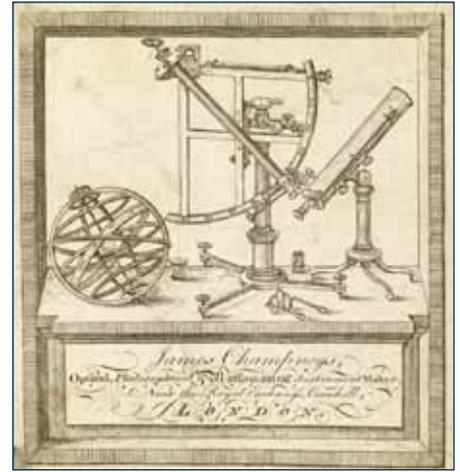


Fig. 3 (Top): Trade card of James Champneys, at his Cornhill address, where he moved in 1764 (British Library) (Middle and bottom): Small spyglass made by Champneys. Tube covered with green coloured rayskin; drawtube with green coloured paper; with (worn-out) silver tooling. Signed: J. Champneys'. With original leather casing, c. 1760 (Louwman Collection of Historic Telescopes).

According to the advertisement, Champneys offered these telescopes nearly 20% cheaper than “those sold at other shops” [read: Dollond]. On 18 February 1765, however, these activities were abruptly stopped. The new judge, Charles Pratt Lord Camden, confirmed the ruling of his predecessor, Lord Mansfield, and so the judicial verdict was again in favour of Peter Dollond. Champneys was forbidden to continue the production and selling of achromatic telescopes and was convicted to pay Dollond a compensation of £150 plus expenses, in total £250.¹⁸

The consequences for all the other opticians were considerable. After the formal injunction of the verdict in July 1767 Peter Dollond had obtained the exclusive and enforceable right to produce achromatic telescopes until the patent expired in 1772, causing their price to rise sharply.

The Emigration of Champneys and Eastland to the Dutch Republic

Having been left with no other option, both Champneys and Eastland sought their luck elsewhere. Already in the autumn of 1768 the two opticians left for Holland: Eastland settled in The Hague and Champneys went to Amsterdam, together with his former apprentice and new son-in-law John Cuthbertson, who in September of that year had married Champneys' daughter Jane.¹⁹

1. James Champneys & John Cuthbertson

In Amsterdam Champneys and Cuthbertson founded an instrument makers' workshop bearing both of their names, although only Cuthbertson was registered as “porter” (‘citizen’) of Amsterdam. For reasons of marketing, they soon published some manuals for scientific instruments in the Dutch language, for instance for the use of globes, air pumps and frictional electrical machines.²⁰ A price list of their Amsterdam firm confirms that they continued to sell (and probably produce) achromatic telescopes (Fig. 4). However, as the Amsterdam firm of Jan and Harmanus van Deijl already had established their brand as important producers of Dutch made achromatic telescopes, the optical business seems to have made little profit. No achromatic telescope signed ‘Cuthbertson & Champneys Amsterdam’ has survived, and of this period only one reflecting telescope is known (Fig. 5).²¹

Moreover, Champneys could not find his niche in Amsterdam. Probably in the course of 1771 he returned to England. However, in London Champneys could not escape his

CATALOGUS
VAN
OPTISCHE, MATHEMATISCHE EN PHYSISCHE
INSTRUMENTEN,
Welke gemaakt en verkogt worden, by
JOHN CUTHBERTSON
EN
JAMES CHAMPNEYS,
T' AMSTERDAM.

OPTISCHE INSTRUMENTEN.

Weeromkastende Telescoopen van 1 voet/	60	—
dito dito	18 duim.	92
dito dito	1 voet	117
dito dito met Schroeven beweer- gende van 2 voet.		120
Verrekijers of Achromatische Telescoo- pen, van een nieuwe uitvinding, ge met dubbele Voorwerpglazen.		
De kleinste, in Koper	A	11:11

De Grootste, in dito, met een dubbeld Oogglas.	119 20
Twee voets, in Mahognyhout.	22
Dito, in Haayze vel, om in de zak te dragen.	24
Drie voets, in Mahognyhout.	33
Dito, in Haayze Vel, voor de Zak.	36
Vier Voets, in Mahognyhout.	44
En dus voor allerhande lengten in de- zelfde evenredigheid.	
Voorts alle soorten van Straalbrekende Verrekijers, tot de minste Prys- zen	
Groote dubbelds samengestelds Micro- scopen met zwarte Segryne Kas- sen.	95
Dito staande dito.	69
Dito minder foort.	55
Zonne Microscopen, naar de nieuwste Verbeteringen, met een Zak Mi- croscoop.	70
Groote Zak Microscopen.	28
Kleiner dito.	18
Nog kleiner dito.	40
Linnen Microscopjes.	30
Brand Spiegel, van 2 voet Diameter, op een voet.	180

Fig. 4 Price list of the Amsterdam workshop of Cuthbertson and Champneys, listing also “achromatic telescopes of a new invention” with “double objective glasses”. (Utrecht University Library).



Fig. 5 Signature ‘CUTHBERTSON & CHAMPNEYS AMSTERDAM’ on a reflecting telescope (Museum Boerhaave Leiden).

creditors anymore. His business as ‘optician, dealer and chapman’ did not overcome his severe financial problems with the result that in January 1772 Champneys officially was declared bankrupt.²² By March 1772 he was forced to sell off:

... his neat and genuine household furniture, linnen, China and books, which were all new within 12 months, and little the worse for wear. And tomorrow will likewise be sold, his entire stock and utensils in trade; consisting of optical and mathematical instruments, amongst which are four large engraved plates of the charts of the White Sea; sundry turning lathes and other utensils.²³

Nevertheless, the situation was not hopeless. In 1775 Champneys was able to reach a final settlement with his main creditor Peter Dollond, with the result that shortly afterwards he could return to his profession of optician.²⁴ In 1777 ‘James Champneys, Optician, Cornhill’ is again listed between the members of the ‘Society for the Encouragement of Arts, Manufactures and Commerce’.²⁵ However, this is also the last time we hear from him. He probably died shortly afterwards.

In the meantime, Champney's son-in-law John Cuthbertson, had developed the Amsterdam workshop into the most renowned Dutch instrument makers' firm of the last quarter of the eighteenth century.²⁶ In 1774 Cuthbertson's brother Jonathan joined the firm, eventually to settle in Rotterdam as an independent scientific instrument maker.²⁷ Both brothers made and sold all sorts of scientific instruments, among which several optical instruments.²⁸ Especially Jonathan remained active in the field of optics, as may be deduced from his booklet *Verhandeling over de Verrekijers* [‘Treatise

on Telescopes'], published in 1794. In this small tract achromatic telescopes were praised as being the best available.²⁹ His Amsterdam brother however, soon specialized in air pumps and frictional electrical plate machines.³⁰ But, whilst Jonathan remained in Holland until his death in 1806, John Cuthbertson followed the example of his father-in-law. In 1793 he returned to England, prompted by an economic slowdown in the Dutch Republic. Broker Abraham Ypelaar – better known for his renowned cabinets of microscopic specimens – auctioned all Cuthbertson's remaining instruments and tools.³¹ However, two of Cuthbertson's apprentices, Hartog van Laun and Hendrik Hen, would ensure that the legacy of Cuthbertson & Champneys would persist long into the 19th century.³²

2. William Eastland

The optician William Eastland also left for the Dutch Republic, in his case to The Hague, the seat of the Dutch Stadtholders and a place noted for its abundance of cabinets of experimental philosophy.³³ Probably Eastland had already some contacts here. The Hague was, for instance, the place where Anne Sisson lived, daughter of the well-known English instrument maker Jonathan Sisson, brother of Jeremiah Sisson, and the widow of Sisson's former apprentice Benjamin Ayres. In the 1750s the latter had been the official scientific instrument maker to the Dutch Stadtholder, as well as to the Amsterdam admiralty.³⁴ The Hague was also the residence of Louis Thornbury, an English dealer in prints and fancy goods, with good contacts in the London community of scientific instrument makers.³⁵

