Found: a diagram of the 1630 Rome halo display

Eva Seidenfaden

Stadtbibliothek Trier, Weberbach 25, 54290 Trier, Germany
(eva.seidenfaden@t-online.de)

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Christoph Scheiner's diagram of the 1630 Rome halo display, thought to be lost already in 1658, may have been found.
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1. Introduction

The Rome halo display of 1630 was one of three halo displays that Christiaan Huygens used in the 1660s to illustrate his groundbreaking theory of halos [1]. Even in Huygens' day, however, the documentation of the display was weak. One of the observers, the Jesuit scholar Christoph Scheiner, had described the display in a 1631 letter to Pierre Gassendi. An engraved diagram of the display was supposed to accompany the letter, but the diagram had been lost already by 1658, according to the editors of Gassendi's *Opera Omnia*, where the letter was published [2]. Huygens in 1659 tried to locate the diagram but was unsuccessful. He then drew his own version of the diagram, basing it on the description in Scheiner's letter [3]. It is Huygens' diagram that has usually been offered in the literature as "the" diagram of the display. Then, in the 1890s, what appeared to be Scheiner's diagram of the display was found by Anton von Braunmühl in the Munich University Library. Von Braunmühl described the item but did not appreciate its significance for halo history. The diagram, a copper engraving, was part of a bound volume of material collected by Scheiner's assistant Johann Baptist Cysat [4]. Unfortunately, the volume is no longer to be found, probably a casualty of the bombing of the Munich University Library on the night of 9/10 March 1943 [5].

Thus, it was breathtaking to learn recently that a diagram of the display is among the holdings of the Herzog August Bibliothek in Wolfenbüttel [6]. It appears to be nearly identical to the version described by von Braunmühl [7].

2. Specifics

During an ongoing digitization campaign, a leaf showing the 1630 Rome halo display (Fig. 1) was included in the database "Virtuelles Kupferstichkabinett." The Kupferstichkabinett, funded by the Deutsche Forschungsgemeinschaft [8], is a cooperative project of the Herzog Anton Ulrich Museum in Braunschweig and the Herzog August Bibliothek in Wolfenbüttel.

The leaf is in the possession of the Herzog August Bibliothek and belongs to its graphics collection. According to Mrs. Petra Feuerstein-Herz at the Herzog August Bibliothek, the scan was added to the database on 7 October 2009. The provenance of the leaf is unknown [9]. As the online project description states, the "... roots of these collections derive from the collections of prints and drawings of the Dukes of Braunschweig-Wolfenbüttel. The historical coherence of these collections was lost in the course of the eighteenth and early twentieth century when objects were dispersed between the two institutions."

The leaf, showing a copper engraving and description, is 261 mm × 222 mm large and was once part of a bound volume—traces of the binding can still be seen on the right-hand side. According to Mrs. Feuerstein-Herz [9], the leaf has a watermark and is blank on the verso, with the exception of an older, small, handwritten letter "Q" and a more recent number "34." There are traces of an ancient fold about 20 mm from the left rim. There is no doubt that the leaf is an original 17th century printing.

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Fig. 1. (Color online) Wolfenbüttel diagram of the 24 January 1630 Rome halo display. (© Herzog August Bibliothek Wolfenbüttel, Graph. C: 707).

The diagram is a spatial representation, not just a flat projection, and the circular halos are not concentric. The outer parhelia cross the parhelic circle at the intersections with the larger halo.

3. Leads

At this preliminary stage, it is too early to assess the significance of the diagram for early halo history, and it is not the purpose of this article to do so; rather, it is to announce the existence of the diagram and to alert readers to the possibility that other material relating to the 1630 halo display may still await discovery. The leaf may also belong to an unknown published work dealing with halos.

Von Braunmühl speculated that the diagram was intended for inclusion in Scheiner's *Parelia in quibus multa de Iridibus, Halonibus, Virgis, Chasmatis*, a halo pamphlet that, as far as we know, was never published [10]. If von Braunmühl's conjecture is correct, there may be other copies of the diagram that have survived. There is also the remote possibility that a draft of *Parelia* might still turn up somewhere.

