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Early (17th and 18th centuries) drawings of lantern-flies and mentions of their bioluminescence (*Fulgora* spp., Hemiptera, Homoptera, Fulgoridae)

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ABSTRACT

*For many years, it was believed that the first two notices about New World lantern-flies (Fulgoridae), with descriptions and illustrations of the insects, as well as mentions of their luminescence, were due to Nehemiah Grey (1681) and Maria Sibylla Merian (1705). However, there are illustrations of lantern-flies prior to Grew's paper, and the first of them, by Jacques de Heyn (1620), also refers to the bioluminescence of those insects. The second is a watercolour by Pieter Holstejn (1614-1673), a Dutch Golden Age painter and engraver. Several illustrations of lantern-flies were lately produced during the 17th and 18th centuries, for example by Alexander Marshal (*ca. *1620-1682), an English entomologist, gardener, and botanical artist, by Iob Leutholf (1694), and also by an anonymous artist (first half of the 18th century).*

Key-Words: *Fulgora;* Early drawings; Jacques de Heyn; Pieter Holstejn; Alexander Marshal; Iob Leutholf; Anonymous artist; 17th and 18th centuries; Bioluminescence.

For many years, it was believed that the first two notices about lantern-flies, with descriptions and illustrations of the insects, as well as mentions of their luminescence were due to Nehemiah Grey (1681) and Maria Sibylla Merian (1705).

Nehemiah Grew [Figure 1] (26 September 1641 – 25 March 1712) was an English plant anatomist and physiologist, known as the "Father of Plant Anatomy". Grew was the only son of Obadiah Grew (1607-1688), Nonconformist divine and vicar of St Michaels, Coventry, and was born in Warwickshire.

He graduated at Pembroke College, Cambridge in 1661, and ten years later took the degree of M.D. at Leiden University, his thesis being *Disputatio medico-physica de liquore nervoso.* He began observations on the anatomy of plants in 1664, and in 1670 his essay, *The Anatomy of Vegetables,* was communicated to the Royal Society by Bishop Wilkins, on whose recommendation he was in the following year elected a fellow. In 1672, when the essay was published, he settled in London, and soon acquired an extensive practice as a physician. In 1673 he published his *Idea of a Phytological History,* which consisted of papers he had communicated to the

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FIGURE 1: Nehemiah Grew (1641-1712).

Royal Society in the preceding year, and in 1677 he succeeded Henry Oldenburg as secretary of the Society. He edited the *Philosophical Transactions* in 1678-1679, and in 1681 he published by request a descriptive catalogue of the rarities preserved at Gresham College, with which were printed some papers he had read to the Royal Society on the *Comparative Anatomy of Stomachs and Guts.* In 1682 appeared his great work on the *Anatomy of Plants,* which also was largely a collection of previous publications. It was divided into four books, *Anatomy of Vegetables, Anatomy of Roots, Anatomy of Trunks* and *Anatomy of Leaves, Flowers, Fruits* and *Seeds,* and was illustrated with eighty-two plates, while appended to it were seven papers mostly of a chemical character. The *Anatomy* is especially notable for its descriptions of plant structure. He described nearly all the key differences of morphology of stem and root, showed that the flowers of the Asteraceae are built of multiple units, and correctly hypothesized that stamens are male organs. *Anatomy of Plants* also contains the first known microscopic description of pollen. Much of Grew's pioneering work with the microscope was contemporary with that of Marcello Malpighi and the two reportedly borrowed freely from one another. Grew's work on pollen was more extensive than that of Malpighi, leading to the discovery that although all pollen is roughly globular, size and shape is different between species; however, pollen grains within a species are all alike. This discovery is central to the field of palynology.

In his *Musaeum Regalis Societatis. Or a catalogue & description of the natural and artificial rarities belonging to the Royal Society and preserved at Gresham Colledge* (Grew, 1681, another edition in 1685), he described and illustrated [Figure 2] a "lanthorne-flie" received from Peru and mentioned its luminescence (Grew, 1681: 158-159, 1685: 158-159).

> "The LANTHORN-FLY of *Peru. Cucujus peruvianus.* A quite different *Species* from that described by *Moufet.* And, with respect to his Wings, in no way of kin to the *Beetle* or *Scarabeus*-kind, but rather the *Locust.* I find it no where described.
>
> 'Tis above three inches long, and thick as the *Ring-finger.* His Head, in bigness and figure, admirable; near an inch and half long, in the thickest part of it above half

