# Aurorae Borealis Studia Classica

# Vol. XIV

# *De Lumine Nocturno Boreali Svetice Nordskien* (1726)

# by Conrad Quensel (praeses) & Hans Eurodius (respondens)

digitized, with a biographical introduction and summary of contents by Per Pippin Aspaas *Aurorae Borealis Studia Classica* ('Classic Studies of the Northern Lights') is <u>a series</u> of digitized books, with biographical introductions and summaries of contents, edited by Per Pippin Aspaas and published by <u>Septentrio Academic Publishing</u>, the diamond open access publishing service of University of Tromsø – The Arctic University of Norway (UiT). The books as such are already in the public domain; all further content is open-access except when stated otherwise.

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The fourteenth volume in the series presents a dissertation by Conradus (Conrad) Quensel (1676-1732), professor at Lund University in Sweden, and his student, Johannes (Hans) Eurodius (1703-1756). In the text, detailed descriptions of two northern lights seen in Lund in the autumn of 1726 are accompanied by ample discussion of observations made ten years earlier in both Sweden and on the Continent, where an exceptionally strong auroral outbreak was seen in March 1716. The theoretical deliberations of Quensel/Eurodius largely follow theories presented by Friedrich Wolff and Johann Friedrich Weidler in the aftermath of the 1716 event. As praeses, Quensel was responsible for the contents, whereas Eurodius acted as respondens, meaning that it was his task to defend the dissertation orally in a public defence. It is unclear who actually wrote the dissertation text. The introduction, written by neo-Latinist and historian of science Per Pippin Aspaas, contains biographical information about the authors as well as a summary with ample extracts of the Latin text in English translation. A list explaining the references in Quensel/Eurodius' text rounds off the introduction.

I thank Dr. Stefan Zathammer of the ERC-funded NOSCEMUS project for his assistance and guidance on how to transform the image-only scans into a full-text searchable PDF. OCR (optical character recognition) was done with the Transkribus software using the <u>NOSCEMUS</u> <u>model</u> for early modern Latin. The automated transcription was manually corrected by me.

- The editor

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### CONRAD QUENSEL (1676–1732) & HANS EURODIUS (1703–1756)

#### **Biographical** introduction

#### by Per Pippin Aspaas

Conrad (or Conradus) Quensel is among the lesser-known professionals of the natural sciences in eighteenth-century Sweden. Born in April 1676 in the capital, Stockholm, by the age of ten he was enrolled as a student at Uppsala University. He soon moved to continue his studies at Uppsala's sister institution in Finnish Åbo (Turku), where his father had obtained a high position at court. In Åbo, he among other things defended a dissertation on the mythic golden bough (*Aureus ramus*, with Christiernus Alander as *praeses*, 1694) and wrote a Latin obituary of bishop Petrus Bång (1696). In 1702, Quensel was appointed professor of mathematics in Swedish-ruled Estonia. His workplace was in Pernau (Pärnu), where the University of Dorpat (Tartu) had been relocated in the period from 1699 to 1710. In the latter year, Quensel fled to Sweden because of Russia's military advances in the Baltics during the on-going Great Northern War. With the year 1712 came his appointment as professor of mathematics at Lund University in Scania (Skåne). Quensel remained in this position until his death in January 1732, despite having applied for the professorship in astronomy at Uppsala University more than once and having been offered – but declined – a better paid position in theology at Lund.

As a professor of mathematics, Quensel primarily worked on astronomy and its practical implications, such as geodesy and calendar calculations. He published several almanacs, for Stockholm, Lund, and other Swedish towns. Moreover, he stayed in close contact with the Royal Society of Learning and Sciences in Uppsala, whose member he became in 1728. By that time, he had already submitted several works to the secretary of the society, some of which were printed in the *Acta Literaria Sveciæ* (see *Aurorae Borealis Studia Classica*, vol. XIII). Inspired by the society's secretary, the Uppsala professor Erik Johan Burman (1692–1729), Quensel made meteorological observations in Lund. In conjunction with his meteorological and astronomical observations, he also studied the aurora borealis, to which he devoted an entire treatise in the year 1726.

The 1726 treatise *De Lumine Nocturno Boreali Svetice Nordskien* (On the Nocturnal Northern Light, in Swedish Nordskien) was published as a graduation exam. In the capacity of *praeses*, Quensel was responsible for the contents. It was common in early modern Sweden that the *praeses* not only figured on the title page alongside the name of the *respondens* (responding student); very often, the entire text had actually been written by the *praeses*. In such cases, the responding student's task was limited to defending the work orally during the public defence. The treatise *De Lumine Nocturno Boreali* was referred to as the work of Quensel (only) by other contemporary scholars, including the Uppsala professors E. J. Burman in 1727 and Anders Celsius in 1733.<sup>+</sup> However, in this case there is reason to believe that the student took an active role in producing the work and that he had actually written at least part of the treatise himself, because the author refers to himself as an "Ephebus" (young man) and states that he saw an aurora borealis for the first time in October 1726 (see pages 16 and 22).