There is circumstantial evidence to suggest that the diagram might have passed through the hands of the Jesuit scholar Athanasius Kircher at some point. If so, his correspondence or publications might shed further light on the diagram or related material. Kircher was one of Scheiner's successors at the Collegio Romano [11]. The friendship between Kircher and Duke August the Younger has been described by Fletcher [12]. Kircher was in contact with Cardinal Francesco Barberini, Gassendi, Huygens, Peiresc, Scheiner himself, and many others [13], but the correspondence is immense, and checking all of it would be a daunting task. To start with the letters in the possession of the Herzog August Bibliothek seems a promising first step [14]. Another candidate is the Augsburg art merchant Philipp Hainhofer, also in contact with Wolfenbüttel [15]. Nevertheless, we have to keep in mind that there are many other ways the leaf may have reached Wolfenbüttel, not necessarily in the 17th century.

4. Conclusion

We found what seems to be an original diagram of the legendary 1630 Rome halo display. This gives us hope that this is not the only diagram that survived and that more material may still await discovery. A thorough study of the leaf and its possible context is necessary to reveal its significance for halo science.

References and Notes

1. C. Huygens, B. de Volder, and B. Fullenius, *Christiani Hugenii Zelemii, dum viveret, Toparchæ Opuscula Postuma, Quae Continent Dioptricam. Commentarios De Vitris Figurandis. Dissertationem De Corona & Parheliis. Tractatum De Motu. [Tractatum] De Vi Centrifuga. Descriptionem Automati Planetarii* (Apud Cornelium Boutesteyn, Lugduni Batavorum, 1703). The "Observatio Scheineri anno 1630" can be found on pp. 359–363 and is available at http://www.e-rara.ch/zut/content/pageview/1274375. The 1630 diagram is depicted on Tab. VI of the volume (http://www.e-rara.ch/zut/content/pageview/1274388).
2. P. Gassendi, *Opera Omnia* (Frommann, Stuttgart-Bad Cannstatt, 1964). A facsimile of the 1658 Lyon edition. On page 401 of Vol. 6 (available at http://gallica.bnf.fr/ark:/12148/bpt6k254689/f416.image.r=gassendi+opera+omnia+vol+6.langFR), Scheiner writes: "… cum qua etiam adiungo exemplar Pareliorum anno præterito obseruatorum eorumque explicatione …" The editor's entry following Scheiner's 3 December 1631 letter to Gassendi can be found on p. 402 (http://gallica.bnf.fr/ark/12148/bpt6k254689/f417.image.r=gassendi+opera+omnia+vol+6.langFR): "*Parheliorum Schemata exciderunt.*"
3. C. Huygens, *Œuvres complètes de Christiaan Huygens*. D. Bierens de Haan, ed. (Martinus Nijhoff, La Haye), Vol. 2 (1889), Correspondance 1657–1659. For example, in his 15 October 1659 letter to Huygens (p. 496), Chapelain writes: "Pour vostre projet *des Parelies et des Couronnes* je n'en attens rien de commun et de mediocre pour vostre gloire. Monsieur de Monmor a qui sans luy decouurir vostre fin, suyuant vostre desir, j'ay demandé de vostre part cette figure du Parelie de sept soleils obserués a Rome en 1630. par Scheiner, apres l'auoir cherchée dans les Manuscrits de feu Monsieur Gassendi m'a respondu qu'elle n'y estoit pas et m'a promis d'en escrire a Lion a lhomme [sic] du Defunt pour scauoir s'il la veuë et s'il ne la point, et pour l'obliger a la luy enuoyer au cas qu'elle soit en sa puissance." Also available at http://www.dbnl.org/tekst/huyg003oeuv02_01/huyg003oeuv02_01_0310.php#z0675. Huygens in his 25 July 1662 letter to Hevel writes: "Praecipua autem illa solium similis est in multis illi quam Scheinerus habuit Romae Anno 1630, in quâ item Soles 7 cujusque figuram ex epistola ipsius, quae