Accounts relating to Eastland are scarce and somewhat confusing, because some sources mention a father and a son with the same name.³⁶ The optician William Eastland, however, was not married and had no legitimate children.³⁷ He was born in about 1702 in Epsom, Surrey, being the son of a farmer. According to Gloria Clifton, he was trained as an instrument maker from the age of 16 onwards and worked by himself from 1726.³⁸ In 1737 Eastland was chosen to serve as Assistant for the Worshipful Company of Spectacle makers, but at first he declined this duty for which refusal he was convicted to pay the heavy fine of 11 pounds, 4 shilling and 3 pence.³⁹ Perhaps to avoid this payment he changed his opinion and in May 1737 he still was sworn in as Assistant. But his business was not flourishing. That same year he ran short of money, so to get his bills paid 'William Eastland, spectacle maker of Charterhouse Yard' (in Clerkenwell, London) was forced to act as plaintiff in a lawsuit involving sev-



Fig. 6 (Left) Compound microscope on a tripod, signed 'Eastland | & | Cooke | London', passed down through the family of Jonas Regenboog, Eastland's Dutch business companion. The instrument is the product of collaboration between William Eastland and the optician John Cooke, who in 1764 also signed the protest against Dollond's exclusive patent. (Right): Detail of the signature (Photo's: Ilja Nieuwland).

eral debtors.⁴⁰ Unfortunately, with little results. In 1743 'William Eastland, coffee-man and spectacle-maker from Ludgate Hill' (between Clerkenwell and the City) was declared 'insolvent'. Therefore he was forced to serve as a 'prisoner in the fleet'. This meant that he was sentenced to work for the admiralty, but that his earnings were used to pay off his debts, more particular those of his main creditor, a certain Ann Davis.⁴¹ However, Eastland seemed to have overcome these difficulties. We already saw that in the early 1750s he worked as a subcontractor for James Ayscough, who had his shop at Ludgate Street. So, as Ayscough passed away in 1759, of all the witnesses in the Dollond lawsuit, Eastland was the person best informed about the manufacture of the earliest achromatic telescopes.⁴² At that time Eastland was in his sixties and very experienced as an optician. But Eastland not only faced a judicial battle with Dollond, he also was facing domestic problems. For in March 1768 the glass grinder 'William Eastland of Cow Cross' (a former street in Clerkenwell) is on record as plaintiff in an indictment against a certain Ann, wife of a John

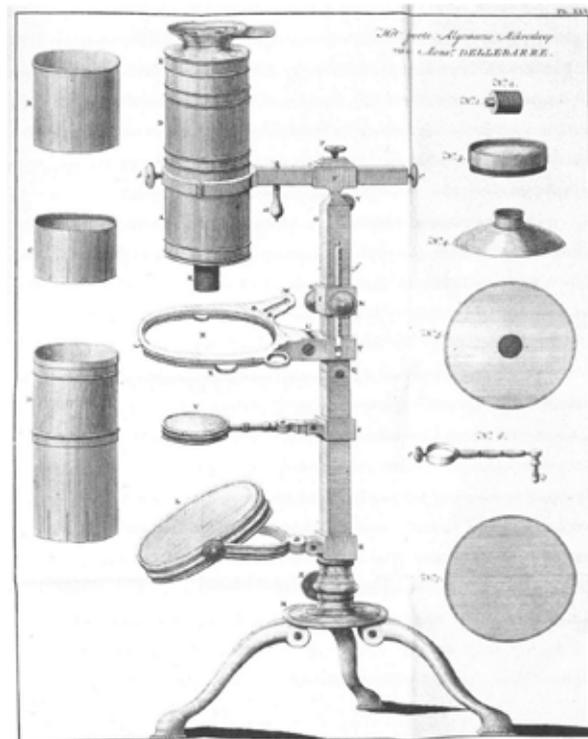


Fig. 7 Dellebarre microscope. Engraving from H. Baker, translated and enlarged by M. Houuttuyn, *Het Microscop gemakkelijk gemaakt*, 3rd edition (Amsterdam 1778). pl. XXV.

Pearce:⁴³ She appeared to have been Eastland's mistress, because Ann declared in court that "as good as three of her children" were procured by Eastland. She had left him to marry her present husband, and Eastland, who only called her "his former servant",

now accused her of stealing his watch and bringing it to a pawnshop. However the judge acquitted Ann Pearce from prosecution, because in the years 1765 and 1766 Eastland had allowed her to bring this same watch a few times to the pawnbroker's shop, more specifically at moments when Ann had asked him for money for one of his (illegitimate) children. In any case, Eastland is mentioned in England for the last time at a meeting of the London Court of Spectacle makers on 30 June 1768.

A few months later Eastland moved to the Dutch Republic. At least, that's what we suppose, for his actual whereabouts are unknown until September 1770, when his name is recorded in the archives of The Hague. The *vreemdelingen register* ('foreigners register') of this town reveals that the unmarried 'konstwerker' William Eastland, born in 'Ipsom' (= Epsom, Surrey), being of the Episcopal religion, received that month a deed of admission for the time of one year.⁴⁴ Being 68 years of age, his move to a country where he could not speak his mother tongue was quite some step. Did he flee to avoid a lawsuit of Peter Dollond, or did he fear the mother of his illegitimate children? It is hard to tell. But perhaps there was another reason. Because the address Eastland gave as his residence is quite amazing. It appeared that he was already living in the Dronkemannsstraat, in the house of a certain Louis François Dellebarre.

Eastland and the Development of the Dellebarre 'Achromatic' Microscope

Dellebarre was a French citizen from Abbeville in Picardie, who around 1765 had settled in Leiden as a private teacher of geography.⁴⁵ Leiden had a well-known university and many private teachers earned their living there as a tutor of university students. However, early in 1770 Dellebarre suddenly moved to The Hague and changed his profession: he became producer of microscopic preparations. His first known deliveries of such items were to the cabinet of experimental philosophy of the Dutch Stadholder.⁴⁶ But then, in September 1770, he also delivered a "grand myroscope" and a smaller 'dito'.⁴⁷ A manual for such a "large universal microscope, made by L.F. Dellebarre, living in the 'Dronkemannsstraat in 's-Hage'", dated 7 December 1770 is still preserved.⁴⁸ A month later, on 29 January 1771 this type of microscope suddenly was called: "un grand myroscope, universel, achromatique".⁴⁹ In short, now Dellebarre claimed to have invented an achromatic microscope.

This innovation took place exactly during

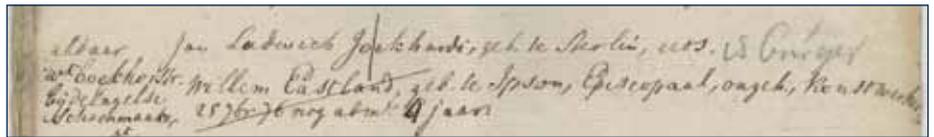


Fig. 8 Entry of 'Willem Eastland' in the 'List of foreigners in the respective areas of The Hague'. (Archive The Hague, inv. no. 1039, fol. 37v).



Fig. 9 (Top and below) Telescope, with main wooden tube and three brass-plated drawtubes, signed 'W. Eastland'. Achromatic triplet. $F_{\text{objective}} = 380 \text{ mm}$ ($\approx 15 \text{ inch}$), $\varnothing = 29 \text{ mm}$. Aperture ratio $\approx f/13$. The construction of the used brass-plated drawtubes was patented in 1782 by the London instrument maker Joshua Lover Martin, the son of the well-known London instrument maker Benjamin Martin. As William Eastland died in The Hague in 1787, this telescope seems to have been made there between 1782 and 1787. However, the clamp type cover depicted emerges around 1800. Therefore the telescope was probably produced by Eastland's companion Jonas Regenboog, who used the firm name "W. Eastland & Co" until his death in 1839. Hypothetically Eastland's former apprentice William II Eastland would also qualify as the maker of this telescope, but as far as is known he was imprisoned in 1774 and was no longer active as an optician after that time. This instrument was discovered in a Dutch antiques shop in 2011 and was purchased by the late Dick Regenboog (1941-2013), descendant of Eastland's Dutch associate Jonas Regenboog.

the time in which Eastland lived in Dellebarre's house. Given Eastland's life-long experience as an optician, making telescopes as well as microscopes, it is an educated guess that the two artisans exchanged information with regard to the topic of achromatism as well as the construction of microscopes. Especially, because it is known that in the mid-1760s Eastland made microscopes together with the London instrument maker John Cooke. In 1764 the latter had been one of the signatories of the protest against Dollond's exclusive patent on the achromatic telescope. At least two microscopes have survived bearing the joint signatures of Eastland and Cooke (Fig. 6).⁵⁰ So, apart from the exchange of information, it is also highly likely that Eastland worked as a subcontractor for Dellebarre during the initial phase of his microscope produc-

tion, probably assisting in the grinding of the lenses.