The responding student Hans (in Latin: Johannes) Eurodius was born in Öraholma, Finja Parish<sup>2</sup> in July 1703, as the son of the local provost. In 1718, he was enrolled at Lund University. Eight years later, due to his successful defence of the treatise *De Lumine Nocturno Boreali*, Eurodius acquired the title of *magister* (master). He later became ordained in Uppsala. From the year 1737 onwards, Eurodius figures as a pastor in Förslöv Parish just north of Helsingborg, a position he kept until his death in 1756. He appears not to have taken active part in auroral observations after he obtained his magister degree.<sup>3</sup>

#### Further reading

- Aspaas, Per Pippin (ed.): Articles on the aurora borealis in the Acta Literaria Sveciæ (1720– 1729) by Erik Johan Burman, Conrad Quensel and Anders Celsius, *Aurorae Borealis Studia Classica*, vol. XIII (2022)
- Aspaas, Per Pippin (ed.): CCCXVI. Observationes de lumine Boreali partim a se, partim ab aliis, in Suecia habitas (1733) by Andreas (Anders) Celsius, *Aurorae Borealis Studia Classica*, vol. XV (2023)
- Quensel, Alice: Conrad Quensel. Karolinska bilder från akademierna i Pernau och Lund, *Personhistorisk tidskrift*, 71:1-2 (1975), pp. 11-37

<sup>&</sup>lt;sup>1</sup> "Synopsis Observationum Meteorologicarum Upsalensium Anni 1726. per Er. Burman", in *Acta Literaria Sveciæ*, Volumen Secundum, Anno MDCCXXVII, Trimestre Primum, pp. 254–257 (on p. 256). Digitized and translated in *Aurorae Borealis Studia Classica*, vol. XIII; CCCXVI. Observationes de lumine Boreali ab A. MDCCXVI. ad A. MDCCXXXII. partim a se, partim ab aliis, in Suecia habitas, collegit Andreas Celsius (Norimbergæ, 1733), pp. 23–24. Digitized in *Aurorae Borealis Studia Classica*, vol. XV.
<sup>2</sup> Finja is in the interior part of Skåne, about 60 km from Lund as the crow flies.

<sup>&</sup>lt;sup>3</sup> Biographical information on Eurodius has been culled from Carl Sjögren, *Skånska nationen före afdelningarnes tid* (1682–1832). Biografiska och genealogiska anteckningar jemte historik (Lund, 1897), p. 149. An obituary, referred to by Gunnar Carlquist in *Lund* stifts herdaminne. Biografier. De obefordrade prästerna (Lund, 1991), p. 112, has not been consulted: Då...Kyrkio-Herden wid Förslöf och Grefwie Församlingar...Hans Eurodius blef...till sitt hwilorum beledsagad uti Förslöf Kyrkia den 20 Julii 1756 (Lund).



Portrait of Conrad Quensel by unknown painter. Original in the art collections of Lund University, photograph by Fredrik Tersmeden. <u>Public domain</u>

## DE LUMINE NOCTURNO BOREALI SVETICE NORDSKIEN

#### Summary of contents by Per Pippin Aspaas

#### [Title page] (pp. [vi]-[vii])

The full title can be translated<sup>4</sup> as "A graduation exam On the Nocturnal Northern Light, in Swedish Nordskien, which Johannes Eurodius from Skåne offers for public examination on the 26<sup>th</sup> of November in the year 1726, at the usual time and place, with the consent of the most splendid Faculty of Philosophy at the *Academia Carolina* [i.e., Lund University] and with the most splendid and illustrious magister Conradus Quensel, royal and ordinary professor of mathematics as *praeses*".<sup>5</sup> The title page furthermore states that the work was printed *Litteris Haberegerianis*, i.e. by Abraham Haberegger (1659–1738), the contract printer of Lund University.

#### **§§.** 1-2 (pp. 1-2)

The first couple of paragraphs underline the theological foundation for the study of the socalled Book of Nature. One of its phenomena is "the very rare, famous, pleasant and sometimes scary spectacle [...], which, under the name of nocturnal northern light [*Lumen nocturnum Boreale*] is the subject of this exercise". Quensel/Eurodius explains that "our reason for using that name is because this fascinating phenomenon is most commonly seen around the horizon of our Pole [i.e., the North Pole]". Furthermore, "by means of the abundance of light that it emits, it sheds light on things buried in the deepest darkness of the night, thus revealing them to our eyes" (pp. 1–2).

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<sup>&</sup>lt;sup>4</sup> All translations in this Introduction are by Per Pippin Aspaas.