in Gassendi operibus extat, restitui." [Huygens, Vol. 4, Correspondance 1662–1663 (1891), p. 182, http://www.dbnl.org/tekst/huyg003oeuv04_01/huyg003oeuv04_01_0091.php#z1037]. He had already made a similar statement in his 2 September 1660 letter to Chapelain [Huygens, *Oeuvres complètes*, Vol. 3, Correspondance 1660–1661 (1890), p. 120, http://www.dbnl.org/tekst/huyg003oeuv03_01/huyg003oeuv03_01_0074.php#z0775]. Much more about the 1630 halo display can be found in W. Tape, E. Seidenfaden, and G. P. Können, "The legendary Rome halo displays," Appl. Opt. 47, H72–H84 (2008).
4. A. von Braunmühl, "Originalbeobachtungen etc. aus der Zeit der Entdeckung der Sonnenflecken," Jahrbuch für Münchener Geschichte **5**, 53–60 (1894): "Derselbe ist ein in Schweinsleder gebundenes nicht paginiertes Buch in 2° und stellt, wie schon eingangs erwähnt, eine von Scheiners Schüler, dem schon wiederholt genannten Johann Baptist Cysat (1586–1657) zu eigenem Gebrauche angelegte Sammlung von verschiedenen ihm zugesandten Tafeln und Schriften, sowie einigen eigenen Handzeichnungen von Sonnenflecken dar. Wir heben aus dem Inhalte das Wichtigste hervor: 1) Das erste Blatt ist eine Kupfertafel, die in ein von Scheiner bereits vollendetes, aber nicht mehr erschienenes Werk über die Nebensonnen gehörte. Dasselbe gibt ein ziemlich gutes Bild einer solchen Erscheinung, die Scheiner am 24. Januar 1630 zu Rom beobachtete, wohin er im Jahr 1624 im Auftrage seiner Obern gekommen war, um die mit der Gründung eines Kollegiums in Neisse zusammenhängenden Geschäfte zu erledigen. Schon im April 1615 zu Ingolstadt und am 20. März 1629 zu Rom hatte Scheiner solche Erscheinungen beobachtet und war der erste Astronom, der sie einer eingehenden Würdigung unterzog." (pp. 54–55). For the provenance of the volume, see p. 53: "Die Bibliothek der Ludwigs-Maximilians-Universität in München besitzt einen bisher nicht beachteten Sammelband, der aus dem Nachlasse des Jesuiten P. Joh. Bapt. Cysat aus Luzern stammt, welcher von 1618–1622 Professor der Mathematik an der damals in Ingolstadt befindlichen Hochschule war. Diese Sammlung ist im Katalog der Bibliothek unter Scheiner, Math. 203. 28. eingetragen und steht in der That auch, wie die folgende Beschreibung derselben zeigen wird, in enger Beziehung zu jenem bedeutenden, bisher nur zu wenig beachteten Astronomen und Mathematiker P. Christoph Scheiner S. J. (1573–1650), der als Mitentdecker der Sonnenflecken und als ihr bedeutendster langjähriger Beobachter im siebzehnten Jahrhundert zu betrachten ist."
5. I. Friedl and S. Kuttner, Munich University Library (personal communications, 2006, 2007).
6. Herzog August Bibliothek Wolfenbüttel, Graph. C: 707.
7. "Das Bild trägt die Unterschrift: *Parelia Romae uisa, observata, atque consignata, à P. Christophoro Scheiner Soc.is Jesu, in Domo Professu ejusdem; anno 1630, die 24. Januarij, ab hora Italica 17½ ad 21½, Astronomica à meridie munerata [sic] 22½, ad 2½; Germanica, Hispanica, Gallica, 10½ antemeridiana, ad 2½ pomeridianam: plus minus.* [sic] und ist mit einer *Explicatio figurae* versehen." (Von Braunmühl in [4], p. 59).
8. Available at http://www.virtuelles-kupferstichkabinett.de/ or http://dbs.hab.de/grafik/. Within the database, the permanent URL of the leaf is http://diglib.hab.de/?grafik=graph-c-707.
9. P. Feuerstein-Herz, Herzog August Bibliothek Wolfenbüttel (personal communication, 2011).
10. A. von Braunmühl, "Christoph Scheiner als Mathematiker, Physiker und Astronom," Bayerische Bibliothek **24**, p. 68 (1891): "Es scheint übrigens das erwähnte Bild darauf hinzudeuten, dass die Abhandlung über derartige Erscheinungen