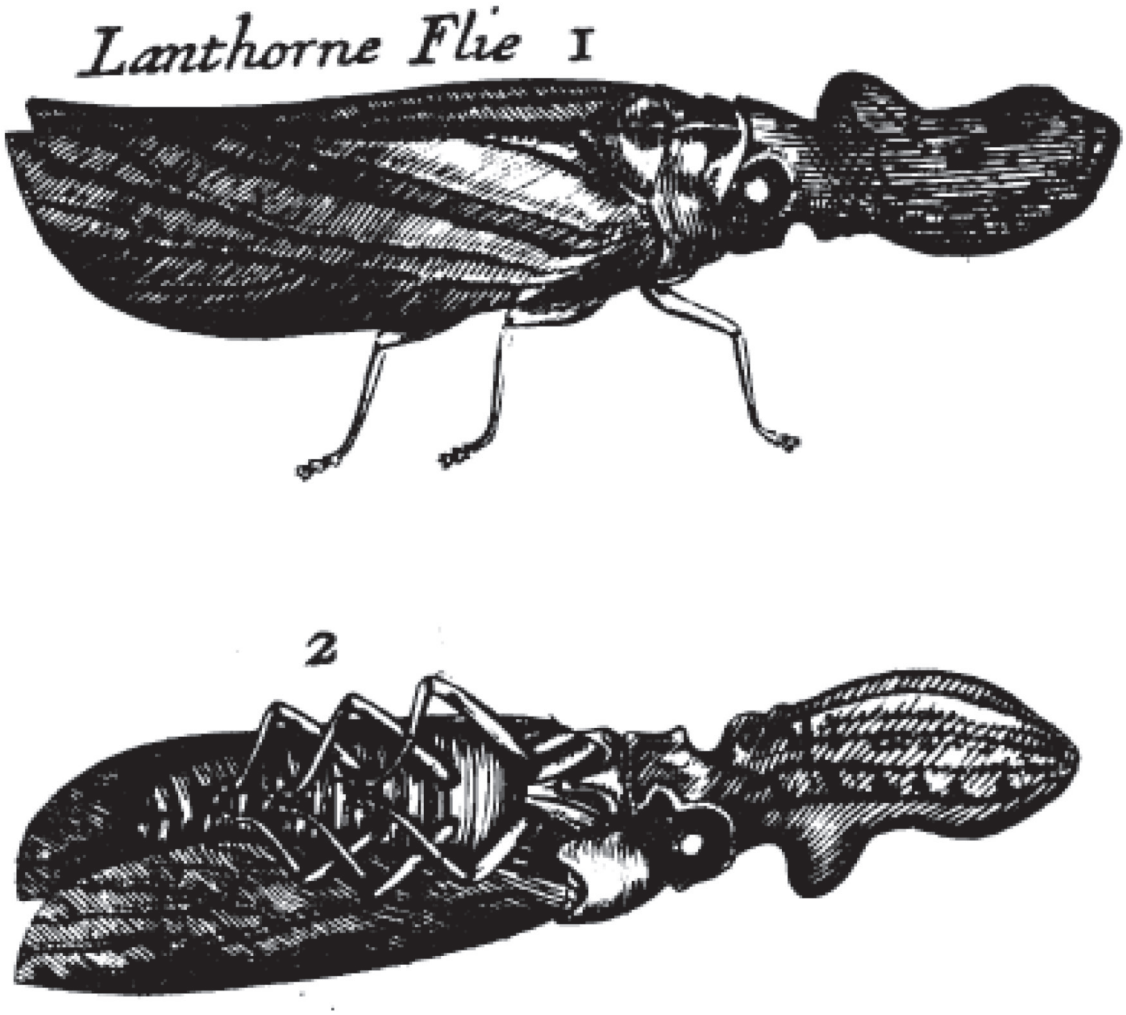

FIGURE 2: *Fulgora* drawings in Grew's *Musaeum Regalis Societatis* (1681), plate 13.

an inch over. From the Eyes forward it first swells or bellies out, afterwards contracts into a smaller, but blunt end. 'Tis also crowned with a broad blunt knob, and the end resimated or bended upward. In its Circumference it hath seven low Ridges or Angles, marked with so many black lines, an eighth line being added betwixt the two uppermost Angles. The greater part hereof (now) betwixt yellow and straw-colour. Yet stained with brown and red streaks and spots, neatly arranged, especially on top and both sides. It seems, at least in the fore part, to be hollow, and almost like a Bladder blown up.

The Eyes, for the bigness of his Body, very small. Of a dusky-colour, yet glossy, and Sphaerical, looking just like two brown Seed-Pearls. Under these stand two small round parts, open at top, which seem to be the Roots of a pair of Horns: unless any will conceit them to be his Ears. Both these and the Eyes are guarded with a semilunar Ridge.

The other parts, being more or less spoil'd, cannot be perfectly describ'd. His *Proboscis* sufficiently strong, about ½ an inch long, and as thick as a stitching or *Taylers* Needle. The Feet all broken off. His Body an inch and a ¾ long, not much exceeding the length of the Head, about ¾ over. Composed, besides the Shoulders, of about ten Rings. He hath four Wings, almost like those of the *Locust;* the uppermost somewhat stronger and stiffer than the other. Both Pairs are of a dun-colour, sprinkled with dark-brown spots. They are extended considerably beyond the Body; yet the ends are worn off.

That which, beside the figure of the Head, is most wonderful in this *Insect* is the shining property of the same Part, whereby it looks in the Night like a little Lanthorne (*Lamphorne*[1]). So that two or three of these fasten'd to a stick, or otherwise conveniently disposed off, will give sufficient light to those that travail or walk in the Night" [our enphasis].

FIGURE 3: Maria Sibylla Merian *ca.* 1700. Copperplate by Jacobus Houbraken from a portrait by Georg Gsell.

Madam Maria Sibylla Merian [Figure 3] (2 April 1647 – 13 January 1717) was a German-born naturalist and scientific illustrator, a descendant of the Frankfurt branch of the Swiss Merian family, founders of one of Europe's largest publishing houses in the 17th century). She was born as the ninth child in Frankfurt, into the family of the Swiss engraver and publisher Matthäus Merian the Elder, who remarried Johanna Sibylla Heyne in 1646. Her father died three years later, and in 1651 her mother remarried the flower- and still life painter Jacob Marrel. Marrel encouraged Merian to draw and paint. While he lived mostly in Holland his pupil Abraham Mignon trained her. At the age of thirteen she painted her first images of insects and plants from specimens she had captured. Early on, she had access to many books about natural history. Regarding her youth, in the foreword to *Metamorphosis insectorum Surinamensium,* Merian wrote: "I spent my time investigating insects. At the beginning, I started with silk worms in my home town of Frankfurt. I realized that other caterpillars produced beautiful butterflies or moths, and that silkworms did the same. This led me to collect all the caterpillars I could find in order to see how they changed".

In May 1665 Merian married Marrel's apprentice, Johann Andreas Graff from Nuremberg; his father was a poet and director of the local high school, one of the leading schools in 17th century Germany. In January 1668 she had her first child, Johanna Helena, and the family moved to Nuremberg in 1670, her husband's home town. While living there, Merian continued painting, working on parchment and linen, and creating designs for embroidery. She also gave drawing lessons to unmarried daughters of wealthy families (her *"Jungferncompaney", i.e.,* virgin group), which helped her family financially and increased its social standing. This provided her with access to the finest gardens, maintained by the wealthy and elite where she could continue collecting and documenting insects. In 1678, she gave birth to her second daughter Dorothea Maria. In 1679, she had published her first work on insects which was a two-volume, illustrated book focusing on insect metamorphosis.

1. Before the widespread availability of glass or the invention of synthetic plastics, horn was valued for its translucency. Thin sheets of horn glazing were used to protect a candle or other flame against wind or spray.

In 1678 the family had moved to Frankfurt am Main, but her marriage was an unhappy one. She moved in with her mother, after her stepfather died in 1681. In 1683 she travelled to Gottorp and was attracted to the Labadists community in Holstein. In 1685 Maria travelled with her mother, husband, and children to Friesland where her half-brother Caspar Merian lived since 1677.

After Jean de Labadie had died, Pierre Yvon moved the community to a stately home – Walt(h)a Castle – at Wieuwerd in Friesland, which belonged to three sisters Van Aerssen van Sommelsdijck, who were his adherents. Here printing and many other occupations continued, including farming, and milling.

At its peak, the religious community numbered around 600 with many more adherents further afield. Visitors came from England, Italy, Poland and elsewhere, but not all approved of the strict discipline, separatism and community property. Those of arrogant disposition were given the most menial of jobs. Fussiness in matters or food was overcome since all were expected to eat what was put in front of them. It seems the community had problems with Merian's husband; he was refused but came back twice.

Several noted visitors have left their accounts of visits to the Labadist community. One was Sophie of Hanover, mother of King George I of Great Britain; another was William Penn, the Quaker pioneer, who gave his name to the US state of Pennsylvania; a third was the English philosopher John Locke. In 1690 Maria Sibylla's mother died.

In 1691 she moved with her daughters to Amsterdam and met with Agnes Block, Caspar Commelin, Michiel van Musscher and Steven Blankaart. In 1692 her husband divorced from her. In the same year, her daughter married in Amsterdam Jakob Hendrik Herolt, a successful merchant on Surinam, originally from Bacharach. The flower painter Rachel Ruysch became her pupil.