<sup>&</sup>lt;sup>5</sup> The term *praeses* means, the professor presiding at the ceremony; during the early modern period, he was often – but not always – the author of the text as well. The respondent (*respondens*) is the candidate that presents the text and publicly defends it before a committee of scrutinizing professors, or *opponentes*. We cannot tell who actually wrote the text and will therefore refer to the author as Quensel/Eurodius in the following.

#### §. III (pp. 2–5)

The next paragraph deals with the naming of the phenomenon and its problematic epistemology. Quensel/Eurodius mentions the following synonyms (cf. p. 2):

Swedish names: Nordsken, Nordlius, Nordbloss, Lysnor, Himmelsteckn, Eldsteckn German names: Nord-schein, Nord-licht, Feuerzeichen Latin names: Lumen Boreale, Lumen septentrionale, Chasma Boreale, Phaenomenon Septentrionale Luminosum, Coruscationes Boreales, Aurora Borealis

Quensel/Eurodius, however, chooses to use the term *Lumen nocturnum Boreale* (hereafter simply: northern light). He admits that he finds the term *Aurora Borealis* relevant, but the "Aurora" in the north does not have enough properties in common with the real Aurora (dawn) in the east to warrant this name, he argues. Furthermore, the [Cartesian] term *Chasma* is too wide and all-encompassing for any meaningful discussion. Nor should the distant lightning phenomena known as *Kornmogen* (silent lightning) be confused with the northern light. A similar phenomenon that certain early-modern writers interpreted as reflections from schools of herrings (in Swedish: *Sillblixt*) was not to be confused with the *Lumen nocturnum Boreale*, either. Finally, the so-called *Fata Morgana* is dismissed as a not related phenomenon.

When arguing against the various phenomena, Quensel/Eurodius actually reveals the rudiments of a definition. The northern light is not likely to be seen during a full moon; it is usually seen in the north of the atmosphere, not in the south or east; it takes place during night-time, not during daytime or at the time when the sun sets; it is not a local or endemic phenomenon, but widespread; it is seen in the upper parts of the atmosphere, not immediately above sea or ground level.

#### §. IV (pp. 5-18)

In this lengthy paragraph, Quensel/Eurodius goes through numerous reports and remarks by other observers, both printed and unpublished. The paragraph is rounded off with his own meticulous description of two northern lights seen in Lund, on 8 and 24 October 1726.<sup>6</sup>

Ancient observations are somewhat obscure, but some genuine northern lights were definitely described by the natural philosophers Pliny the Elder and Seneca the Younger as well as by the poet Lucan (all active in the first century CE), the author concludes. Also, the historian and bishop Gregory of Tours described it in the sixth century CE (pp. 5–6).

<sup>&</sup>lt;sup>6</sup> It should be noted that Quensel/Eurodius uses the Julian calendar ("old style"); the Gregorian ("new style") was not adopted in Sweden until 1753. According to our Gregorian calendar, the dates in question would be 19 October and 4 November. See further the dataset P.P. Aspaas: "Swedish observations of the Aurora Borealis in the period 1716-1732 in contemporaneous scholarly publications", DataverseNO, 2023, <u>https://doi.org/10.18710/G5J4YS</u>.

More important than ancient observations are those that were made in Quensel/Eurodius's own century, he finds. Especially in the aftermath of the exceptionally great auroral outbreak of 6 / 17 March 1716, many interesting reports were published. The editors of the widely read monthly *Acta Eruditorum* in Leipzig assembled reports from Leipizig, Halle, Halberstadt, Braunschweig, Helmstedt, Bremen, Hamburg, and numerous places in Holstein and Prussia as well as from Leiden, Amsterdam, and London. Extracts from some of these reports, as published in the August 1716 issue of the *Acta Eruditorum*, are quoted by Quensel/Eurodius on pp. 6-11. Furthermore, the same issue contained a report from Paris, where an observation had been made 11 April of the same year (p. 11).

The author proceeds from observations of the 1716 auroral outbreak made abroad to observations made of the same event in Sweden. A letter that Magnus Oxelgren (1686-1750) wrote to Quensel's colleague, Professor Andreas (Anders) Rydelius (1671-1738) is quoted in the Swedish original on pp. 11-13.<sup>7</sup> Oxelgren, who observed the northern light in Norrköping, reported that he could hear a *sibilus* (hissing sound) and discern "en luckt såsom af en wåt dimba" (a smell resembling that of moist fog). Furthermore, some of the movements and reflections of this particular northern light resembled "det man kallar Silleblixtet" (the so-called *Sillblixt*). Another letter, written to the bishop's office in Lund by a late provost named Olaus (Olof) Strandell (?-1716) in Blekinge is also quoted, followed by the manuscript of another ecclesiast, Petrus Lindstorphius (1663-1743) in Korsberga, Småland (pp. 13-14).