With his new microscope-design (Fig. 7) Dellebarre aimed to solve a number of problems. By using in the ocular four mutual exchangeable lenses with different focal lengths, he tried to obtain several different magnifications, as well as a larger field of view. Moreover by using pairs of crown and flint glass he also thought to have solved the problem of colour distortion in the image. However, to put it in the words of Eduard Frison: "Dellebarre had little or no understanding of practical optics; by simply bringing together, as he did, biconvex lenses of crown and flint glass, obviously no achromatism can be achieved".⁵¹ After all, the objective lens of Dellebarre's microscope was *not* achromatic! Nevertheless,

at the time Dellebarre's microscopes were highly praised.

In May 1771 Dellebarre composed a note about his new microscope which was published in the Amsterdam edition of the French *Journal des Sçavans*.⁵² In it Dellebarre explained that in the course of 1770 he had discovered this "Myroscope plus parfait", and that the instrument had received very flattering comments from several Dutch professors, both from Leiden and Utrecht. Indeed it is known that in 1772 David Hahn, professor of physics at Utrecht University wrote a letter of recommendation to the Berlin Academy of Sciences, with the result that indeed a Dellebarre microscope was acquired for the Academy's cabinet.⁵³ Further expressions of support followed, culminating in an official and very commendable declaration of approval by the French Académie Royale des Sciences in 1777.⁵⁴ But by then Dellebarre had moved to Paris⁵⁵, and Eastland had chosen his own path, establishing himself as an independent optician in The Hague, specialized in the construction of achromatic telescopes.

Eastland left Dellebarre's house in The Hague probably after one, possibly two years. In September 1772 the now widower Dellebarre remarried.⁵⁶ By that time Eastland lived in the "Jan Hendrikstraat, across the hat maker". A short time later he moved to the Boekhorststraat, "at the English shoe maker" (Fig. 8).⁵⁷ There at least he could speak his mother tongue.⁵⁸

Eastland as Independent Optician

In the 1780s Eastland attained again a certain degree of fame. A locally published journal, for instance, wrote about him:

In general people attribute the invention of the achromatic doublet or colourless telescope to the late Mr. Dollond, the famous English optician, but the London printed quarto edition of the *Universal Dictionary of Arts & Sciences* attributes and grants the honour of this discovery to one of the most renowned artisans of this city. His name is *Eastland*, who currently practices his art in The Hague.⁵⁹

According to this article, people in The Hague took Eastland to be the inventor of the achromatic telescope, although he himself never claimed the honour of that discovery. And even though the remark about the *Universal Dictionary of Arts & Sciences* seems to be wrong, it is interesting to note that the 1772 edition of *A New Royal and Universal Dictionary of Arts and Sciences* was issued by the engraver and publisher John Cooke (1730-1810), active

as such since 1765.⁶⁰ He seems to be the same man as the scientific instrument maker John Cooke, who in the mid-1760s was in a partnership with Eastland. So, although the lemma on the achromatic telescope in Cooke's version of the *Dictionary* coins "the late Mr. Dolond" [sic] as the inventor⁶¹, Eastland could have had the impression that his former partner would have told another version of this story.

Anyway, the emigrated English instrument maker continued his old practise in his new country. In 1781, for instance, Eastland performed repairs on optical instruments at the Stadholder's court and he delivered also a telescope.⁶² However, the largest order came from the Dutch East India Company (VOC). In the years between 1782 and 1788 Eastland and his new Dutch business companion Jonas Regenboog (about whom more below) delivered 108 "achromatic helmsmen's telescopes [...] of equivalent quality and price to English examples", for 20 guilders each.⁶³ Several Dutch auction catalogues from that time testify to Eastland's activity. For instance the instrument cabinet of the wealthy Amsterdam merchant Aron de Joseph de Pinto contained in 1785 a "telescope with nine eye-glasses, made by Eastland in The Hague".⁶⁴ This production of telescopes even attracted attention in Germany. In 1796 the *Algemeine Litteratur Zeitung* reported that, in The Hague "lives an English optical instrument maker by the name of Eastland, who manufactures very good achromatic telescopes" (see Fig. 9).⁶⁵

Eastland's Dutch Apprentices: 1. Jona Francis Robert

As he had done previously in England, Eastland employed an apprentice shortly after his arrival in Holland.⁶⁶ The first was Jona Francis Robert, a former Grenadier of the Swiss Guard in The Hague.⁶⁷ Apparently, Robert saw more prospects in a civil employment and so he resigned from the army. It is not known how long Robert worked for Eastland. In any case, after his training, Robert was hired as a personal instrument maker by the wealthy Zeeland regent Johan Adriaen Van de Perre, a man with remarkable interests in the natural sciences.⁶⁸ Between 1769 and 1779 Van de Perre had been the representative of Stadholder Willem V in the province of Zeeland, and as such he was a prominent member of the Dutch parliament, the States-General of the Netherlands. For that reason Van de Perre frequently resided in The Hague, where he lived in luxury in a palace on the Prinsessegracht.⁶⁹ It is therefore unsurprising that Van de Perre's cabinet of scientific instruments contained a microscope craft-

ed by "W. *Eisland en Corpa, te 's Hage*" (an obvious misread for 'W. Eastland and Comp, in the Hague').⁷⁰ When in 1779 he decided to return to Zeeland to live as a "Philosopher", leading a life devoted to the sciences, Van de Perre engaged this Jonas Robert, whom he knew through "de heer Estland" ['Mr Eastland'].⁷¹

It was Robert who, at Van de Perre's request, participated in the construction of a huge planetarium, today still on display in Middelburg.⁷² In 1787, however, Robert obtained another position, namely that of "Mechanist bij het Cabinet van zyne Doorluchtige Hoogheid Prins Willem V" ['Instrument maker to the Cabinet of His Illustrious Highness Prince Willem V']. Even though Van de Perre was reluctant to see him go, he did write a letter of recommendation to Aernout Vosmaer, the director of the Stadholder's Cabinet. In this letter, Van de Perre wrote that he knew Robert as an "orderly and honourable man and a very fine instrument-maker" who had served him "faithfully", not only maintaining his cabinet of experimental philosophy, but also "making various new pieces, to the admiration of myself and of many other cogniscenti".⁷³

Eastland's Dutch Apprentices: 2. Jonas Regenboog

Jona Francis Robert was not the only instrument maker to collaborate with Eastland. In the Utrecht University Museum is a small microscope, signed "*Eastland & Comp*".⁷⁴ The addition '*& Comp*' almost certainly indicates to Eastland's association in 1779 with the "konstwerker" ['instrument maker'] Jonas Regenboog.⁷⁵ In the accounts of the East India Company VOC this name is mentioned frequently as an associate of Eastland. Regenboog was a former pupil of the "Fundatie van Renswoude" in Delft. This Foundation provided practical training in technical professions for talented orphans in Delft, as well as in similar institutions in The Hague and Utrecht.⁷⁶

Jonas Regenboog was born in Delft on 23 January 1753, as the son of Pieter Pietersz Regenboog and Johanna Koeleweij. His parents both died before his fifth birthday, so Jonas was adopted by the Delft orphanage on 8 July 1758, where he was to remain for seven years. In that time he must have brought to the attention of the proprietors of the Renswoude Foundation, since on 4 November 1765, he was admitted at that institution as a 12-year-old pupil. Due to a fractured bone, he was unable to perform heavy manual labour. Probably because of this, he was trained to be a silversmith from 1767 onwards. His first tutor, the Delft silversmith Dirk van de Goorbergh, con-

