Decoding narratives on halo phenomena: an approach to Tycho Brahe's Vision of Urania in *De nova stella* (1573)

Dagmar Luise Neuhäuser

Abstract: The booklet *De nova stella*, published by Tycho Brahe in 1573, contains various texts, some of which have little to do with the stellar explosion known today as a supernova: Towards the end there is a poem *In Uraniam Elegia Autoris*, 232 verses long, in which Tycho condenses a visionary encounter with the goddess of the muses, Urania. But who or what is "Urania"? Is it just a literary fiction, an allegory of the supernova, an epiphany in the style of Ovid, a self-reflection projected onto the outside world? In a *close reading*, text passages that have received less attention so far are decoded - the evidence found in the process makes it clear: Tycho's "Urania" has a *fundamentum in re*. An hitherto underexposed side of the Renaissance scholar becomes visible: Tycho Brahe as a gifted observer of rare meteorological phenomena, who stands in the tradition of halo visionaries. The first part of the article attempts to provide an introduction to this complex subject.

Keywords: Tycho Brahe; prophetic astrology; meteorology: halo phenomena; stella nova; SN 1572.

1. Decoding narratives on halo phenomena: an introduction

In our inter-disciplinary research project called Terra-Astronomy, we use *terrestrial archives*, both of natural as well as cultural provenance, as epistemic key to study astrophysical problems with secular time-scales.[1] Either way, whether examining comet orbits, nova/supernova explosions, or solar activity, our methods must guarantee a clean data set drawn from these archives - otherwise, sustainable conclusions are not possible.[2] *Historical* records of celestial observations in the day and night sky need to be reviewed regarding sources, transmission lines, dating issues, terminology, contexts, intentions, translations etc. Existing collections of the respective sightings often do not meet a sufficient hermeneutic standard, which is otherwise given in the humanities; nevertheless, scientific research sometimes relies on them uncritically.[3]

Our methodological efforts are aimed at a deep understanding of the textual basis - this can be reliably operationalized only through a close reading, so that the quantification of observed parameters for scientific needs can take place.[4] We also try to develop *criteria* for physical identification - because historical observations of *celestial signs* are often described phenotypically: However, with the help of categories - like position, time, appearance (color, shape and size), behavior, and duration, details that could in principle be mentioned in the records - the phenomena can be classified in today's sense. More precisely: whether and which criteria are fulfilled is checked by asking where, when, of what kind, how variable and for how long the reported sighting was in the sky, and by comparing this in each case with the typical characteristics of the suspected physical event.[5]

Fig. 1. Lunar halo feature on the evening of 2022 April 15, Alberta, Canada - shown here courtesy of photo author Alan Dyer, for more details see: https://www.amazingsky.com/Atmospheric/Atmospheric-Halos/i-69kHhJ8/A

Awareness of the problems involved in classifying the various *signs*, both astronomical and atmospheric, is widely underexposed: It is a danger signal, as happened a few years ago, when one report on a "red cross" that appeared in the sky, makes a career as nearby supernova, as aurora borealis during a severe solar storm, as airburst after a short gamma-ray-burst, all to explain somehow the detected C14-variation around 775 (all dates given in Christian era) - but what if the record from the Anglo-Saxon Chronicle was an unrelated sighting of a so-called halo phenomenon due to an incoming depression?[6] As an example of various halo effects, see *Fig.* 1: The upper and lower vertical pillar together with the horizontal (here paraselenic) circle form a - hardly discernible - cross of light. To the natural scientific community, we address our primary recommendation for dealing with historical transmitted observations: "Historical records must not be used as quarry: we have to approach the problem unbiased, we have to be aware of our modern interests."[7]

In fact, there is a further layer: many textual testimonies about heavenly events - in the form of myths, visions, poems, dreams - are interpreted as pure fiction.