Remarks on auroral observations made in Sweden after 1716, as published in the *Acta Literaria Sveciæ* by Erik Johan Burman and others, are summarised on pp. 14–16. In between his quotations from the Swedish *Acta Literaria* (on which see *Aurorae Borealis Studia Classica*, vol. XIII), the author also refers to other reports stating that "meteorological phenomena [*meteora*] of this kind are seen more or less every year in Norway and Greenland" (p. 15).<sup>8</sup>

Quensel/Eurodius rather abruptly introduces his own experience with the phenomenon. The relevant passage can be translated thus, with some of the original terms in brackets (pp. 16–18):

Finally, as I was occupied with these deliberations, by chance I got lucky enough to now be able to share my experiences from autopsy. On the 8<sup>th</sup> day of October (old style) this year, between sunset and the rise of the moon – which took place more than an hour past midnight – a nocturnal northern light was seen by myself and many others here in Lund. In both strength and duration, it matched the northern light that various observers described in the year 1716, except that the sky this time was covered by thin clouds spread out in all directions, preventing the bow and rays in the north to be revealed. The flashes [*coruscationes*] were seen at first successively in different parts and then simultaneously everywhere and in all directions, even in the very Zenith itself, shedding an abundance of light on all the clouds

<sup>&</sup>lt;sup>7</sup> The same source was translated into Latin and published by Celsius in 1733, see Aurorae Borealis Studia Classica, vol. XV.

<sup>&</sup>lt;sup>8</sup> This circumstance was picked up by Anders Celsius, who later formed a theory of two kinds of northern light based on the discrepancy in auroral frequency between the European continent and far-northern latitudes (see *Aurorae Borealis Studia Classica*,

<sup>&</sup>lt;u>vol. XV</u>).

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and surfaces underneath, and hurling out their rays from luminous whirling masses [vortices] spinning around in various ways. Gradually, the clouds grew thinner, making the stars visible not only in-between the disjointed clouds, but also through the most luminous parts of the clouds and through the rays themselves. I confess that neither was I able to form a clear idea of a fire from all this; neither could I hear the sound of crackling flames nor discern the smell of burning sulphur. The night in question - exactly like the day before and after - was not devoid of strong winds. On the day before, the wind came from the northeast; on the following, from the southeast; moreover, both days were marked by clouds and rain showers. However, on the 24<sup>th</sup> of October (old style) after midnight when the moon had set, between 4 and 7 o'clock [in the morning] this phenomenon was again seen here in Lund. It appeared in all its splendour, with shining rays of enormous number and length, whitish in its bowshaped base and with lightnings [*fulgurationes*] incessantly exploding without a sound, resembling extremely thin shreds of fog erupting between the western and northnortheastern parts of the sky, bursting out from several little black clouds occupying the western horizon. When the fast movement of the lightnings [fulgurationes] (also called 'undulating flames' by some) – each consisting of a smoky or cloudy matter, barely visible in its bleak whitishness, yet very widespread, extremely thin, and lower than the rays - was at its most conspicuous, then, in the blink of an eye – hard to tell exactly where – they seemingly exploded. In the very same blink, they would lift from the horizon and fly up deep into the sky, where they would instantly vanish. No less significant was the variation in colour exhibited by the rays. Soon, they would be shining brightly in sky blue and green, beautiful to behold; soon, they resembled the colour of a blank sword or that of flames raging through thick smoke (called 'bloody flames' by some), a rather frightening sight setting the entire western and northwestern parts of the sky ablaze; soon, that dark and lurid colour - the very same that we saw on the moon on the  $10^{\text{th}}$  of October (old style) in the year 1725, when it had fully entered the shadow of the earth and shortly before it left the centre of its shadow would start becoming diluted and turn into a violet colour with lovely hints of red, especially towards the northern parts of the sky. No sound and no smell were discerned. The entire spectacle gradually disappeared, as if it was extinguished by the brightness of dawn and the increasing light from the east. Or rather, it ceased appearing, without there being any sign of defect, either in its continued duration or in the causes that had rendered it visible prior to the break of dawn. Meanwhile, a biting wind started blowing from the northwest and whatever stars that had broken through the very dense heap of rays, were unable to do so from behind those horizontal clouds. Something very peculiar was noted: in the rays, barely any movement at all appeared, except for a very slow movement from the west towards the north; as usual, however, they were all roughly perpendicular to the horizon and roughly parallel to each other, with a slight branching towards their uppermost parts. As a result of their sheer length, however, they were curving inwards towards the Zenith. The sky was clear for the most part and the weather uncomfortably freezing. The preceding day we had a larger share of rainy clouds than sunshine; the following brought freezing temperatures and was totally serene, except for some low-hanging clouds in the western, northern, and southern parts of the horizon. The northwestern clouds retained a dark red hue long after the rising of the sun. The entire following night, the sky was perfectly clear and the cold yielded substantial amounts of hoarfrost.