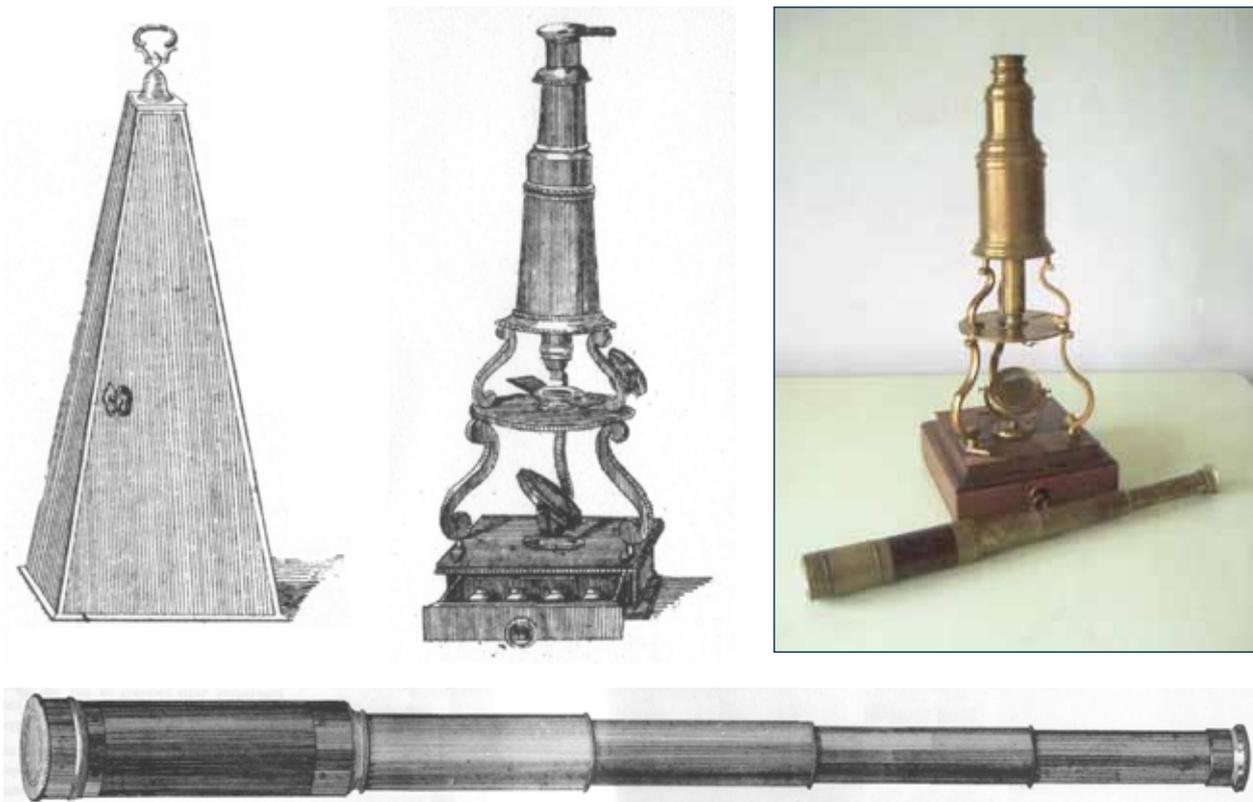


Fig. 10 Engravings of a telescope and a compound microscope, exactly resembling the instruments passed down through the family of Jonas Regenboog, Eastland's Dutch business companion and successor. Illustrations from the catalogue of scientific instruments in J. Heynen's Raadgevingen voor Minkundigen (1839). Heynen was the successor of the firm 'Eastland & Comp'.

sidered him to be too frail, and refused to continue his apprenticeship. Contacts with silversmiths based in The Hague were also fruitless. Eventually Regenboog continued his apprenticeship with the English silversmith Thomas Bakewell in Rotterdam. There he must have learned the English language. By 1773, Regenboog finally reached a sufficient level of skills to become a master silversmith. The regents of the Renswoude Foundation, who had obtained a silver corkscrew from the newly installed silversmith, licenced Regenboog to elaborate his education by learning how to manufacture jewels from the French jeweller Deshons in The Hague. However, the intended association with this individual was unsuccessful. Now the regents offered Regenboog the choice to continue his studies in France or in England, or to settle, supported by the Foundation, as an independent 'master jeweller' in The Hague. Jonas preferred the latter - probably because his girlfriend was pregnant - and with a start-up capital of 600 guilders from the Foundation, he settled in January 1777 in The Hague, in a house at the Noordeinde. The following April he married Elisabeth Engeler from The Hague, and at the beginning of July 1777 she gave birth to their first son. In total, the couple produced ten children dur-

ing the period 1777 to 1793, of who only four reached adulthood.

Because Regenboog had come off age, the archives of the Renswoude Foundation are silent about his association with William Eastland. It is clear, however, that Regenboog never worked as an instrument maker under his own name. He always used the name "Eastland & Comp", even after the death of his elderly business partner and optical tutor, William Eastland, in December 1787.⁷⁷ For instance, in 1792, the firm "William Eastland en comp.", "Optische Glase-Slypers en Instrument-Maakers in 's Gravenhage" ('optical grinders and instrument makers in The Hague') added a 14-page addition on practical matters to the Dutch translation of George Adams *Verhandeling over het Zien*.⁷⁸ In this addition Dutch customers were encouraged to buy - or offer for repair - all kinds of optical equipment.⁷⁹ In 1798, Regenboog indeed repaired a microscope made by the Leiden instrument maker Jan Paauw, using the name "Wm. Eastland & Comp".⁸⁰ Another booklet by "Eastland & Comp", called *Optische beschrijving van het oog*, was also issued, but at present no copy could be found.⁸¹

In 1802, Jonas Regenboog was appointed

to the post of Custodian ("Custos") at the "Gezelschap ter beoefening der Proefondervindelijke Wysbegeerte in Den Haage" (the 'Society for the Study of Experimental Philosophy in The Hague'), established in 1797 and renamed in 1805 "Maatschappij voor Natuur- en Letterkunde Diligentia" ('Society for Nature and Literature, Diligence'). The job of the custodian was to assist the 'working members' of the society in undertaking their experiments and to offer the necessary services relating to the Society's Cabinet of Scientific Instruments. For a professional instrument maker, this was obviously a part-time position, which Regenboog presumably occupied until 1817.⁸² However, he was not only an instrument maker. During these years he remained active as a 'jeweller'. When in 1795 the guilds were abolished under French influence, Jonas Regenboog was still registered as a silversmith. He also trained his sons Jonas and Jacob to be a jeweller.⁸³ Nonetheless, the optical instrument manufacture remained one of his main pursuits, as is evident from the fact that in 1825, for example, the elderly Jonas Regenboog submitted a number of polished lenses to a large industrial exhibition in Haarlem, using the firm's name *Eastland & Co*.⁸⁴ The quality of his work was so outstanding that he was awarded a

bronze medal. The inspection report of the manufacturing committee is particularly informative regarding the question how the firm was known in those days:

The committee has inspected, with great interest, the concave and convex ground glasses, exhibited by the very elderly, but still very skillful optician Regenboog, under the company name 'Eastland and Comp.' at The Hague. *Eastland*, his former companion who died many years ago, had worked with the aged *Dollond* in London; who left him at the time when he [Dollond] made his name with the achromatic telescope, and was able to transfer the art of grinding achromatic glass elements from there to this locality. This firm has long been well known for these developments, and the surviving contributor is still active; as can be demonstrated by the achromatic glasses of different diameter and focal length exhibited by him. The display is set up to show in sequence his smallest ground lenses up to those of 100 Rhinell[and] inches focal length. The Commission awarded this firm a bronze medal.⁸⁵

On 4 February 1839, Regenboog's wife died after 62 years of marriage. For the 86-year-old instrument maker, this was the moment to give up his glass-grinding. That very month he began negotiating the buy-out of his business by his largest competitor, the successful optician Jacobus Heynen (1790–1860), who had moved to the Noordeinde of The Hague in 1834.⁸⁶ The upshot of those negotiations is clear from the following two entries in the *Dagblad voor 's Gravenhage* of 15 March 1839:

1. I hereby announce to my esteemed [customers] that, as a result of my age and infirmity, I have transferred ownership of my Optical Glass GRINDING WORKS to Mister J. Heijnen, Optical Expert and Purveyor to His Majesty the King of the Netherlands; whom I thank for his constant support for the firm of EASTLANDT and REGENBOOG. I have the boldness to recommend, with the fullest confidence, Mister Heijnen, through his proven thorough expertise in this art, to my former patrons. [Signed] EASTLANDT and REGENBOOG

2. My reference to the above Announcement of Messrs EASTLANDT and REGENBOOG, whose famous SPECTACLES and OPTICAL GLASS GRINDING WORKS, etc., I have taken on behalf of my son, who worked in my workshop as an instrument maker. I take the liberty of trusting in my beloved coun-

try and countrymen, promising them prompt service and integrity. [Signed] J. Heijnen, Optical Expert and Purveyor to His Majesty the King of the Netherlands.