Independent scholar
Venice, Italy.
email: terra-astronomy@protonmail.com

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Sigmund Freud's dictum at the beginning of the 20th century that the unconscious projects itself into an imaginary outside is still powerful.[8] Also, Carl Gustav Jung (d. 1961) denies any external real factuality with the psychogenetic foundation of the archetypes.[9] On the other side, many natural explanations put forward in the 19th and early 20th centuries fall short.[10] Others *physicalize* these texts and impute far-reaching knowledge to them.[11] A currently dominant research approach is limited to examining the function(s) and meaning(s) within the textual conception, because one has - supposedly - nothing but the text (of the vision, the dream, the myth) whose truthfulness cannot be verified.[12]

A prime example here is the controversy about the "sign of the cross ... made by light ... across the sun", which, according to the church historian Eusebius of Caesarea (d. c. 339), Emperor Constantine the Great (d. 337) himself and together with others saw in the sky (note 60): Although newly advanced arguments (with recourse to previous considerations) have elaborated that an impressive halo feature may have been the natural basis, i.e., the *fundamentum in re* of the relevant textual evidences, a fictitious understanding is still being debated. The main counter-argument is that there would be no "test" to distinguish between real and constructed visions - in the second part of our approach, we will try to dispel this prejudice.[13] What is interesting here is that historians who - by chance - became observers of extended halo displays suddenly understood the lore better; they were thus also able to contextualize the aftermath of the sighting more appropriately.[14]

Fig. 2. Solar halo (22° ring) above Merano, Alto Adige/South Tyrol, Italy, on 2020 July 21 (photo DLN)

Studying historical celestial observations worldwide and systematically (within an inter-disciplinary team), one will find that various halo phenomena around the sun and moon have been carefully observed and noted since long ago.[15] In particular, the 22° ring - the halo par excellence - around sun (*Fig.* 2) or moon (*Fig.* 1) is a credible signal for rain within the next two days, thus it took attention as *portent*; for example, an omen from Assyria has: "If the sun is surrounded by a halo: it will rain; change of weather. From Rašil."[16] In *Meteorologica*, Book III, Aristotle (d. 322 BC) discusses in detail - what we call today - the rainbow (gr. ἶρις), which can occur around the opposite point of the sun or moon in the departing rain. The same book also treats the most common halo phenomena, such as the 22° ring (gr. ἅλως), as well as parhelia or paraselenae (modernly called mock suns/moons or sun/moon dogs), which can be seen as rainbow-colored or whitish glowing patches of light to the right and/or left of the sun or moon, about a hand span away with an outstretched arm (see *Fig.* 1).[17]

Despite Martin Luther's (d. 1546) scathing verdict "but all my life I have believed in no book less than this [*Meteorologica*], ... that everything in nature happens from natural causes"[18], the physical understanding was grown - based on Aristotle and Ibn Al Haytham ([Alhazen] d. 1040) via Willebrord Snellius (d. 1626) and René Descartes (d. 1650) and others to Christiaan Huygens (d. 1695). Here just a brief and general summary: Halo phenomena are atmospheric-optical, whitish-shiny or rainbow-colored brightenings in the form of spots, arcs, columns and circles caused by reflection or refraction, respectively, of sunlight or moonlight on floating or falling ice crystals (usually hexagonal plates or columns with certain orientations), which occur mainly in veil clouds (especially in cirrus, cirrostratus, see *Fig.* 2) at an altitude of about seven to twelve kilometers, but also in ground-level ice fog.[19]

As a sign of blessing, i.e., as a harbinger of rain, and at the same time of overwhelming size and beauty, the apparitions of halo effects are widely loaded with religious associations. The explanatory text of a broadsheet - for instance - printed for the German-speaking market, which refers clearly to a complex halo feature on 1630 April 19, probably above Nuremberg, expresses both aspects, the natural as well as the supernatural: it is a weather-indicator *and* it is a kind of divine presence, revelation, communication.[20] In the Reformation aftermath, the religious interpretation of such celestial spectacles was increasingly problematized. Martin Luther (d. 1546) rejects this *sign language* at least since his confrontation with Thomas Müntzer (d. 1525) and the bloody end of the Peasants' Wars (which does not rule out the possibility that he himself once considered them important). His opponent, on the other hand, believed primarily that the eternal Word *speaks* through the images on sky - it can be shown that his so-called "rainbow" banner and sermon are clearly based on halo apparitions.[21] Both strands can be traced further historically: *sola scriptura* or the actualized *experience* of the biblical writings - among the followers of the latter, the (Ana-)Baptists and the Dreamers, there are many other visionaries.[22]

Philipp Melanchthon (d. 1560) is less restrictive than Luther, as his Latin epigram on the broadsheet about an extended halo phenomenon he and others observed above the Elbe river on 1551 March 21 shows (*Fig.* 3).[23] Although he speaks of a "mendax imago" in the face of various bows and multiple suns, the apocalyptic concern about the significance of this apparition also resonates:[24]

As the sun alone spreads its light over the whole earth
and alone refreshes everything with revitalizing warmth,
the Son alone, through the mind of the eternal Father,
inflames our hearts with his rays.
Ah, why are several images of the sun nevertheless seen
and why is a false image in the empty sky deceiving?
Some may invent fabrications of doctrine
and throw more torches into the discord.
But you, Son of God, drive the lies far away,
may Your Light alone guide the unanimous hearts.