In 1699 the city of Amsterdam granted Merian permission to travel to Suriname, along with her younger daughter Dorothea Maria. On 10th July, their ship set sail. The goal of the mission was to spend five years illustrating new species of insects. In order to finance the mission, she sold 255 of her own paintings. Before departing, she wrote:

> "In Holland, [I saw] with much astonishment what beautiful animals came from the East and West Indies. I was blessed with having been able to look at both the expensive collection of Doctor Nicolaas Witsen, mayor of Amsterdam and director of the East Indies society, and that of Mr. Jonas Witsen, secretary of Amsterdam. Moreover I also saw the collections of Mr. Fredericus Ruysch, doctor of medicine and professor of anatomy and botany, Mr. Livinus Vincent, and many other people. In these collections I had found innumerable other insects, but finally if here their origin and their reproduction is unknown, it begs the question[sic] as to how they transform, starting from caterpillars and chrysalises and so on. All this has, at the same time, led me to undertake a long dreamed of journey to Suriname".

Merian arrived on 18/19 September in Surinam, and met with the governor Paulus van der Veen. She worked for two years, traveling around the colony and sketching local animals and plants. She criticized Dutch planters' treatment of natives and black slaves. She recorded local native names for the plants and described local uses. In June 1701 malaria forced her to return to the Dutch Republic.

Back in the Netherlands, Merian lived in Kerkstraat, where she opened a shop. Merian sold specimens she had collected and published a collection of engravings of plant and animal life in Suriname. In 1705 she published the classic book *Metamorphosis Insectorum Surinamensium.*

In 1715, Merian suffered a stroke and was partially paralysed. She continued her work, but her illness probably affected her ability to work. A later registry lists her as a pauper.

Maria Sibylla Merian died in Amsterdam on 13 January 1717 and was buried four days later. Her daughter Dorothea published *Erucarum Ortus Alimentum et Paradoxa Metamorphosis,* a collection of her mother's work, posthumously.

Shortly before Merian's death, her work was seen in Amsterdam by Peter the Great. After her death, he acquired a significant number of her paintings which to this day are kept in academic collections in St. Petersburg.

Merian was the first to see the luminescence of lantern-flies. In the Latin edition of her *Metamorphosis insectorum Surinamensium* (Merian, 1705b), in the plate 49, depicting a branch of pomegranate with cicadas and lantern-flies [Figure 4], she vividly described her surprise when beholding the strange phenomenon of the luminescence of the lantern-flies she had kept in a box [Figure 5]:

FIGURE 4: Cicadas and lantern-flies (*Fulgora laternaria* Linnaeus, 1758) and a branch of pomegranate (Merian, 1705a, 1705b: pl. 49).

FIGURE 5: Merian's surprise observing luminescent lantern-flies (Figuier, 1869: 135).

"*MALUS PUNICA,* arbor ubique terrarum satis nota, etiam in agris Surinamensibus nascitur. Exhibuit illa mihi aliquod scarabaeorum genus, tardum naturâ & segne, atque adeo captu facile, anteriùs sub capite oblongam gerens proboscidem, quam, ut mel per eandem exsugant, floribus scitè infingunt. Die 20 Maji immotè illis quiescentibus, ex sponte rupta in dorso pelle muscar virides eruperunt, alis instructae pellucidis, qualis Surinami frequentissimae reperiuntur, volando celerrimae, ita ut aliquot uni solùm capiendae horas insumerem. Lyrae sonum edit musca ejusmodi, eminus cantu percipienda, qua de re Lyricem etiam, Belgis *Lierman,* nuncupari suevit. Eandem verò, quam praecedens habuerat scarabaeus, servaverat proboscidem, cum per dorsum pedes, oculi, totumque corpus exivisset, relictis exuviis, situ & forma pristinum insectum mentientibus. Persuasum mihi ab Indis est, ex hoc muscae genere ita dictos Laternarios, Belgis *Lantarendragers,* produci, formatos, ut hic im mari & foeminâ tam volitante, quam quiescente delineavi. Caput eorum seu cucullus in capite noctu laternae in modum lucet; de die autem planè est transparens instar vesicae, atque striis è rubicundo viridique colore distinguitur. Qualis est lucernae tenebras illuminatis lux, talis nocturno tempore ex hac vesica emittebatur fulgor, sic prorsus, ut scripta expressa typis, ac sunt novellarum in Belgio, ad lumen ejus legere haud foret impossibile. Adhuc apud me istiusmodi conservo muscam, suae metamorphosi proximam, quae omni ex parte, ipsis quoque non mutatis alis, muscae retinuit formam, nisi quod in capite accreverit vesica. Dicitur hac musca ab Indis mater Laternariorum, perinde ut sacarabaeum praedictum muscae nuncupant parentem. Quam inferiùs in flore Mali Punicae cernis haerere muscam, quomodo sensim Lyricen in Laternarium transfiguretur, exhibet. Ut melius distingui possint, ita vocantur, quamvis posterior aeque ac prior Lyrae sonum edat, forsan proboscide mediante, quippe cum haec communis omnibus sit & cunctis transfornationibus maneat eadem. Cum aliquando Laternarios magnâ copiâ mihi attulissent Indi, scatulae eosdem majori ligneae inclusi, illos noctu lucere, adhuc inscia; verum de nocte insolito strepitu expergefacta & perterrita, è lecto prosiliens lumen accendere jussi, quis domi meae insuetus esset strepitus, ignara. Tum vero, è scatulâ stridorem profectum, illico nobis paruit; illam itaque cum animi quedam perturbatione aperuimus, sed adapertam magis adhuc paventes in terram subito rursus dejecimus, quod inter aperiendum inde velut ignea ereumperet flamma, totius refulgens, quoties novum evolaret insectum: quo tandem animadverso, ad nos redeuntes, iterum congregavimus animalcula, splendorem in ipsis plurimum demiratae".

Or, in Buch'oz (1771: 49) translation:

"Le Grenadier qui est assez connu partout, croît aussi à Surinam. J'ai trouvé sur cet arbre une espèce d'Escarbots naturellement lents & paresseux, & par conséquent très-facile à prendre. Ils ont pardevant dessous la tête une longue trompe qu'ils savent appliquer sur les fleurs pour en sucer le miel. Le 20 Mai ils se tinrent en repos; & leur peau s'étant fendue sur le dos, il en sortit des mouches vertes dont les aîles étoient transparentes; on en trouve beaucoup à Surinam qui vont fort vite en volant, ensorte que souvent il faut courir long temps avant d'en attraper une. Cette espèce de mouches fait un boudonnement qui ressemble au son d'une vielle, & qu'on entend de loin, c'est pourquoi les Hollandois lui ont donné le nom de *Lerman,* c'est-à-dire *Vielleur* lorsqu'il étoit Escarbot. Elle avoit conservé la trompe qu'elle avoit lorsqu'elle étoit Scarabée; les pieds, la tête & tout son corps étant sorti par derrière, elle avoit laissé des dépouilles qui ressembloient par leur situation & par leur forme à l'ancien Insecte. Les Indiens ont voulu me persuader que de ces mouches provenoient les *Lantarendragers* ou *Porte-Lanterne,* qui sont tels que j'ai ici représenté le mâle et la femelle volans & en repos. Leur tête, ou, pour mieux dire, ce long capuchon luit la nuit comme une lanterne; pendant le jour il est transparent comme une vessie, & rayé de rouge et de verd.