Shortly afterwards, Heynen published a well-known booklet, the *Raadgevingen voor Minkundigen, tot conservatie van het gezicht, en over het gebruik en misbruik van brillen, oogglazen, enz.* ['Guidance for Experts, on preserving the surface of, and on the use and misuse of, spectacles, eyeglasses, etc.'].⁸⁷ Although Heynen ended this booklet by saying that "his advice does not arise from self-interest or selfishness, but only from the desire to be useful to his fellows" it nevertheless appears, from the illustrated *Generale Catalogus van optische, mathematische en physische instrumenten, die gemaakt en voorhanden zijn in het magazijn van J. Heijnen [...] te 's Gravenhage in het Noordeinde* ['General Catalogue of optical, mathematical and physics instruments made and sold by J. Heijnen [...] from his shop in the Noordeinde area of The Hague'] that was printed in the back of the booklet, that a main objective was to highlight to the public his extensive store inventory. Some of these instruments must have come directly from 'Eastland & Regenboog', including not only a number of achromatic telescopes, but presumably also some 'physical and mathematical objects', such as electrifying machines and air pumps. The illustrations from Heynen's booklet show both new products and a number of instruments of eighteenth-century design (Fig. 10).⁸⁸

On 30 August 1839, just over six months after the death of his wife, Jonas Regenboog died. In his obituary he was described as an "Optical glass grinder and instrument maker"⁸⁹ Through the Heynen company, who subsequently adopted the establishment date of 'Eastland & Regenboog' as its own, the firm continued to exist until 1929, when the Great Depression put an end to a century and a half of history.⁹⁰ By then, the Dollond dispute and the achromatic telescopes, where it had all begun, had long become forgotten.

Acknowledgement

The author is indebted to (1) the late Dick A. Regenboog (1941-2013), descendant of Eastland's apprentice Jonas Regenboog; (2) Marlise Rijks for her research in the archives of The Hague (3) Tiemen Cocquyt, Museum Boerhaave, for his generous assistance (4) Gloria Clifton, emerita curator of the National Maritime Museum, Greenwich, for her information from English sources and (5) Dr. Alison Morrison-Low, principal

curator of the National Museums Scotland in Edinburgh, for her mediation in translating the earlier Dutch paper (of which this article is an enlarged and updated version) into English. Cf. 'De opmerkelijke geschiedenis van de Haagse instrumentmakersfirma 'Eastland & Regenboog' (c.1768-1839), of hoe het beruchte Engelse patent voor de achromatische telescoop in Nederland werd ontdekt', *Studium. Tijdschrift voor Wetenschaps- en Universiteitsgeschiedenis*, 4 (2011), pp. 171-180.

Notes and References

1. Brian Gee (edited by Anita McConnell and Alison Morrison-Low), *Francis Watkins and the Dollond Telescope Patent Controversy* (Ashgate 2014).

2. Other opticians sued by Peter Dollond for the infringement of his late father's patent were Francis Watkins, Addison Smith and Christopher Stedman. In 1768 Dollond also started a legal procedure against Henry Pyefinch.

3. Many persons have discussed this topic. See for instance: Duane H. Jaecks, 'An investigation of the eighteenth-century achromatic telescope', *Annals of Science*, 67:2 (2010), pp. 149–186; Richard Sorrenson, 'Dollond & Son's Pursuit of Achromaticity, 1758-1789', *History of Science*, 39 (2001), pp. 31–55; M. Eugene Rudd, Duane H. Jaecks, Rolf Willach, Richard Sorrenson & Peter Abrahams, 'New light on an old Question: who invented the Achromatic Telescope?', *Journal of the Antique Telescope Society*, 19 (Summer 2000), pp. 3–12; R. Willach, 'New Light on the Invention of the Achromatic Telescope Objective', *Notes and Records of the Royal Society of London*, 50:2 (1996), pp. 195–210. More general context is presented by Richard Sorrenson, *Perfect Mechanics. Instrument Makers at the Royal Society of London in the Eighteenth Century* (Boston 2013); Jared Pashovitz, *Market Knowledge: the Philosophic Instrument Trade in Eighteenth-Century England*, Master's Thesis, Department of History, University of Saskatchewan, available on the internet; Anita McConnell, 'A survey of the networks bringing a knowledge of optical glass-working to the London trade, 1500-1800' (unpublished tract, April 1997, available on the internet), and Mary Margaret Robischon, 'Scientific Instrument Makers in London During the Seventeenth and Eighteenth Century', [unpublished] Ph.D. dissertation University of Michigan, 1983.

4. John Dollond, 'A Letter from Mr. John Dollond to James Short Concerning a Mistake in M. Euler's Theorem for Correcting the Aberrations in the Object-Glass of Refracting Telescopes', *Philosophical Transac-*

tions, 48 (1753-1754), pp. 289-291.

5. John Dollond, 'An Account of some Experiments concerning the Different Refrangibility of Light', *Philosophical Transactions*, 1 (1758), pp. 733-743.

6. The names of these 35 protesting instrument makers were first found in the archives by R.B. Prosser. See his article: 'The invention of the achromatic lens', *The Observatory*, 40 (1917), pp. 297-301. Their petition to annul Dollond's patent was read aloud in court on 22 June 1764. (National Archives, Kew. London, Privy Council Papers ref. PC 1/7 no.94: 'Petition for the revocation of John Dollond's patent of 1758').

7. See the literature in n. 3.

8. Others attributed this role to the instrument maker Robert Rew. Cf. Anita McConnell, *Jesse Ramsden (1735-1800), London's Leading Scientific Instrument Maker* (Ashgate, 2007), p. 239; Stuart Talbot, 'Jesse Ramsden FRS., his Optical Testament', *Bulletin of the Scientific Instrument Society*, no. 50 (1996), pp. 27-29. James Ayscough was active as an independent optician since 1748. He had been apprenticed to James Mann in c. 1732 and went into a partnership with Mann during the years 1743-1747. See Gloria Clifton, *Directory of British Scientific Instrument Makers 1550-1851* (London, 1995), p. 13.

9. 'The answer of William Eastland', 29 October 1765. National Archive (Kew Richmond, London): Chancery Court, PRO C12/1956/19. See, Robischon, 'Scientific Instrument Makers in London' (n. 3), p. 288.

10. Robischon, 'Scientific Instrument Makers in London' (n. 3), p. 293. Gee, *Watkins and the Dollond Controversy* (n. 1), p. 147.

11. *Ibid.*; Gee, *Watkins and the Dollond Controversy* (n. 1), p. 151-152.

12. Sorensen, 'Pursuit of Achromaticity' (n. 3), p. 42.

13. Gee, *Watkins and the Dollond Controversy* (n. 1), p. 177; The Prideaux family is an ancient Cornish clan whose origins go back to the 11th century. The only 18th-century Richard Prideaux I was able to trace was 'Mr Richard Prideaux of Tavistock, Devon.', mentioned in the subscription list of *The Family Expositor* (London, 1753). He was an important serge weaver, who also served as the portreeve of Tavistock. A George III silver two-handled cup and cover, engraved on one side with a coat-of-arms and on the other the inscription 'The Worshipful Richard Prideaux Esquire Portreeve of Tavistock 1762', was auctioned at Bonhams, 24 September 2014, lot. no. 167. See R.M. Prideaux, *Prideaux: a Westcoun-*

try clan (Chichester, 1989); Archive Devon, Devon Freeholders Book, QS/7/41 (1767) and QS/7/44 (1771); website Bonhams.