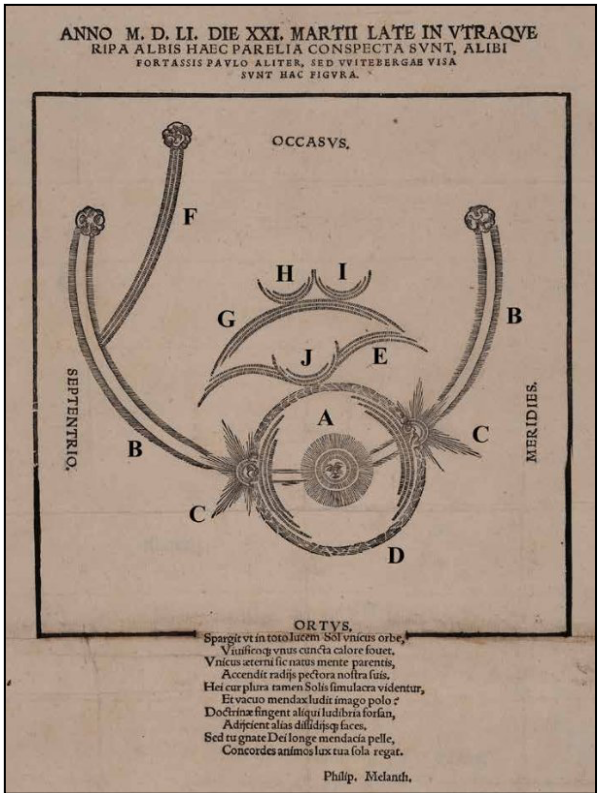

Fig. 3. Broadsheet with a solar halo phenomenon above Wittenberg/Elbe on 1551 March 21; Stiftung Schloss Friedenstein Gotha, "Fliegende Blätter", Band II, p. 502, No. 450, Inv. Nr.18,4 (explanations of the added letters, see note 23)

One of the greatest biblical apocalypticists is the Hebrew prophet Ezekiel, who had a number of visions during the Babylonian exile in the sixth century BC. According to Donald H. Menzel (1953), who was a professor of astrophysics at Harvard University, Ezechiel "proves to take top rank as an observing scientist and recorder of important meteorological phenomena"; "and - whatever religious significance one may wish to assign to it - the origin of the vision becomes clear."[25] As part of his critical examination of modern sightings of so-called *flying saucers* (UFOs), D. H. Menzel also "searched for early examples" - "the story of the wheels" from chapter one of the Book of Ezekiel came to mind.[26]

"And I looked, and, behold [!], a whirlwind came out of the north, a great cloud, and a fire infolding itself, and a brightness was about it", that is the beginning of Ezekiel's first vision - datable to June/July 593 BC - at the river Chebar in Chaldea/Babylonia: "out of the midst thereof came the likeness of four living creatures. And this was their appearance; they had the likeness of a man".[27] Menzel elaborates - from the further and more detailed description by Ezekiel - "we clearly see that the figure contained a cross, centered on the sun. The arms of the cross looked like the spokes of a wheel; each formed the body of a figure".[28] In his book "Flying saucers" (1953) Donald H. Menzel provides a re-visualization similar to the light pattern in *Fig.* 10, for instance. Indeed, Ezekiel's vision (not only this one) has its factual Sitz-im-Leben, its *fundamentum in re*, in the experience of a great halo phenomenon: Even if the textual analysis can be refined today - also thanks to numerous photographic documentations and media possibilities on the one hand, as well as excellent editions and commentaries of the biblical books on the other - someone who, like D. H. Menzel, masters atmospheric sign language, can re-translate the narratives and ensure that they meet the halo criteria and pass the halo test.[29]