> La lueur qui sort de cette vessie pendant la nuit ressemble à la lumiere d'une lanterne, ensorte qu'il ne seroit pas difficile d'y lire un livre d'un caractère semblable à celui de la Gazette de Hollande. Je conserve une de ces mouches qui est préte à se transformer, elle a conservé toute la forme d'une mouche, n'ayant pas même changé ses aîles, mais cette vessie, dont j'ai parlé, lui a crue à la tête; les Indiens nomment cette mouche la mere des *Portes-Lanternes* comme ils nomment l'Escarbot la mere de ces mouches. La mouche que j'ai dessinée en bas sur une fleur de Grenade représente un *Vielleur,* qui peu à-peu prend la forme d'un *Porte-Lanterne;* on leur donne ces noms pour les distinguer, car l'un & l'autre rendent un son semblable à celui d'une vielle, apparemment avec la trompe qui est commune à tous les deux, & qu'ils ne perdent point dans toutes leurs transformations. Quelques Indiens m'ayant apporté un jour un grand nombre de ces *Portes-Lanternes,* je les renfermait dans une grande boëte, ignorant alors qu'ils jettoient cette lumiere: la nuit entendant du bruit je sautai du lit, & je fis apporter une chandelle, je trouvai bientôt que le bruit venoit de cette boëte, que j'ouvris avec precipitation; mais effrayé d'en voir sortir une flamme, ou pour mieux dire autant de flammes qu'il y avoit d'Insectes, je la laissait d'abord tomber; revenue de mon étonnement ou plutôt de ma frayeur, je ratrapai tous mes Insectes, dont j'admirois la vertu singuliere".

It must be noticed that Merian clearly indicated that the Dutch settlers called the insects *Lantarendragers* (lantern-bearers).

In his paper on Merian's insects, Rev. Guilding (1834: 371) commented, in relation to her plate 49:

> "The subterraneous larva and the smaller expanded figure belong to a true Cicàda (…). The larger figures well represent the noble Fulgòra lanternària *Fabr.* 1. *Gmel.* 2089 [sic], one of the most singular of all insects, and a precious addition to any cabinet. The creature at the bottom is fictitious. The hollow lantern-shaped head of the Fulgòra has been glued on a Tettigònia [sic; Cicada], and probably sold to our good-tempered author by some cunning negro [sic]. From her words, 'Persuasum mihi ab Indis est', she had evidently no better authority for presenting us with this strange figure. […]. Madame Merian gives us an account of her first discovery of the shining property of the Fulgòra, and tells us of the horror [sic] which seized her when she opened the box to separate the quarrelling [sic] inmates, and saw it filled with fire".

*

But lately, as shall be seen in the sequence, several illustrations of lantern-flies from the 17th and 18th centuries, the first two prior to Grew's paper, have been made available. The first of them, by Jacques de Heyn (1620) also refers to the bioluminescence of those insects! To these drawings an overlooked paper by Ludolfus (1694), including a drawing of a lantern-fly from Surinam, anteceding Merian's magnificent plate, must also be cited.

Jaques de Heyn – 1620 – *Phosphoricus of Lamptaren dragger uit Westindien*

The Dutch painter and engraver Jacob de Gheyn II [Figure 6] (or Jacques de Gheyn II) (*ca.* 1565 – March 29, 1629) was born in Antwerp and received his first training from his father, Jacob de Gheyn I, a glass painter, engraver, and draftsman. In 1585, he moved to Haarlem, where he studied under Hendrik Goltzius for the next five years. He moved again, to Leiden, in the middle of the 1590s. His work attracted the attention of wealthy sponsors, and his first commission was for an engraving of the Siege of Geertruidenberg from Maurice of Nassau, Prince of Orange. This event from March 27 to June 24, 1593, had been more of a demonstration of power by Prince Maurits than an actual war and had even attracted tourists. As a publicity stunt, the siege and its subsequent engraving were successful in propagating an image of Prince Maurits as an able general. Around 1600, de Gheyn abandoned engraving, and focused on painting and etching. Moving to The Hague in 1605, he

FIGURE 6: Jacobus de Heyn.

was employed often by Dutch royalty, designing a garden in the Buitenhof for Prince Maurice of Orange, which featured the two first grottoes in the Netherlands. After Prince Maurice's death in 1625, de Gheyn worked for his brother, Prince Frederick Henry. De Gheyn painted some of the earliest female nudes, vanitas, and floral still lifes in Dutch art. He is credited with creating over 1,500 drawings, including landscapes and natural history illustrations. He produced 117 engravings for the military manual The Exercise of Armes while living in Amsterdam. De Gheyn married Eva Stalpaert van der Wiele of Mechelen in 1595. His son, Jacob de Gheyn III, was born in 1596, and grew to become an engraver in his own right, as well as the subject of a portrait by Rembrandt. De Gheyn II died in The Hague.

In the P. and N. de Boer Foundation (*Stichting*), in the Herengracht of Amsterdam, a remarkable drawing (watercolour on vellum, 115 × 170 mm) of a *Fulgora* exists, bearing the following inscription: on top of the golden edge: *"IDGheyn fe. An. 1620".* And above this, the extremely interesting note: **"Phosphoricus of Lamptaren dragger uit Westindien"** (our emphasis) (Vignau-Wilberg, 2013: 29) [Figure 7].

It confirms Merian's declaration that the Dutch were aware of the lantern-flies' luminous properties, conferring to them the name "lantern-bearers".

Pieter Holstejn, the younger – first half of the 17th century

Pieter Holstejn (1614, Haarlem – 1673, Haarlem), was a Dutch Golden Age watercolour painter and engraver. His father Pieter Holstejn I was a good glass painter and his brother Cornelis was a good painter. He worked in Haarlem, Amsterdam, Munster and Enkhuizen and was the teacher of the painter Josua Breckerveld. He signed his works with the monogram "PH".