bei seinem Tode bereits nahezu vollendet war, sie wird sich wahrscheinlich unter jenen hinterlassenen Papieren befinden, die bis jetzt nicht wieder aufgefunden sind." Anton von Braunmühl does not give the title, which can be found in P. Alegambe and P. Ribadeneira, *Bibliotheca Scriptorum Societatis Iesu …* (Apud Ioannem Meursium, Antverpiæ, 1643), Stadtbibliothek Trier J III 66 4°, p. 77, and N. Southwell (Sotwello), P. Ribadeneira and P. Alegambe, *Bibliotheca Scriptorum Societatis Iesu* (Romæ, 1676), Stadtbibliothek Trier I.78. a 4°, p. 145. Both editions point to the fact that the *Parelia* were still to appear: "Plura alia ab eius calamo expectamus ut *Parelia* ..." (1643) and "Plura alia parabat ad prælum: nempè *Parelia in quibus multa de Iridibus, Halonibus, Virgis, Chasmatis ...* " followed by "Verùm hæc typis non vulgauit" at the end of the list (1676). This means that, in 1676, the Scheiner pamphlet still was not published. Scheiner died in 1650.

11. E. Lo Sardo, "Kircher's Rome," in *Athanasius Kircher: The Last Man Who Knew Everything*. P. Findlen, ed. (Routledge, New York and London, 2004), p. 53, "The Barberini appointed him to head a commission for the interpretation of the hieroglyphs, and he became professor at the Collegio Romano."
12. J. Fletcher, "Athanasius Kircher and Duke August of Brunswick-Lüneburg. A chronicle of friendship," in *Athanasius Kircher und seine Beziehungen zum gelehrten Europa seiner Zeit*. J. Fletcher, ed. (Harrassowitz, Wiesbaden, 1988), pp. 99–138.
13. J. Fletcher, "Athanasius Kircher and his correspondence," in *Athanasius Kircher und seine Beziehungen zum gelehrten Europa seiner Zeit*. J. Fletcher, ed., pp. 139–178. The names of Cardinal Barberini, Gassendi, Huygens, Peiresc, and Scheiner himself figure in Fletcher's index of correspondents.
14. T. Stäcker, "Athanasius Kircher an Herzog August den Jüngeren. Lateinische Briefe der Jahre 1650–1666 aus den Sammlungen der Herzog August Bibliothek Wolfenbüttel—Transkription und Übersetzung," available at http://diglib.hab.de/edoc/ed000005/start.htm. The diagram is not mentioned.
15. "Aufgrund von Einzelentscheidungen von Philipp Hainhofer gelangten im Zusammenhang von dessen handschriftlichen Reiseberichten sowie in weiteren Konvoluten aus gedruckten und handschriftlichen Einzelschriften zahlreiche illustrierte Flugblätter in den Besitz des Herzogs." [*Deutsche illustrierte Flugblätter des 16. und 17. Jahrhunderts*. W. Harms, ed. (Niemeyer, Tübingen), Vol. 1 (1985), *Die Sammlung der Herzog-August-Bibliothek in Wolfenbüttel*, Part 1, *Ethica, Physica*, p. XXVI]. An excerpt of Hainhofer's correspondence with Duke August the Younger has been transcribed and commented by Ronald Gobiet, but the leaf is not mentioned [*Auszüge aus der Korrespondenz Herzog August des Jüngeren von Braunschweig-Lüneburg mit dem Augsburger Patrizier Philipp Hainhofer aus den Jahren 1613-1647. Briefe Herzog August des Jüngeren von Braunschweig-Lüneburg und des Augsburger Agenten Philipp Hainhofer*. R. Gobiet, ed. (Deutscher Kunstverlag, München, 1979). Hainhofer himself had a large collection of copper engravings: "Ähnlich stand es mit seiner großen Kupferstichsammlung. Sie war in den Reinschriften seiner Reiserelationen, in seinen Stammbüchern, Lautenbüchern u. s. w. vertheilt." [O. Doering, *Des Augsburger Patriciers Philipp Hainhofer Reisen nach Innsbruck und Dresden* (Carl Graeser, Wien, 1901), p. 264.].