#### §. V (pp. 18-22)

After presenting his own observations, Quensel/Eurodius returns to the literature, this time in search of an explanation of the phenomena.<sup>9</sup> He first refers to the influential natural philosopher Christian Wolff (1679–1754) in Halle, who in the *Acta Eruditorum* had written

<sup>&</sup>lt;sup>9</sup> All references are listed in an Appendix at the end of this Introduction.

that the northern light of March 1716 was a *meteoron ignitum* (meteorological phenomenon involving fire), comparing it to a *fulgur imperfectum* (imperfect thunderstorm) (pp. 18-19). By contrast, the Leibniz-correspondent Rudolf Christian Wagner (1671-1741), professor at Helmstedt, in the same publication thought that it was a *meteoron tantummodo lucens non* ardens (meteorological phenomenon that simply shines, without burning), arguing that frozen particles of ice high in the atmosphere were shining through holes in the clouds (p. 19). For his part, the Wittenberg-professor Martin Gotthelf Löscher (?-1735) believed the phenomenon to be *partim lucidum partim igneum* (partly luminous, partly igneous), taking its rise from a combination of particles emitted from the earth - some merely luminous, some igneous - that due to the cold were concentrated in the northern parts of the hemisphere, where they took the form of shining pyramids capable of drifting and moving (p. 19). Quensel/Eurodius mentions that theories similar to Löscher's were voiced by the professors Johann Georg Liebknecht (1679-1749) in Giessen and Johann Friedrich Wucherer (1682-1737) in Jena (p. 19), before devoting far more space to another Wittenberg professor, the astronomer Johann Friedrich Weidler (1691–1755), whose theory involved volcanoes in the far north emitting sulphureous particles high up in the atmosphere. These were in turn lit up by the rays of the sun shining from underneath the horizon (pp. 20-21).

The summary of theories from German-speaking parts is followed by "some provost from Norway, excelling in profound erudition, whose name has, much to my dismay, escaped from my memory". Quensel/Eurodius had seen his book for sale in Lund "a couple years ago or more", but it was no longer available. He is, however, able to present a summary of this Norwegian's theory, according to which the northern light is caused when frozen particles of ice and snow floating around in the far-northern atmosphere are lit up by the rays of the sun from underneath the horizon (p. 21).<sup>10</sup>

The paragraph is rounded off with a reference to Burman's theoretical article in the *Acta Literaria Sveciæ* (Volumen Primum, Anno 1724, Trimestre Tertium), in which the Uppsala professor presents a tentative, bipartite definition of the phenomena. On the one hand, there was the lively, vivid, multi-coloured *Chasma* caused by effluvia and exhalations of sulphureous particles; on the other, the less spectacular, arc-like *Lumen septentrionale* caused by refraction or reflection of sunlight in the far north (pp. 21–22; see further *Aurorae Borealis Studia Classica*, vol. XIII).

<sup>&</sup>lt;sup>10</sup> The provost in question is probably Jens Spidberg (1684–1762), whose *Historische Demonstration und Anmerckung über die Eigenschaften und Ursachen des so genandten Nord-Lichts* (Halle 1724) was presented in *Aurorae Borealis Studia Classica*, <u>vol. V</u>.

#### §. VI (pp. 22-24)

This paragraph contains Quensel/Eurodius' own explanation of the phenomena. The author excuses himself as an *Ephebus* (a Greco-Roman term usually referring to an adolescent in his late teens; p. 22). The 23-year-old Eurodius (or the 50-year-old Quensel as his ghost writer) does, however, take the liberty of stating his opinion "in a very few words only" (pp. 23–24):

To my mind, then, the nocturnal northern light [Lumen nocturnum Boreale] is a shining meteorological phenomenon [Meteoron], highly frequent in the northern part of the sky. Although it is visible in all zones, both cold and temperate, it will grow in frequency as well as size the closer to the Pole observers are situated. It is generated by the refraction of solar rays, who will either (the more common scenario) produce light by means of a gigantic whirling mass *vortex* of not very dense, nebulous or snow-filled particles that encircle the clouds in a broad area, or (less commonly) shed light upon - and set in motion from the internal composition of the clouds - an enormous flood of *effluvia* emanating upwards through their surface and spreading out into the universe through the vast *vortex* of the upper atmosphere. This gushing flood, springing forth from inside the very masses of the clouds, is set in motion by the internal movement of a giant congestion of particles that have been sent out from the interior of the earth; exactly the same kind of particles that crash into each other when lightnings [fulmina] are formed. This movement can, even without any flame being ignited, be sufficient to create those barely distinguishable, imperfect thunderstorms [*fulgurationes imperfectae*], which accompany this meteorological phenomenon [*meteoron*] closer to earth than the rays themselves. The rays of the sun are, however, refracted by our atmosphere and reflected by this whirling mass [vortex] or flood [flumen] of particles - the true source of the light that illuminates the clouds underneath as well as the area of earth's surface surrounding the observers. This rather uncommon meteorological phenomenon *[meteoron]* can be attributed the same kind of effects that fully-fledged thunderstorms [fulgura perfecta] are born to produce. I have nothing more to add (beyond that which has already been mentioned and which all can be used to either complement or corroborate this theory), except the following:

- 1) The northern part of the sky, in our temperate segment of the earth, is more apt to produce this phenomenon than the southern segment, because the sun stays between the North Pole and the Nadir during every night of the entire year.
- 2) Clouds are dispersed throughout the entire hemisphere during the time of a northern light, but they shine with a lot of light, nevertheless. Yet they never occupy the entire hemisphere of the atmosphere but are confined within a rather limited area of the discernible horizon. By turning their surfaces against rays that are placed higher up, at a completely different place than our eyesight judges them to be situated, they glow with a light that is far from being their own.
- 3) The atmosphere does split apart the rays of the sun, without being prevented by the circumstance that the earth's body is opaque and exceedingly vast. An experiment to this effect is given by famous magister Matthias Marcus Roth, who in his Observationes Dioptricae writes: "an interesting instrument is a lens perforated in its middle. In case it catches a figure in the remaining part of its convex surface, the lens burns just like an integral convex lens, nor does it display images less distinctly. This experiment demonstrates that the middle portion of lenses, close to their axis, is not strictly necessary in order to unite the rays of light." The same kind of experiment can anybody make with a convex lens that is obscured in its middle area by means of a rather large, circular, flat object. Such a lens will be equally effective as the above-mentioned, perforated lens. However, given that the upper parts of the atmosphere are so diffuse, they fail to reflect

the refracted rays of the sun to us without being mixed with thicker, or at least denser, *effluvia*.

- 4) There are many phenomena occurring in conjunction with these rays that require a theory similar to that of Kircher concerning the Fata Morgana of the Calabrians.
- 5) I would not exclude completely the possibility of a fire or flame occurring. Sometimes, there will come to stages where the above-mentioned lightnings [*fulgurationes*] are produced; I do not, however, consider that the rays themselves have ever consisted of flames of burning matter. This I conclude because of their position squarely to the horizon and due to their sudden disappearance with the arrival of dawn.

#### §. VII (p. 24)

In a very brief last paragraph, Quensel/Eurodius returns to God Almighty as the creator of this wondrous phenomenon of light, in which traces of his *effigies* can be seen.

### APPENDIX

### Bibliography of references in Quensel/Eurodius (1726) by Per Pippin Aspaas

- [§. II, p. 2] "Psalm. 121:4" = The Bible, Old Testament, Psalms
- [§. III, p. 2; §. IV, p. 15; §. V, p. 19] "MART. GOTTH. LOESCHERUS, Phys. & Medic. Prof. Wittebergensis, in Comm. Phys. De Phæn. Sept. Luminosò" = <u>Martin Gotthelf</u> <u>Löscher (?-1735)</u>, Commentatio physica de phaenomeno septentrionali luminoso nec non morbo epidemico anni currentis / Autore Martino Gotthelff Loeschero (Vitembergae, 1721). <u>Digitized</u>
- [§. III, p. 2] "a GASSENDO" [indirect quote, through Loescherus] = <u>Pierre Gassendi (1592–1655)</u>
- [§. III, p. 3] "Novellæ publicæ Holsaticæ" = [probably:] Stats- u. gelehrte Zeitung des hollsteinischen unpartheyischen Correspondenten [compare <u>https://ld.zdb-</u> services.de/resource/2655510-4 (visited 2 January 2023)]
- [§. III, p. 3] "BARTHOLINUS de luce hom. & Brutorum" = <u>Thomas Bartholin (1616–1680)</u>, Thomae Bartholini / De Luce Hominum & Brutorum Libri III: novis rationibus, & raris historiis secundùm illustrati (Hafniae, 1669). <u>Digitized</u>
- [§. III, p. 3] "OLAUS MAGNUS Lib. XX hist. cap. 29" = <u>Olaus Magnus (1490–1557)</u>, Historia de gentibvs septentrionalibvs, earvmqve diversis statibvs, conditionibvs, moribvs, ritibvs, svperstitionibus, disciplinis, exercitiis, regimine, victu, bellis, structuris, instrumentis, ac mineris metallicis, & rebus mirabilibus, necnon vniuersis penè animalibus in septentrione degentibus, eorumque natura ... / Avtore Olao Magno Gotho (Romae, 1555). <u>Digitized</u>
- [§. III, p. 3] "GESNERUS de reb. nocte lucentibus" = <u>Conrad Gessner (1516–1565)</u>, Conradi Gesneri Medici / De Raris et Admirandis Herbis, qvae sive qvod noctv luceant, siue alias ob causas, Lunariae nominantur, Commentariolus: & obiter de alijs etiam rebus quae in tenebris lucent ... (Tigvri, [1555]). <u>Digitized</u>
- [§. III, pp. 3-4] "in Actor. Literariorum Sveciæ Trimestri secundo Anni 1725 ... a Celeberrimo MAGNO CELSIO Upsalensium olim Prof." = <u>Magnus Celsius (1621–1679)</u>, "Meteoron Upsaliæ à MAGNO CELSIO, olim Astron. Profess. & Coll. Antiqv. Assess. ex Ms.", in