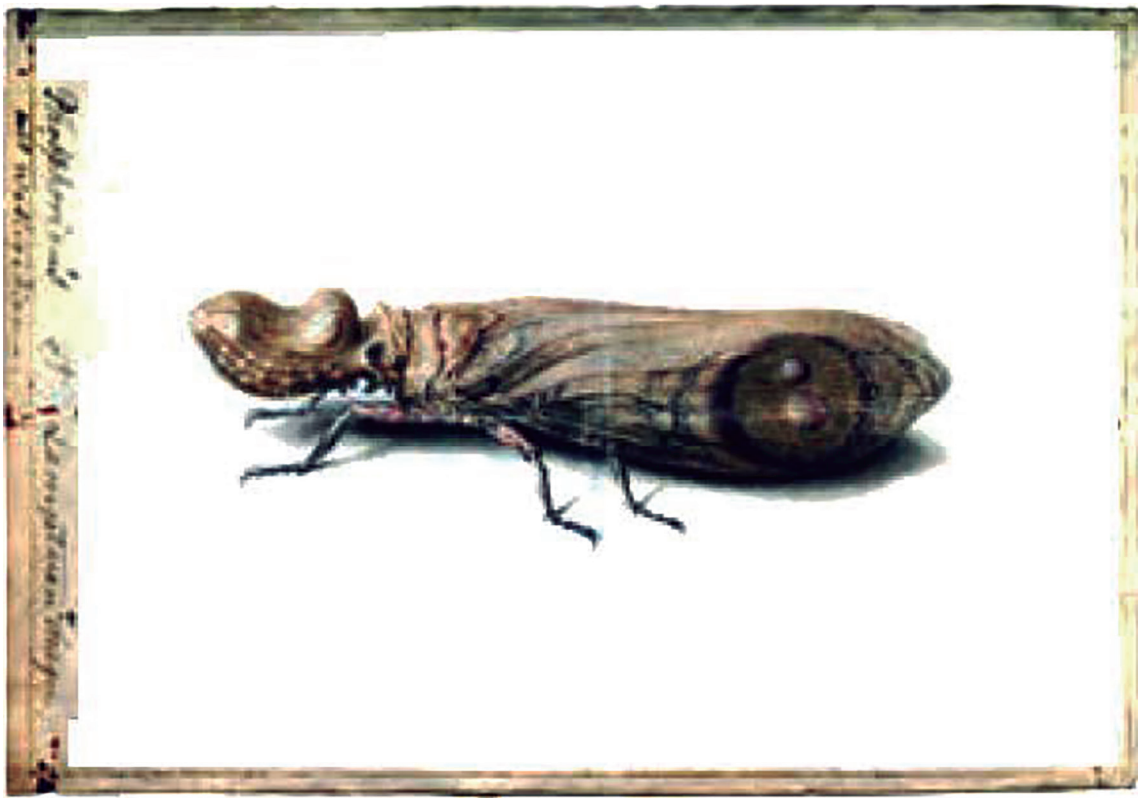

FIGURE 7: The *Phosporicus* of Jacques de Gheyn (1612).

His drawing of a *Fulgora* was reproduced by Vignau-Wilberg (2013: 9, 29), who commented:

> "The lantern fly is light brown. Fine blackish brown penstrokes outline the insect's forms and describe the delicate structure of its wings. Watercolour, including pale wash, renders the head and legs more vivid. Maria Sibylla Merian, who saw the insect on her expedition to Surinam, included it in her Metamorphosis insectorum Surinamensium (Amsterdam, 1705), which made it better known. Holsteijn's image predates that illustration by about fifty years. Yet it was not the first: the earliest realistic depiction was painted by Jacques de Gheyn II in watercolour on vellum. Dated 1620, this continued the series of small natural history studies by de Gheyn in an album that must date from *ca.* 1600-04. Holsteijn did not base his depiction of this striking insect on de Gheyn's version, but created his own image. Like de Gheyn, however, he took a mounted specimen as his model".

Alexander Marshal's *Lanthorne-fly* – 17th century

Alexander Marshal (*ca.* 1620 – 7 December 1682 in London) was an English entomologist, gardener and botanical artist, noted for the florilegium he compiled, consisting of some 160 folios of plants cultivated in English gardens, and finally presented to George IV in the 1820s. Marshal belonged to a coterie of gentleman gardeners from London, who cultivated and studied rare plants. These previously unknown species were introduced to England from the Near East and the New World in the 1600s. Marshal worked on his florilegium for some thirty years, and despite his not being a professional artist, his book boasts some of the most pleasing images in botanical art. Marshal was described as an accomplished painter of flowers and fruits in Sir William Sanderson's *Graphice* (Sanderson, 1658: 20). Marshal painted for the pleasure it gave to him and his horticulturist friends. He believed that plants could only be understood if they were grown to reveal their complete

FIGURE 8: Pieter Holteyns' Fulgora. "Pen and ink, watercolour with body colour and gum arabic; 166 × 211 mm Paper, two smooth edges, traces of cutting at the right edge, lower edge ragged, watermark (upper edge, centre): cropped letters 'LD [?]' (watermark: B). Inscribed: PH (monogrammed, between the insect's feet) and Baron de Wassenaer // et Warmondt (in brown, lower right)" (Vignau-Wilberg, 2013: 9).

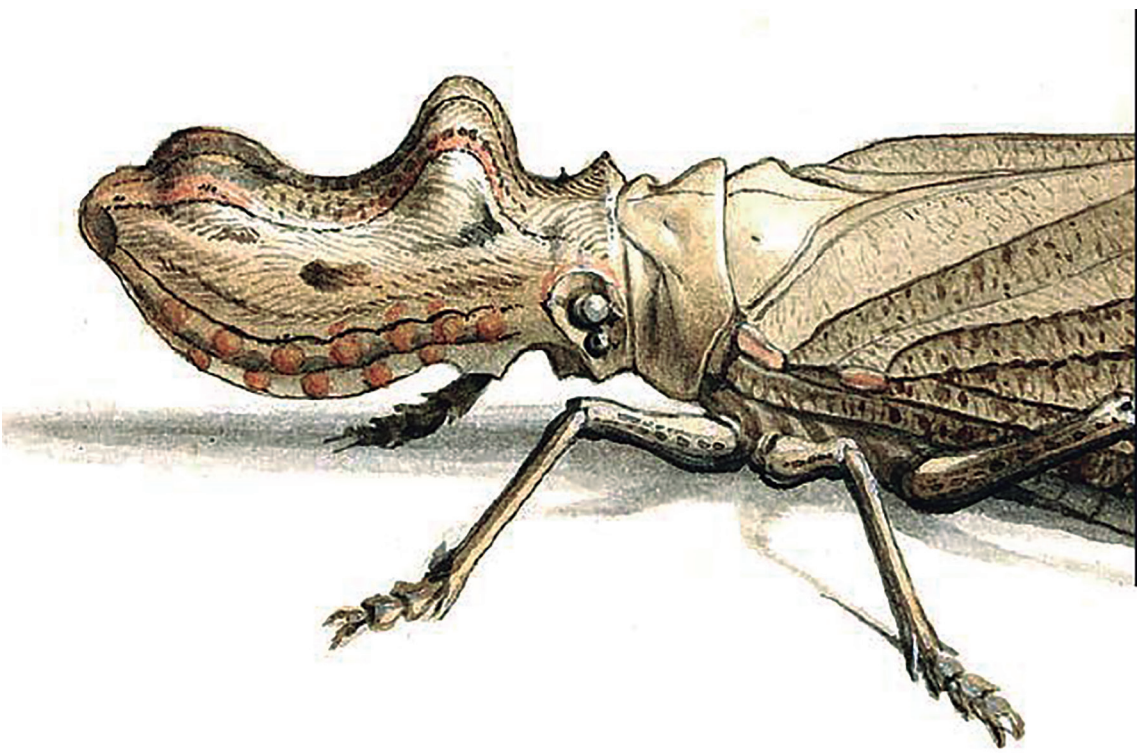

FIGURE 9: Details of Holtejns' drawing (Vignayu-Wilberg, 2013: 8).

life-cycle. His florilegium is now part of the collections of the Royal Library at Windsor Castle. The plates depict more than 600 plant species, and detailed studies of insects, birds and animals. It is notable as the only surviving florilegium by an English artist from the 1600s. Though long known as a botanical illustrator, his talent in depicting insects only came to light in 1980. His album of 57 pages has 129 watercolours of a variety of insects – butterflies, moths, caterpillars, beetles, locusts, spiders, flies, and crickets; it is deposited at the Ewell Sale Stewart Library, Academy of Natural Sciences, Philadelphia. On the reverse side of his drawings are notes in his own hand, providing much autobiographical material. He enlisted the aid of John Tradescant (1608-1662), and Henry Compton, in acquiring many rare, exotic insects. His experimenting with pigments led to their be-