14. McConnel, *Ramsden* (n. 8), p. 239 and Talbot, 'Ramsden' (n. 8), p. 28: "Mr. Hall, in court, produced several object glasses, and the court admitted him the prior inventor". (Extract from a letter by Watkins to Ramsden, dated 1763).

15. First published by an anonymous, but well informed author 'Veritas', thought to be Peter Dollond's former brother-in-law, Jesse Ramsden: 'Letter to Mr. Urban', *Gentleman's Magazine and Historical Chronical* 60:2 (1790), pp. 890-891. Partly reproduced in *The Philosophical Magazine*, 2 (1798), p. 177. See Talbot, 'Ramsden' (n. 8).

16. James Champneys became an apprentice to the optician Richard Winn at Fleet Street in 1752. See Clifton *Directory* (n. 8), pp. 54, 301.

17. 'The answer of James Champneys', 29 October 1765: "And this defendant saith that for about ten months last past [he] made and vended several of such glasses made after the invention of Mr E[squire] Hall, and still continues to sell the same". (National Archive (Kew Richmond, London): Chancery Court, PRO C12/1956/19).

18. Champneys was only able to pay £ 204. See Gee, *Watkins and the Dollond Controversy* (n. 1), p. 183-189; Sorensen, 'Pursuit of Achromaticity' (n. 3), note 40.

19. John Cuthbertson became an apprentice to James Champneys in 1761. He was installed as a 'poorter' (citizen) of Amsterdam on 29 December 1768. See W.D. Hackmann, *John and Jonathan Cuthbertson. The Invention and Development of the Eighteenth Century Plate Electrical Machine* (Leiden, 1973), p. 14.

20. A manual for globes is mentioned in an advertisement in the *Amsterdamsche Courant*, 18 December 1770. Other publications are in the Utrecht University Library: *Verzameling van eenige fraaie proeven, voor de tafel-lugtpomp. Benevens eene beschrijving van twee zulke werktuigen, zo als dezelve gemaakt worden door John Cuthbertson en James Champneys* (Amsterdam: Yntema and Tieboel, 1770); *Beschrijving van eenige der fraaiste electrische proeven, met een voorafgaand berigt wegens het gebruik van de nieuw uitgevonden electriseer machine, welke gemaakt en verkogt worden by John Cuthbertson en James Champneys, mathematisch, physische en optische instrument makers* (Amsterdam, 1770). For the products sold in their workshop at the corner of the Kromme Elleboog en Beurssteeg, see: *Cata-*

logus van optische, mathematische en physische instrumenten, welke gemaakt en verkogt worden, by John Cuthbertson en James Champneys, t'Amsterdam (n. p. n.d. [=c. 1770]).

21. The reflecting telescope, signed 'Cuthbertson & Champneys Amsterdam' is in the collection of Museum Boerhaave, Leiden. A similar telescope is mentioned in the Isaak Warnsinck sale (Amsterdam 1858). Other instruments bearing their joint signature are an 'universal ring dial' (Collection Harvard University) and a 'pantograph' (Utrecht University Museum). See *Catalogus van twee uitmuntende collectien [...] nagelaten door [...] Is. Warnsinck* (Amsterdam: F. Muller, 1858), no. 3 and H.J. Zuidervaat, *Telescopes from Leiden Observatory and other collections, 1656-1859. A Descriptive Catalogue* (Leiden, 2007), no. 161.

22. *London Gazette*, 14 January; 8 February; 2 May and 20 June 1772.

23. *Gazetteer and New Daily Advertiser*, 20 March 1772, cited after: Gee, *Watkins and the Dollond Controversy* (n. 1), p. 188.

24. *London Gazette*, May 1775; Gee, *Watkins and the Dollond Controversy* (n. 1), p. 189.

25. *A List of the Society for the Encouragement of Arts, Manufactures and Commerce* (London, August 1777), p. 12.

26. On John Cuthbertson, as the designer of a new type of electrical machine, see Hackmann, *John and Jonathan Cuthbertson* (n. 19).

27. See Jonathan Cuthbertson's advertisements in the *Rotterdamsche Courant*, 9 March 1790; 30 August 1791; 22 September 1791.

28. For a Cuthbertson made telescope is advertised in the *Leydse Courant*, 19 December 1770. Microscopes made by Cuthbertson were present in the auctions of De Pinto (Amsterdam, 1785), Van Swieten (Rotterdam, 1789), an anonymous gentleman from Amsterdam (10 July 1794) and Ferdinand Alvarez (The Hague, 1801).

29. Jonathan Cuthbertson, *Verhandeling over de Verrekykers. Bebelende, eenige dwaalingen van de onkundige daar over. Hoe of men zy stellen en gebruiken moet. Welke geschikt is tot byzondere gebruiken. Manier om de vergrootende vermoo- gen, en volmaaktheid te vinden. En hoe of men weeten kan welke de beste is &c, &c.* ([n.p. = Rotterdam] 1794). Only known copy: Scheepvaart Museum, Amsterdam (Crone collection).

30. John Cuthbertson made for instance the

largest electrostatic machine ever made in the eighteenth century, still preserved at Teyler's Museum in Haarlem.

31. *Amsterdamsche Courant*, 30 March and 24 April 1793.

32. Hendrik Hen called himself 'maker and retailer of physical and optical instruments'. From 1808 on he worked '*In de Groene Brill*' ('In the green spectacles'), Kalverstraat no. 35. Hen was also Cuthbertson's Dutch agent (see *Amsterdamsche Courant*, 9 May 1793). After his death in 1819, his widow continued the business at least until 1832. Hartog van Laun, worked in Amsterdam as an independent instrument maker between 1784 and 1815. His heirs (Abr. van Laun, Van Emden and Boosman) continued the instrument makers business until 1881. See H. Hooijmaijers, 'Hartog van Laun's Orrery', *Bulletin of the Scientific Instrument Society*, No. 106 (Nov. 2010), pp. 6-12.

33. H. J. Zuidervart, 'Cabinets for Experimental Philosophy in the Netherlands', in: Jim Bennett & Sofia Talas, *Cabinets of Experimental Philosophy in Eighteenth-Century Europe* (Leiden/Boston: Brill, 2013), pp. 1-26.

34. J.H. Leopold, 'Some notes on Benjamin Ayres', in: R.W.G. Anderson [et al], *Making Instruments Count. Essays on Historical Scientific Instruments presented to Gerard L'Estrange Turner* (Aldershot, 1993), pp. 395-402.

35. Peter de Clercq, 'Science at Court: the Eighteenth-century Cabinet of Scientific Instruments and Models of the Dutch Stadholders', *Annals of Science*, 45 (1988), pp. 113-152, esp. p. 123. An English air pump, signed with his name was in the collection of the Fundatie van Renswoude in The Hague, later transferred to the Musée de l'industrie in Brussels, see N.E. Mailly, *Catalogue des collections du musée de l'industrie* (Bruxelles, 1846), no. 704. The Musée de l'industrie was dissolved after 1861.

36. The *Webster Signature Database of the Adler Planetarium* mentions father and son William Eastland, following E.G.R. Taylor, *The Mathematical Practioners of Hanoverian England* (Cambridge, 1966). This, however, relates to his cousin of the same name, a son of George Eastland of Rotherhithe (Surrey), who, from 1762 onwards, was a student of William Eastland: <http://historydb.adlerplanetarium.org/signatures/>.

37. The Hague archive, register of immigrants, 16 September 1778: Re-enrolment for four years of William Eastland, born 'Ipson, Episcopaal, onghewwd, konstwerker',

living in the Boekhorststraat at 'the English shoe maker'.

38. Records of the Spectaclemakers' Company at London Metropolitan Archives, Court Minutes, volume 2, 1695-1738, ref. MS5213/2, folio 109: 26 February 1718/19. [England used the Julian calendar in which the new year started on 25 March until 1755]: 'W[illia]m Eastland, Son of John Eastland late of the parish of Ebbitham (sic) in the County of Surry, farmer dec[eas]ed putt Apprentice to Thomas Gay C[itize]n & Spectacle[make]r of London for 7 yeares from this day - Cons[ideration] Love & good will'. The place mentioned in Surrey is probably Ebbisham. Idem, fol. 170, 31 March 1726: 'William Eastland formerly bound to Thomas Gay and turned over to Thomas Lincoln admitted & sworn free'. Apparently Eastland had completed his seven-year apprenticeship with Thomas Lincoln. For optical instrument makers Thomas Gay (fl. 1711-1732) and Thomas Lincoln (fl. 1720-1762), see Clifton, *Directory* (n. 8), p. 91.