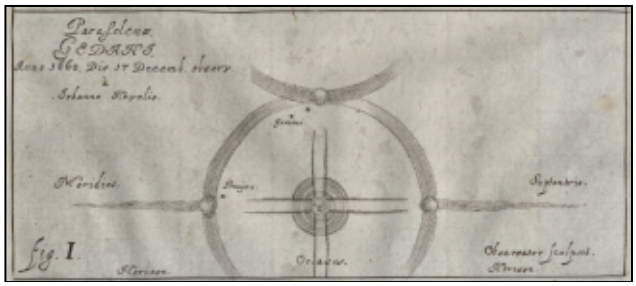

Fig. 4. Lunar halo cross and paraselenae with long tails above Gdansk on 1660 December 17, observed by Johannes Hevelius; *Mercurius in Sole Visus*, Gdansk 1662, fig. I (section), provided as a digital copy by ThULB Jena

Each halo display is unique (due to weather conditions, altitude of sun or moon etc.), but since the laws of reflection and refraction are always the same, figures, patterns, symmetries etc. can be re-cognized by experienced observers. The imaginative naming of effects is either self-explanatory (e.g., "the likeness of a man") and/or it already obeys certain fixed designations that are established for the respective appearances within the airy drama (just compare the biblical prophets with each other and with the later tradition).[30] It seems that the interpretation of the signs follows the more original mnemonic function - sometimes these set pieces have become whole, admittedly somehow irrational stories.[31] Many observational reports prove that such apparitions - even without primary religious charge - have an overwhelming aesthetic:

"If a Finnish halo enthusiast that were given a chance to get in to a time machine, the destination would probably be Kuusankoske on 10 March 1920. On that morning in southern parts of the country a spectacle developed in the sky that is still regarded as possibly the greatest halo display in Finland. ... The most important giving of the display may lie in what the several reports from people who had no experience on halo observing tell about the psychological factors that affect the observations."[32]

Halo phenomena are transcendent in a quasi natural way: Their numinosity, which in contrast to the term coined by Rudolf Otto (d. 1937) is by no means completely formless, is actually experienced as *mysterium fascinosum* or *mysterium tremendum* or simply as *augustum*.[33] Marcel Minnaert (d. 1970), the pioneer of popularizing atmospheric *wonders* as optical facts, gives in his book "Light and Color in the Outdoors" the following as an example of a disturbing halo feature:

"On 14 July 1865, the alpinist [Edward] Whymper and his companions were the first to reach the top of the Matterhorn, but on the way back four of the men slipped and fell headlong down a precipice. Toward the evening, Whymper saw an awe-inspiring circle of light with three crosses in the sky: 'the ghostly apparitions of light hung motionless: it was a strange and awesome sight, unique to me and indescribably imposing at such a moment'."[34]

Even an experienced observer such as Johannes Hevelius (d. 1687) seems to have been enthusiastic about the sighting of a moonlight cross above Gdansk on December 17, 1660 (see Fig. 4):

"across the real moon itself, which is extremely rare, spread an exceptionally large, shiny white or silver-colored cross ... it was so brilliant and full of light that it shone clearly even until the sun rose".[35]

2. Tycho Brahe's Vision of Urania in *De nova stella* (1573) - a close reading

The second section attempts to apply the outlined method of "decoding narratives on halo phenomena" to a text that has received philological attention as well as interest from natural philosophy and the history of science: "In Uraniam Elegia Autoris" is an extensive Latin poem found quasi at the end of "De nova stella" (1573) - this is the short title of Tycho Brahe's book-conglomerate about the supernova (now) named after him.[36] Anyone who deals with the stellar explosion of 1572, e.g., with regard to its brightness and color evolution (as we did within the framework of our inter-disciplinary research project, called terra-astronomy),[37] comes across this "elegy", at least in passing. A close analysis of the *Urania-vision* it presents will show that information about the new star and its observation by Tycho Brahe (1546 - 1601, *Fig.* 5) will be also given here - albeit only indirectly.[38] The more immediate question, however, is: what did Tycho *see* when he thought he had seen "Urania"? (And it is in this sense that this article speaks of "vision".)