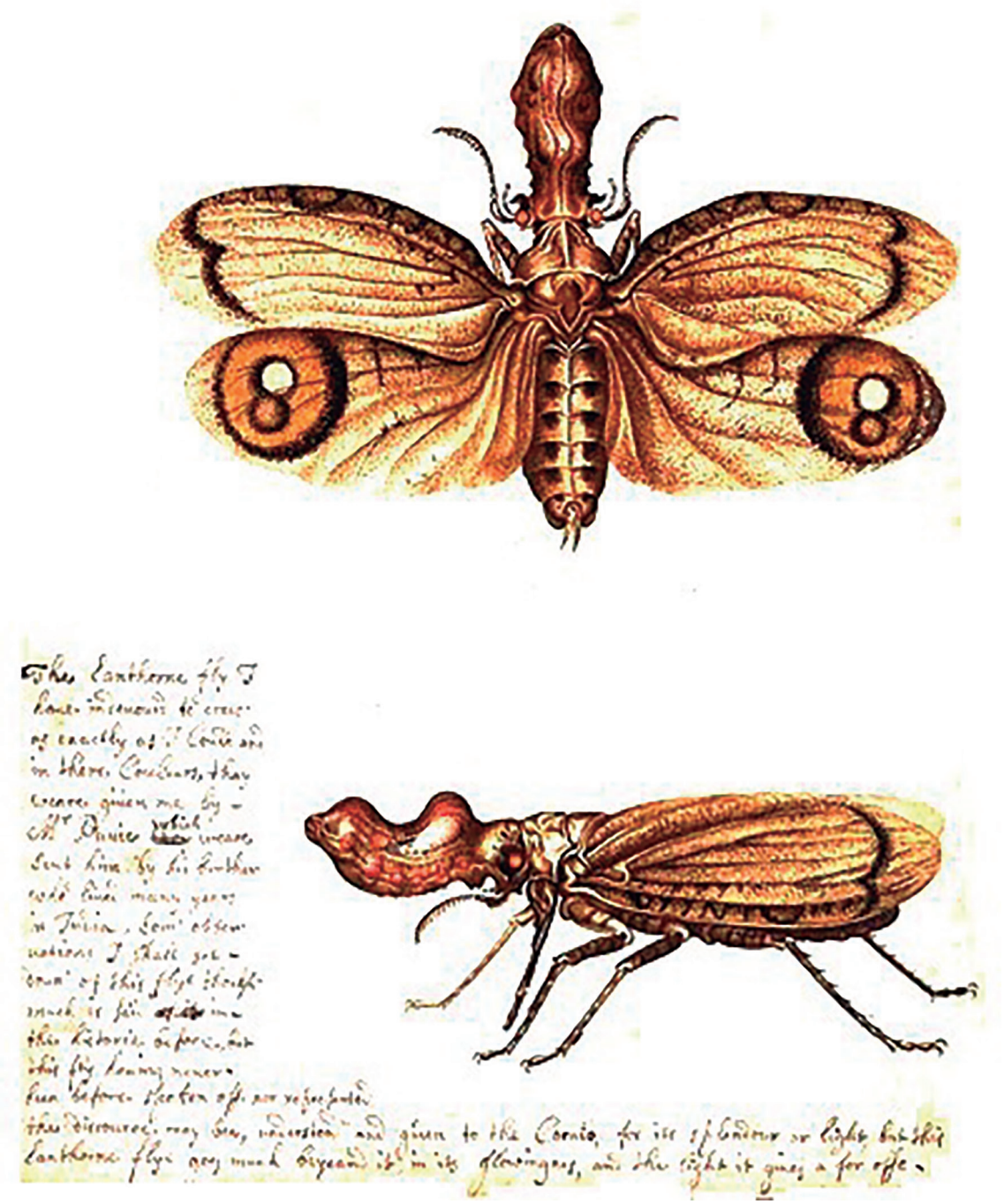

FIGURE 10: Alexander Marshal's *Lanthorne-fly* (pl. 23r).

ing extracted from flowers, berries, gums, and roots, as well as verdigris and arsenic. On Marshal's death, he left behind a childless widow, Dorothea, the daughter of Francis Smith. Earlier in his life he operated as a merchant, living for some time in France. He is recorded living at Ham in 1650, London in 1651, and Islington in 1654, staying there with the son of an Alderman Dewes. His final years were spent at Fulham Palace, the home of his friend Henry Compton, Bishop of London from 1675.

In his watercolour depicting a *Fulgora,* in plate 23 [Figure 10], the text, in his own handwriting, reads[2]:

> "The **lanthorne fly** I/ have indevourd to draw/ as exactly as I Could and/ in there Couleurs, thay/ weare given me by/ Mr. Punic which weare/ sent him by his brother/ who lived many years/ in India [*i.e.,* West Indies], some observations I shale set-/doune of this fly though/ much is said in/ the historie before, but/ this fly having never/ been before spoken off, nor represented [sic],/ the discourse may bee, understood and given to the Cornia, **for its splendors or light, but this/ lanthorne flye goes very much beyeand it in its glowingnes, and the light it gives a for offe**" (our emphasis).

FIGURE 11: Job Ludolfus (Leutholf).

Ludolfus (Job Leutholf) – 1694

Iob Leutholf (Latinized as Iobus Ludolfus) [Figure 11] was born in Erfurt on 24 June 1624 and died in Frankfurt am Main on 8 April 1704. In 1630 he entered the University of Erfurt to study medicine, law, music and Oriental languages and literature, including Ge'ez, Hebrew, Syriac and Arab. Graduated in Law in 1645, he pursued his philological studies at Leiden. He travelled extensively in Europe and, in 1648, at Oxford, he studied Ethiopian manuscripts at the Bodleian Library. In that same year, he entered the service of Baron von Rosenhan, the Swedish representative in Paris. The Baron, at the request of the Swedish Queen Christina, sent Leutholf to Rome in order to research Swedish manuscripts. In that same year of 1648, in Rome, he met four Ethiopian monks, one of them being the *Abbas* Gorgoryos, who would definitely influence Leutholf's future studies. Gorgoryos became Leuthorf's teacher and his main informant. During the year 1649, still in Rome, they had frequent meetings and the monk's teachings were

2. Cf. http://www.ansp.org/researcharch/library/archives/099-0991marshal1941.

APPENDIX SECVNDA
AD
HISTORIAM ÆTHIOPICAM
IOBI LVDOLFI
continens
DISSERTATIONEM
DE
LOCVSTIS
Anno praterito immensa copia in Germania visis,
CUM
DIATRIBA,
Qua sententia autoris nova de שלוים Selavis, sive locustis, cibo Israëlitarum in deserto, defenditur, & argumentis contrariis viri docti respondetur.

Qua occasione nonnulla S. Scripturæ loca declarantur, & autores quidam notantur vel emendantur.

Cum quatuor Indicibus locupletissimis, ut versa pagina docebit.