39. Thomas H. Court & Moritz von Rohr, 'Contributions to the history of the Worshipful Company of Spectaclemakers', *Transactions of the Optical Society*, 31:2 (1930) pp. 53-90, esp. p. 56, 78.

40. National Archives (Kew, Richmond), C 11/2455/11 (1737): Eastland versus William Maynard and ten others.

41. *The London Gazette*, 2 August 1743.

42. Jaecks, 'The eighteenth-century achromatic telescope' (n. 3), p. 168.

43. Old Bailey Proceedings: Accounts of Criminal Trials, 13th April 1768. See the website 'London Lives'.

44. Archive The Hague, inv. no. 1123, fol. 91.

45. In March 1766 Louis François Dellebarre, "leermeester in de geografie, jongman van Abbeville", living at the Pieterskergragt, married Marie Louise Françoise de Lannoy, "jonge dochter van Abbeville in Picardie". Archive Leiden, inv. no. 1004 (Schepenhuwelijken) Inv. no. 208, M-221.

46. Quittanciën library and cabinet Willem V. Koninklijke Bibliotheek, The Hague, inv. no. 131F14: invoices 21 April and 25 May 1770.

47. *Ibid.*, invoice, 3 September 1770.

48. Museum Boerhaave, Leiden. documents object v07643.

49. Archive The Hague, Fundatie Renswoude. Printed in Maria Rooseboom, *Bijdrage tot de geschiedenis der instrumentmakerskunst in de noordelijke Nederlanden* (Leiden 1950), pl. 2. See also Quit-

tanciën (n. 46): invoice 29 August 1772.

50. According to Gloria Clifton, John Cooke of Snow Hill, London, became a free member of the Stationers Guild in 1760. He was active as an instrument maker from 1761 until 1767. One microscope signed '*Eastland | & | Cooke | London*' is preserved in the family of Jonas Regenboog, Eastland's Dutch business companion. A similar microscope is in the collection of the Powerhouse Museum, Sydney Australia, reg. no. H5545. Another microscope with this signature is mentioned in the sale of the cabinet of experimental philosophy of an anonymous gentleman from Amsterdam (10 July 1794), no. 41.

51. E. Frison, 'Sociaal-economische toestanden en enggeestige corporatieve beperkingen als invloedsfactoren op de bouw van wetenschappelijke instrumenten in de 18de en 19de eeuw', *Scientiarum Historiae* (1962), pp. 76-90, esp. 85.

52. 'Lettre sur les différences des effets du Grand myroscope Universel, Achromatique de L.F. Dellebarre d'avec tous ceux qu'on a faits précédemment', *Journal des sçavans, avec des extraits des meilleurs journaux de France & d'Angleterre*, 54 (Amsterdam, 1771), pp. 225-240. A Dutch translation followed soon: *Onderscheidene achromatische microscoop door F.L. Dellebarre, vergeleeken tegens die geene, die men voorbeene ofte tot nog toe gemaakt heeft* (n.p., n.d. [=1771]). Copy at Museum Boerhaave, Leiden.

53. *Nouveaux mémoires de l'académie royale des sciences et belles-lettres. Année 1772. Avec l'histoire pour la meme année* (Berlin, 1774), pp. 56-57.

54. *Memoire sur les différences de la construction et des effets du microscope de M. L.F. Dellebarre, d'avec tous ceux qu'on a faits précédemment* (La Haye, 1777).

55. See Louis-Sébastien Mercier, *Tableau de Paris*, Vol. 1 (Hambourg/Neuchatel, 1781), pp. 239-240.

56. Rooseboom, *Bijdrage* (n. 49), p. 56. Dellebarre remarried Johanna Maria Rousselet (b. 1721), from Amsterdam.

57. Archive The Hague, inv. no. 1039 (List of foreigners in the respective areas of The Hague), fol. 37v.

58. In August 1777, a Charles Eastland 'from The Hague' (!) enlisted as "jongmatroos" ('young sailor') on the Dutch East India vessel 'Ridderkerk', sailing for Batavia in the Dutch East Indies. This probably concerned one of William Eastland's illegitimate children, procured in London. Archive VOC, no.

14050: 'Carel Eastland uit 's Hage'. In service as 'jongmatroos': 28 August 1777, sailing with the Ridderkerk; dismissal in Batavia: 28 November 1778 (died).

59. *Bibliothèque des sciences et des beaux-arts* 50 (La Haye: Gosse, 1781), table des matières, lemma 'Lunettes achromatique': "On en attribue généralement l'invention à feu Mr. Dollond célèbre Opticien Anglais, mais le *Dictionnaire universelle des Arts & des Sciences* imprimé a Londres in 40. fait honneur de cette découverte déjà annoncée en 1752 à un des principaux Artistes de cette Capitale. Il se nomme *Eastland*, & exerce encore actuellement son art a la Haye en 1780".

60.. *A new royal and universal dictionary of arts and sciences, or, complete system of human knowledge* (London: John Cooke, 1772). In 1778 two other dictionaries appeared: Adam Rees, *Cyclopaedia, or an Universal Dictionary of Arts and Sciences* (London: various publishers, 1778) and *The new complete dictionary of arts and sciences, or, an universal system of useful knowledge* (London: Alexr. Hogg, 1778). In all these volumes Eastland is not found as being mentioned.

61. [Cooke], *Dictionary* (n. 60), lemma 'Achromatic', stating that "Mr. John Doland [sic] obtained his majesty's letters patent for the sole disposal of it".

62. Quittanciën (n. 46): invoices 3 May 1781 and 2 Febr. 1782.

63. Dirk de Vries, Günter Schilder, Willem Mörzer Bruyns, Peter van Iterson, Irene Jacobs, Nils Persson & Ton Vermeulen, *The Van Keulen Cartography Amsterdam 1680-1885* (Alphen aan de Rijn, 2005). See also: G. Asaert, *Maritieme geschiedenis der Nederlanden: Achttiende eeuw en eerste helft negentiende eeuw, van ca. 1680 tot 1850-1870* (Bussum, 1978), p. 221.

64. This telescope was bought for 20 guilders by a certain 'Van Hemert'. In 1801, a pocket microscope with objects in a shagreen case, made by W. Eastland ("Een fraai Zak Microscoop en Voorwerpen door W. Eastland in een segrijne kasje") was sold in the The Hague sale of Gelinuis van Spaan, merchant of Rotterdam. In 1808 a microscope in mahogany case by 'Eastland & Regenboog' was sold in The Hague, in the auction Maritz/ Pasteur, no. 628.

65. *Allgemeine Litteratur Zeitung*, 4 (1796), p. 249: 'im Haag ein Englischer Opticus, namens Eastland, befindet, der sehr gute achromatische Fernröhre ververtiget'.

66. William Eastland's English apprentices were: in 1753, Thomas Strong, son of the

widow Mary Strong from the parish of Saint Ann's Westminster, and in 1762, William II Eastland, son of George Eastland from Rotherhithe in Surry Cooper. When William I left for Holland, in July 1768, the later was turned over to Henry Shuttleworth. William II Eastland was admitted and sworn in 1773, "at Mr Offin's dealer in Cloths Rose Street Long Acre". However, he soon seems to have left the profession. In 1774 William II Eastland was called a 'chandler', when he became a prisoner in the Poultry Compter in the city of London. Why he was imprisoned is not known. Cf. Personal communication of Gloria Clifton and *The London Gazette*, 25 June 1774.

67. The Leiden instrument maker of Swiss decent Felix Meylan (†1832), had a similar background as Jona Francis Robert. Meylan is known to have made Dellebarre microscopes (e.g. in 1788), so he could have been one of Dellebarre's apprentices. Meylan was a former captain of the Swiss Guard in The Hague, born in "la vallee du Lac de Joux", near Bern. He was registered in The Hague in 1774. In 1789, in Leiden, Jona Francis Robert was a witness at the baptism of one of Meylan's children. Cf. Marian Fournier, *Early Microscopes. A Descriptive Catalogue* (Leiden, 2003), no. 281.