A certain challenge may lie in the fact that poetic self-reflection, not to say self-stylization, is essentially (and rightly) identified here. Furthermore, the somehow irrational-seeming encounter with "Urania" undermines the text as a credible historical-factual source. So, for example, Victor E. Thoren (with contributions by John R. Christianson) in a detailed biography to Tycho Brahe, the "Lord of Uraniborg", published in 1990:

"Then in a 230-line poetic epilogue, … Tycho deprecated the glories esteemed by others of his class: ... What he hoped to achieve was the eternal glory of having successfully cultivated astronomy, and he would not be deterred by the opinions of others. ... What he did not accomplish by himself he would not call his own. The rest of his *Elegy* is allegorical, composed with the intent of capturing in verse the power of the star and the muse."[39]

During the Renaissance and Humanism, the ancient muse Urania was worshipped by lovers of the starry sky as the personification of astronomy: in the poem, she is explicitly introduced as one of the nine Apollonian muses who call home on Mount Olympus. But does one of the world's best observers of the supernova of 1572/73 conclude his multifaceted debut (previously he had only published touching verses about his stillborn twin), which should prove him to be a researcher capable of astronomical art in the broadest sense, with such abstract symbolism? In other words, is the "allegorical rest" of Tycho's elegy entirely fictitious? Is his linguistically sophisticated work above all an eclectic pastime of an ambitious scholar?[40] Or does his encounter with "Urania" not rather breathe the kind of genuine inspiration we know from other visions? When we read and listen, do we not become witnesses to a subtle experience that oscillates somewhere between outside and inside? John R. Christianson (2020) outlines the philosophical-spiritual cosmos in which Tycho moves:

"The final section of the book was an 'Elegy on Urania' composed by Tycho in the style of Ovid. ... Urania suddenly appeared and summoned Tycho to worship her instead of Vulcan. ... In her realm, however, 'high in the sky, above the clouds, I enjoy celestial ambrosia with Jupiter himself'. So then, why do you hesitate? *Ergo age, quid dubitas?* The phrase was echoed in Ripensis' opening poem. Tycho replied to this divine summons in the manner of Pico, as a Magus, a man made divine and able to participate in the intellect infused in nature".[41]

Fig. 5. Portrait of Tycho Brahe from 1586 framed by the family coats of arms, second (corrected) engraving by J. de Gheyn; British Museum (public domain)

Indeed, one must resist the temptation to read Tycho as a modern secularized researcher reduced to a narrow field. Even if his observations and measurements give new impetus to the empirical-inductive method (following on from Hipparchus and Ptolemy), he is nevertheless a scholar whose self-image is embedded in the broad and curious horizon of his time: alchemy, astrology and prophecy - to name just the most obvious *magical* residia - are also somehow part of this. Håkon Håkonsson (2004) has (re)exposed this side of Tycho Brahe, which is often ignored or neglected in historical research focusing on developments in the natural sciences.[42] On the other hand, the challenge also lies in not *psychologizing* and/or *literarizing* from the outset such ambitions and concepts that

are somehow incomprehensible or suspect to us today. Tycho believes - if one takes his elegy seriously as an authentic source - that he has truly experienced this divine election: as “Magus” he is "able to participate in the intellect infused in nature."[43]

Should this observational analyst and holistic practitioner really be content with the literary construct of an *allegory*, far removed from any living symbol of Urania's gifts - *now* that the new star in the sky is challenging traditional ancient knowledge and he feels called to be the high priest of measurement better than ever? Could this thoroughbred Latin-thinking humanist not have perceived the surprising experience of an awe-inspiring *sign* as a quasi supernatural event - even if it was caused by the reflection and refraction of moonlight on tiny ice crystals (the underlying optics were not yet fully understood in the 16th century); analogous to the new *miracle* star, which is nevertheless intensively researched according to all the rules of the art. Was it not a divine greeting and a human salutation (due to a phenomenon seen on sky) at the same time: "Behold, a goddess"? Could it not be that Tycho Brahe is paying homage to the ancient prophetic power of the *halo code* in his Urania-Elegy? In a close reading and with some cross-references, we want to give wings to this thesis.