FRANCOFVRTI AD MOENVM,
Sumptibus JOHANNIS DAVIDIS ZUNNERI.
Typis MARTINI JACQUETI.
ANNO CIↃ. IↃC. XCIV.

FIGURE 12: Title-page of the *Dissertatio de Locustis* (Ludolfus, 1694).

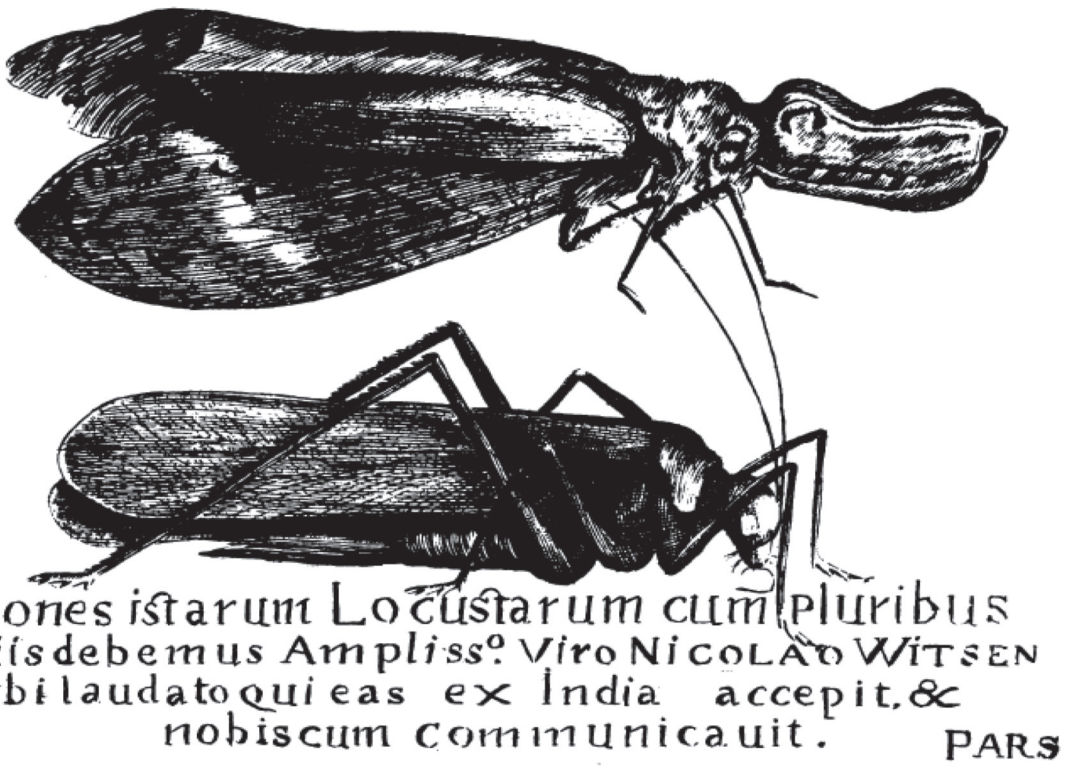

FIGURE 13: Ludolfus' drawing of the lantern-fly (1694: lower half of plate on p. 20).

uttermost important for Leutholf's forthcoming publications. Leutholf returned to Erfurt in 1651, then entering the service of Ernst I, Duke of Saxe-Cotha-Alteburg. On the Duke's suggestion, Leutholf invited Gorgoryos to spend some time in Gotha, in the Friedenstein Castle, where, during three months, the monk improved Leutholf's knowledge of G'ez and Amaric. From that time on, both were always in touch through correspondence.

In 1694, having witnessed the ravages of a swarm of grasshoppers in Germany, Leutholf published a very erudite booklet on grasshoppers (Ludolfus, 1694) [Figure 12], with many citations of ancient authors and principally concerned with the citations of grasshoppers in the Old Testament. In a plate on page 20 of that work he included the figures of two "locusts" – one being actually a lantern-fly, misidentified as a grasshopper[3], which he had received from Nicolaes Witsen, coming from "India" (*i.e.,* the West Indies) [Figure 13]. As we have seen above, Nicolaes Witsen's cabinet of curiosities was also mentioned by Merian. But there is no mention in Leutholf's texts to those two "locusts".

> Nicolaes Witsen (8 May 1641 – 10 August 1717; modern Dutch: *Nicolaas Witsen*) was born in Amsterdam, the son of Cornelis Jan Witsen, burgomaster, head bailiff and administrator of the Dutch West India Company. In 1656 Nicolaes went with his father to England. In March 1662 Nicolaes Witsen held a disputation at the Amsterdam Athenaeum Illustre, in which he argued against the influence of comets on the welfare of all earthly. In 1664 and 1665 Nicolaes made an embassy to Moscovia with the envoy Jacob Boreel. By boat they went to Riga, then Swedish, and over land to Novgorod and Moscow. There he met with Andrew Vinius, who became his lifelong friend, sending him maps and objects. The talks with czar Alexis of Russia about a monopoly on tar had no success. Witsen wrote in his diary that no-one there was occupied with art or science. Witsen visited the Patriarch Nikon and made notes

3. Nehemiah Grew also considered the "lanthorn-fly" closest to grasshoppers (see above).

FIGURE 14: Nicolaes Witsen.

on the worship of icons, interested in his name saint (and patron saint of Amsterdam), saint Nicholas. He studied law at Leiden University, but became more interested in languages and maps. In the 1666-1667 Witsen travelled to Rome and met with Cosimo III de' Medici in Pisa. In Paris, he met the scientist Melchisédech Thévenot. In 1668 he travelled to Oxford. In 1674 he married Catherina Hochepied. Four children were born, not surviving childhood.

Witsen wrote *"Aeloude and hedendaegsche Scheepsbouw en Bestier"* in 1671, which quickly became seen as the standard work on the subject. It led to a correspondence between him and Peter the Great on modernising the Imperial Russian Navy, then backward by Western European standards. This led to an order for warships from Amsterdam shipyards in return for an ukase (negotiated by Witsen) on Dutch-Russian trade, guaranteeing to supply the Republic with grain, wood, talc, tar and skins. In 1697 Witsen organised a four-month training period for the tsar at the Dutch East India Company shipyards during his Grand Embassy, with the Tsar staying in Jacob J. Hinlopen's house and being taken by Witsen among many others to meet the botanist and anatomist Frederik Ruysch.

After 20 years' study, Witsen published the first map of Siberia in 1690. This map represented the world from Nova Zembla to as far away as China. Witsen had discussed with the tsar the trade routes to Persia via the Caspian Sea and to China via Siberia. In 1692 he published a compendium titled *"Noord en Oost Tartarye",* describing Siberia and the surrounding areas, though without literary references. He consulted classical authors and Arabic medieval writers as well as his learned contemporaries in Europe. The second enlarged edition, a bulky book, also written in 17th century Dutch, presents a rather complicated mixture of various texts with encyclopaedic details. It appeared in 1705 and was reprinted in 1785. In this book, Witsen gave an account of all the information available to the Europeans at that time about the northern and eastern parts of Europe and Asia, and also about the Volga area, Crimea, Caucasus, Central Asia, Mongolia, Tibet, China, Korea and the neighbouring parts of Japan. In the text, for instance, we find lists of 900 Georgian and 700 Kalmyk words and illustrations of the writing systems of

Tibetan, Manchu and Mongolian languages. Witsen provides word lists and other data on more than 25 languages. In 1692 Witsen received the diary of Maarten Gerritsz Vries, who had explored the coast of Sahkalin in 1643, and it was never seen again.