Acta Literaria Sveciæ, Volumen Secundum, Anno 1725, Trimestre Secundum, p. 50. Digitized

- [§. III, pp. 4-5; §. V, p. 24] "ab ATHAN. KIRCHERO, lib. X Artis magnæ lucis & umbræ part. 2. cap. I. Parast. I." = <u>Athanasius Kircher (1602–1680)</u>, *Athanasii Kircheri / Ars magna lucis et umbrae, in decem libros digesta: quibus admirandae lucis et umbrae in mundo, atque adeò universa natura, vires effectusque uti nova, ita varia novorum reconditiorumque speciminum exhibitione, ad varios mortalium usus, panduntur* (Romae, 1646). <u>Digitized</u>
- [§. IV, p. 5] "PLINII Lib. 2. Hist. Nat. Cap. 23" = Pliny the Elder (23-79 CE), Naturalis historia
- [§. IV, pp. 5-6] "SENECA Lib. 1. quæst. nat." = <u>Lucius Annaeus Seneca (c. 4 BCE-65 CE)</u>, Naturales quaestiones
- [§. IV, p. 6] "LUCANI Lib. 1. Phars." = Lucan (39-65 CE), Pharsalia aka De Bello Civili
- [§. IV, p. 6; §. IV, p. 15; §. V, p. 19] "D. GEORG. LIEBKNECHT affert in sua Pharo" = Johann Georg Liebknecht (1674–1749), Pharvs, sive De Prodigiis Ignis Coelestibvs: vt vvlgo vocantvr, ex omni aevo collectis, Dissertatio Historico-Mathematica, occasione corvscationvm Borealivm, nvper visarvm, vna cvm cavsis et praedictionibvs istarvm / moderante avctore Io. Georgio Liebknecht ... respondente Immanvele Webero (Giessae, 1721). Digitized
- [§. IV, p. 6] "ex GREGORIO THURONENSI ... observata et memoriæ mandata" [indirect quote, through Liebknecht] = <u>Gregory of Tours (538–594)</u>, Sancti Georgii Florentii Gregorii Episcopi Turonensis / Opera Omnia / opera & studio Domini Theoderici Ruinart (Luteciæ-Parisiorum, 1699). <u>Digitized</u>
- [§. IV, pp. 6-11] "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716" = Relatio de phænomeno Luminoso, quod d. 17 Martii Anni præsentis in multis Germaniæ locis observatum; Appendix ad relationem de phænomeno Luminoso, *Acta Eruditorum publicata Lipsiæ*, Calendis Augusti, Anno 1716, pp. 357-370 & 392. <u>Digitized</u>

[§. IV, p. 7] "quæ Lomacio Misniæ oppido Cl. SCMIDERUS ad Actorum collectores scripserat" [scil. "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716"] = <u>Sigismund Schmieder (1685–1717)</u>, op.cit., pp. 357–359.

[§. IV, pp. 7–8] "quæ Cl. BOETTICHERUS Islebiæ observata transmiserat" [scil. "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716"] = Augustus Fridmannus Bœtticherus, op.cit., p. 359.

[§. IV, p. 8; §. V, p. 19] "ex Cl. WAGNERI descriptione meteororum Igneorum ... quæ Helmstadii visa sunt, excerpta" [scil. "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716"] = <u>Rudolf Christian Wagner (1671–1741)</u>, op.cit., pp. 359–360.

[§. IV, p. 8] "Halberstadii a Cl. ELENDIO" [indirect quote, through Wagner] = Johann Balthasar Elend (?-1739), op.cit., p. 360.

[§. IV, pp. 8–11] "ex CHR. KIRCHIO Berolinensis observatoris Godofredi filio annotata" [scil. "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716"] = <u>Christfried</u> <u>Kirch (1694–1740)</u>, op.cit., pp. 361–364.

[§. IV, p. 11] "ex CASSINI JUNIORIS observatione Parisiensi" [scil. "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716"] = Jacques Cassini (1677–1756), op.cit., pp. 365–365.