68. H.J. Zuidervaart and H. Hoitsma, 'Een Zeeuws planetarium uit de tweede helft van de 18^e eeuw', *Archief. Mededelingen van het Koninklijk Zeeuwsch Genootschap der Wetenschap* [AKZGW] (1982), pp. 69-148, esp. p. 86. See also H.J. Zuidervaart, 'Mr Johan Adriaen van de Perre (1738-1790). Portret van een Zeeuws regent, mecenas en liefhebber van nuttige wetenschappen', *AKZGW* (1983), pp. 1-169.

69. C.J.J. Stal [e.a.], *Prinsessegracht 29, een monumentaal interieur* ('s-Gravenhage, 1988) pp. 7-8.

70. Zuidervaart, 'Van de Perre' (n. 68), p. 123.

71. Zuidervaart & Hoitsma, 'Een Zeeuws planetarium' (n. 68), p. 86.

72. Today the Van de Perre-planetarium is on display in the hall of the Zeeuws Archief in Middelburg. Robert made its large copper ecliptica.

73. *Ibid.*, For information on the Stadholder's Cabinet, see De Clercq, 'Science at Court' (n. 35), pp. 113-152.

74. The microscope is illustrated and described in: P.H. van Cittert, *Descriptive catalogue of the collection of microscopes in charge of the Utrecht University Museum with an introductory historical survey of the resolving power of the microscope* (Utrecht, 1934), pp. 61-62. Van Cittert

writes that this instrument is signed "London", which I doubt. However, for reasons of renovation, this could not be checked. A microscope 'with its apparatus', bearing the signature 'Eastland & Comp.', was also present in the auction of the scientific instruments of Jhr. Menno Baron van Coehorn, sold in The Hague in November 1801 (no. 119).

75. In the beginning of the 20th-century the Heynen-firm of opticians - successor to the optical firm of Eastland & Regenboog - gave the year 1779 as their date of founding, which may well be correct. In that year, Van de Perre left for Zeeland from The Hague, probably accompanied by Eastland's former apprentice Jona Francis Robert. Eastland's lease for his house 'on the east side of Boekhorststraat, with an open exit onto the Katerstraat', ended on 1 April 1779. Eastland rented this accommodation for 140 guilders a year from Mr. Leonard Boeije, 'Extraordinaris-Clercq ter secretarije van Holland' (Special Clerk to the Secretary of Holland). (Archive The Hague, Nots H. Stenfert, act 143, folio 75).

76. E.P. de Booy and J. Engel, *Van erfenis tot studiebeurs. De Fundatie van Renswoude te Delft. Opleiding van wezen tot de 'vrije kunsten' in de 18e en 19e eeuw. De fundatiehuizen. Bursalen in deze eeuw* (Delft, 1985), pp. 128-129.

77. William Eastland died from a form of pneumonia ("slijmziekte") at the end of December 1787 Being recorded as 85 years of age. He was buried *Pro Deo* on the 29th in the "Groote Kerk" [Great Church] in The Hague. (Municipal Archives, The Hague).

78. This Dutch translation of George Adams's *An Essay on Vision* (London, 1789) was made by Henricus Aeneae, a well-known physicist, then living in The Hague. His instrument cabinet (auctioned in 1811) contained 'a pocket telescope by W. Eastland'.

79. A.J.J. Van de Velde, 'Zuid- en Noord-Nederlandsche Bibliographie over Natuur- en Geneeskunde tot 1800, eerste mededeling', *Verslagen en mededelingen van de Koninklijke Vlaamse Academie voor Taal- en Letterkunde* (1937), pp. 255-301, esp. 261-262.

80. Marian Fournier, *Early Microscopes. A Descriptive Catalogue* (Leiden, 2003), no. 158. A similar signature 'Eastland & Comp' was mentioned on a large achromatic telescope with a tripod stand in the catalogue of the sale of the instrument cabinet of the Dutch magistrate Pieter van Buren (1741-1822): *Catalogus van eene uitmuntende Verzameling van Boeken, Prentwerken en*

Prenten [...] nagelaten door [...] Mr. P. van Buren (The Hague, 1823), no. 79.

81. Mentioned in *Catalogus Bibliotheca E.J.Thomassen a Thuessink* (1832), no. 553 and *Catalogus Librorum M.J. Macquelyn* (1851), no. 300.

82. *Wetten voor het gezelschap ter beoefening der Proefondervindelijke Wysbegeerte In Den Haag* ('Laws regulating the Society for the Study of Experimental Philosophy in The Hague') 2nd Edition (The Hague, 1802), pp. 84-85. No optical instruments bearing the name of *Eastland & Co* are listed in the 'Naamlijst & Beschrijving der Natuurkundige Werktuigen behoorende aan de Maatschappij Diligentia in Den Haag, opgemaakt in het jaar 1815' ('Inventory and description of the scientific instruments belonging to the Philosophical Society Diligentia in the Hague'), preserved in the archive of Museum Boerhaave. Jonas Regenboog was probably the author of this inventory. It was only in 1817 that a new assistant, I.H. Nohr, was taken on. For the history of Diligentia, see: Rob Claassen and Peter Wisse, *Twee honderd jaar Diligentia, 1793-1993* (The Hague, 1993). For its cabinet of scientific instruments, see Peter Wisse, 'The Philosophical Society Diligentia and its Instrument Collection', *Bulletin of the Scientific Instrument Society*, No. 67 (2000), pp. 3-8.

83. In the notification of the death of Jacob Regenboog in 1819, his brother Jonas is named as a jeweller.

84. *Algemeene Konst- en Letterbode* 1825, 125; *'s-Gravenhaagse Courant*, 20 June 1825. See also the entry in the *Catalogus der Voortbrengselen van Nederlandsche Volks- en Kunstvljijt toegelaten ter tweede algemeene tentoonstelling, geopend binnen Haarlem in juli 1825* (Haarlem, 1825), pp. 126-127.

85. *Rapport der Hoofdcommissie ter beoordeeling van de voorwerpen van Nationale Nijverheid, ten toon gesteld te Haarlem, in de maanden Julij en Augustus 1825* ('s Gravenhage, 1825), p. 192.

86. In 1825 the optician Jacobus Heynen (†1860) lived on the 'Vijverberg' in The Hague. In 1826 he was listed as living in Dordrecht and in 1830 he was described as 'Gezichtskundige Brillenfabrikant' ['optical lens manufacturer'] in Haarlem. In 1832 he advertised himself as working with Willem Mensert, 'Oculist' to his majesty the King. In 1834 Heynen moved to the Noordeinde in The Hague, probably to the premises in which Jonas Regenboog had set up in 1779. In 1835, Heynen was described as 'Gezichtskundige Hofleverancier' ['optical

purveyor to the Royal Household], eventually, 1839 the firm of *Eastland & Regenboog* was incorporated with his business. Twenty years later, in 1859, he passed the ownership of the shop to his son Antonie Wilhelm Heynen who had been born in 1830. Antonie Wilhelm was married in 1852 to Maria J.W. Sala, daughter of a famous Leiden instrument maker, Carolus Antonius Sala. See Announcements in the *'s Gravenhaagsche Courant*, 11 May 1825; 8 May 1826; *Dagblad van 's Gravenhage*, 10 May 1830; *Vaderlandsche Letter-oeffeningen*, 1840, p. 366; *Algemeen Handelsblad*, 7 november 1859; *Leydse Courant*, 8 August 1879.

87. J. Heynen, *Raadgevingen voor Minkundigen, tot conservatie van het gezicht, en over het gebruik en misbruik van brillen, oogglazen, enz.* ('s Gravenhage, 1839).

88. See, for example, 'Catalogus' No. 70 (Culpeper-type compound microscope), no. 92 (cylinder electricity generator) and No. 94 (reflecting telescope of a type in standard usage in 1775).

89. *Dagblad voor 's Gravenhage*, 2 September 1839.

90. The final advertisement for the firm 'A.W. Heynen, opticien de la cour', appeared in the newspaper *Het Vaderland* [The Homeland], published in The Hague, on 26 May 1929. This firm was then run by Charles Heynen, the founder's great-grandson, who still resided at the address 'Noordeinde 48, The Hague'.

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