Already in his youth Witsen started to collect Siberian curiosities and artworks, gathering corals, lacquer, books, paintings, weapons, porcelain, insects, seashells, stuffed animals and precious stones into his house on Herengracht on the Golden Bend. As mayor, he was patron of the arts and sciences, and maintained contacts with German scholars, such as Leibniz. He corresponded with Antonie van Leeuwenhoek, discovering tiny creatures under his microscope. In 1698 Willem de Vlamingh offered him two seashells from New Holland (Australia) and Witsen offered the drawings to Martin Lister.

Witsen tried to introduce coffee plants from Batavia via Amsterdam to countries in South America. Boerhaave estimated that Witsen had put together a collection of more than 1500 paintings of plants that came to be known as the *Codex Witsenii* and were for the greater part of plants growing in and around the Cape Peninsula. These passed into the custody of Caspar Commelin, Professor of Botany at the Athenaeum Illustre and working in the Hortus Botanicus (Amsterdam). After Commelin's death they were passed to Johannes Burman, inspiring him to produce *Rariorum africanarum plantarum* in 1738-9. On Burman's death in 1779, his effects passed to his son, Nicolaas Laurens Burman. After his death in 1793, his effects, including the *Codex,* were sold by auction in 1800, disappearing from the records.

He helped Maria Sybilla Merian to publish her prints with plants and insects from Surinam.

Witsen died in Amsterdam and was buried in Egmond aan den Hoef, not far from his country house, called "Tijdverdrijf" (= to pleasurably pass time). Peter the Great was present when Witsen died and said he lost a great friend.

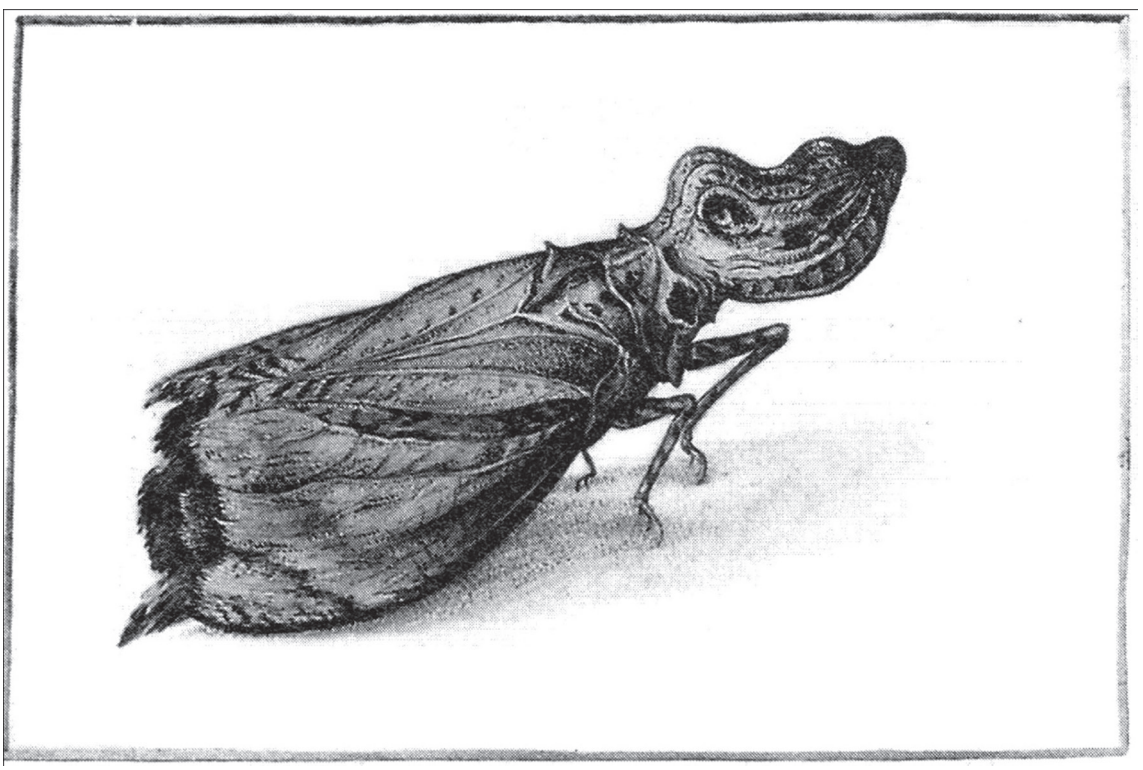

FIGURE 15: *Fulgora* drawing by an anonymous author (first half of 18th century).

Anonymous, first half of the 18th century

A watercolour on vellum drawing, with 85 × 127 mm, belonging to the Germanisches Nationalmuseum, Nürnberg (Figure 15). For some time Merian was considered its author, but this was challenged around 2009. Nowadays it is seen as an anonymous painting executed during the first half of the 18th century by an artist from northern Holland.

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RESUMO

*Por muitos anos acreditou-se que as duas primeiras notícias sobre as jaquiranaboias (*Fulgora *spp., Fulgoridae) do Novo Mundo que continham descrições, ilustrações e referências acerca da bioluminescência desses insetos pertencessem a Nehemiah Grey (1681) e Maria Sibylla Merian (1705). Entretanto, existem figuras de jaquiranaboias anteriores ao trabalho de Grey, sendo que a primeira – da autoria de Jacques de Heyn (1620) – também menciona a bioluminescência. A segunda é uma aquarela de Pieter Holstejn (1614-1673), um pintor e gravador holandês da "Época de Ouro". Ao longo dos séculos XVII e XVIII, outras imagens de jaquiranaboias seriam produzidas como, por exemplo, aquela de Alexander Marshal (*ca. *1620-1682), um artista inglês interessado em entomologia, agricultura e botânica, Iob Leutholf (1694) e por um artista anônimo da primeira metade do século XVIII.*

Palavras-Chave: *Fulgora;* Ilustrações; Jacques de Heyn; Pieter Holstejn; Alexander Marshal; Iob Leutholf; Artista anônimo; Séculos XVII e XVIII; Bioluminescência.

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Ludolfus [Leutholf], J. 1694. *Appendix secvnda ad Historiam Aethiopicam Iobi Lvdolfi continens Dissertationem de Locvstis anno praeterito immensa copia in Germania visis, cum Diatriba, qua sententia autoris nova* שלוים *de Selavis, sive locustis, cibo Israëlitarum in deserto, defenditur, & argumentis contrariis viri docti respondentur. Qua occasione nonnulla S. Scriptura loca declarantur, & autores quidam notantur vel emendantur. Cum quatuor indicibus locupletissimis, ut versa pagina docebit.* Sumptibs Johannis Davidis Zunneri, Typis Martini Jacqueti, Franofvrti ad Moenvm.

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