[§. V, pp. 18-19] "Cl. WOLFII ex l.c. Actor. Lips." [scil. "in Actis Eruditorum Lipsiensibus ad mensem Augustum anni 1716"] = <u>Christian Wolff (1679-1754)</u>, op.cit., pp. 365-370.

- [§. IV, pp. 11-13] "MAGNUS OXELGREN ... ad ... ANDREAM RYDELIUM" = <u>Magnus</u> Oxelgren (1686-1750)
- [§. IV, p. 13] "ad hoc consistorium Ecclesiasticum Lundense ... *Olaus Strandell*" = Olaus (Olof) Strandell (?-1716)
- [§. IV, pp. 13-14] "eadem res a ... *Petro Lindstorphio* descripta" = Petrus Lindstorphius (1663-1743)
- [§. IV, pp. 14-15; §. V, pp. 21-22] "mentionem acta literaria sveciæ faciunt in Trimestri 3 anni 1724 ... ERICUS JACOBI BURMAN" = Erik Johan Burman (1692-1729) [see Aurorae Borealis Studia Classica, vol. XIII]
- [§. IV, p. 15; §. V, pp. 19-21] "Cl. Weidleri observationes cælestes" = Johann Friedrich Weidler (1691-1755), Selectas aliqvot Observationes Coelestes, svperioribus annis Vitembergae habitas / Ioannes Fridericus Weidlerus ... et Matthias Marcvs Roth ... / dispvtantivm disqvisitioni svbmittent (Vitembergae, 1723). Digitized
- [§. IV, p. 15] "Disputatio Upsalensis sub Præsidio Ampliss. Prof. UPMARK edita de septentrione lucido" = Johan Upmark / Rosenadler (1664–1743), Disputatio gradualis De Septentrione Lucido / ... moderante ... Johanne Upmarck ... publico examini subjecta à Johanne Rosell ... (Upsaliæ, 1703). Digitized
- [§. IV, pp. 15-16] "THORMONDUS TORFÆUS in Grœnlandia sua antiqua" [indirect quote, through Loescherus] = <u>Thormod Torfæus (1636-1719)</u>, Gronlandia Antiqva, seu Veteris Gronlandiæ descriptio, ubi Cœli marisqve natura, terræ, locorum & villarum situs, animalium ... varia genera, Gentis origo & incrementa, status Politicus & Ecclesiasticus, gesta memorabilia & vicissitudines, ex Antiqvis memoriis præcipuè Islandicis ... exponuntur / authore Thormodo Torfaeo (Havniæ, 1706). <u>Digitized</u>

- [§. IV, p. 16] "BURMAN ... in Actor. Lit. Sveciæ Trim. 3. Anni 1723" = Erik Johan Burman (1692-1729) [see Aurorae Borealis Studia Classica, vol. XIII]
- [§. IV, p. 16] "[BURMAN] ... in eorundem Actor. Trim. 1. Anni 1724" = Erik Johan Burman (1692–1729) [see Aurorae Borealis Studia Classica, vol. XIII]
- [§. V, p. 19] "Prof. Jenensis JO. FRID. WUCHERER, in Dissert. de meteoris Igneis" = Johann Friedrich Wucherer (1682–1737), Dissertatio academica De Meteoris Igneis qvorvndam ficta significatione / Respondente M. Io. Matthaeo Hübschmann (Ienae, 1724). Digitized
- [§. V, p. 20] "Keplerus ... scribit in Astronomia optica p. 280" [indirect quote, through Weidlerus] = Johannes Kepler (1571-1630), Ad Vitellionem Paralipomena, Quibus Astronomiæ Pars Optica Traditvr; Potißimum De Artificiosa Observatione Et Astimatione Diametrorvm deliquiorumque Solis & Lunæ; Cvm Exemplis Insignivm Eclipsivm ... Tractatum luculentum de modo visionis, & humorum oculi vsu, contra Opticos & Anatomicos (Francofurti, 1604). Digitized
- [§. V, p. 21] "Præpositus quidam ex Norwegia, eruditione multa clarissimus, cujus nomen mihi ... excidit" = [probably:] Jens Christian Spidberg (1684–1762), Historische Demonstration und Anmerckung über die Eigenschafften und Ursachen des so genandten Nord-Lichts (Halle, 1724). Digitized
- [§. V, p. 21] "occasio ... cum CARTESIO in de Meteoris Cap. 7. §. 18 cogitandi" [indirect quote, through Burman 1724] = <u>René Descartes (1596–1650)</u>
- [§. V, p. 24] "Cl. Mag. MATTHIAS MARCUS ROTH ... in observationibus Dioptricis" = <u>Matthias Markus Roth (?-1764)</u>, Selectas aliqvot Observationes Dioptricas dissertatione optica / praeses Matthias Marcus Roth ... et respondens Io. Matthias Moeckel ... pvblice exponent (Vitembergae, 1723). <u>Digitized</u>