Fig. 6. Map of Denmark, engraving by M. Jordan (later colored); Braun & Hogenberg: *Civitates Orbis Terrarum*, Vol. IV, Colonia 1585

This "test" (note 13) should be done: Is there any substantial evidence that the vision of the elegy is based on the sighting of a halo phenomenon, i.e., is it essentially a *halo narrative*? Which criteria are fulfilled? To what extent can the text be re-visualized? We will go through the poem, more specifically all those passages that shed light on what Tycho might have *seen* as "Urania". We use the Latin text of the Dreyer edition (1913), but in the slightly modified form by Peter Zeeberg (2007), which has the advantage of a continuous verse count; P. Zeeberg also provides a translation and detailed commentary in Danish, while some longer passages have been rendered into English by John R. Christianson (2000, 2024).[44] For identification purposes, those categories are queried that allow a critical comparison with other conceivable celestial phenomena (e.g., the *stella nova*, twilight, the starry sky as such), but above all help to clarify whether Tycho's "Urania" has an external reality at all. Information can be found more or less for all five categories (which have already been introduced in the first part): position, time, appearance (e.g., size, form), behavior, and duration, i.e., where, when, how (of what kind), how variable, for how long the sign was seen in the sky? Of course, the observational site limits these questions from the outset: So *where* was Tycho?

Est locus ad Rynae properantes fluminis undas, (1)
Aspicies, Musas hîc habitare putes;
Quo non fertilior, quo non iucundior extat,
Qua videt Arctoum SCANIA tota polum;
...
Hunc nemus umbroso circumdans undique flexu, (7)
Claudit in aprico mollia prata sinu.
In medio spectanda domus, cui prisca Vetustas
Concessit nomen HERRIS habere VADI.
...
HAC ego Stenonj, quòd noster Avunculus esset, (27)
Tempore dum longo, iunctus in aede moror;

In the first 28 verses of the poem, Tycho describes his current whereabouts: it is the former monastery of *Herrevad* (v. 10), which was secularized as a result of the Reformation and is now inhabited and administered by his uncle *Sten Bille* (vv. 19ff.). The extensive area stretches along the middle course of the Rönne (about 10 km upstream from Klippan), a smaller river with only a slight gradient that crosses Scania/Skåne from southeast to northwest; "properantes fluminis undas" in the first line apparently means less fast-flowing than wild-flowing. Tycho's statement that a forest provides shade all around and yet encloses soft meadows in an open, sunny embrace (vv. 7f.) is probably an allusion to the "locus" (v. 1) of Herrevad, but is also largely characteristic of the entire region. Scania, which at that time belonged to Denmark, lies in the extreme southwest of today's Sweden and is washed by the Kattegat, the Sound and the Baltic Sea (see *Fig.* 6); it is a mostly flat undulating landscape with few elevations of a maximum of 200 m - Herrevad lies at an altitude of about 50 m, barely 20 m higher than the nearby Rönne. (The map in Fig. 6 gives Scania as “Schania”, “Heratzcloster” is shown above the two first letters, but the river Rönne is missing.) Overall, the observing site offers a low horizon and, at a geographical latitude of about 56°, a good view of the vast polar region (v. 4), where *the bears* are circumpolar, i.e., never set below the horizon (v. 93). The higher humidity facilitates halo effects, including those that appear particularly bright in ice fog of cold winter months.

Fortè per umbriferae digressus limina Sylvae, (29)
Solus ad irriguas expatiabar aquas.
Sol erat Hesperias se tunc missurus in undas,
Lunaque nocturnos acceleravit equos. (32)
En DEA (nescio quae) coelo delapsa sereno,
Protinus hîc oculos constitit ante meos.

On the day Tycho sighted "DEA" (v. 33), a goddess, he leaves the boundaries of the shady forest - purely by chance or even by providence, as "fortè" suggests (v. 29).[45] He strolls alone "ad irriguas aquas" (v. 30), which

most likely refers to the untamed *Rönne* river and not to artificial irrigation systems, since Tycho describes this very river in the first sentence of his poem as "locus" *where the muses dwell* ("Musas hîc habitare putes"). Nota bene: This opening scene in particular is read as an allusion to some verses by the Roman poet Ovid.[46]

And *what time* did Tycho take his walk? The two following verses 31 and 32 make it clear that the sun *in the west* - described as "Hesperias" (while "Hesperus" means the evening star) - is just sinking into the waves of the Sound ("in undas" here certainly does not refer to the Rönne, cf. v. 1), while the moon accelerates its *nocturnal horses*, i.e., is already climbing the ecliptic in the east. And *where* and *when* exactly did Tycho see "Urania"? Since immediately after this last statement - the lunar horses will be discussed below - "DEA" (i.e., "Urania", vv. 39f.) emerged right in front of his eyes, we may conclude that the apparition is approximately in the direction of the moon (vv. 33f.). The moment is indicated by the setting sun - it is the beginning of civil twilight: the planets and also the brightest stars are becoming clearly visible. But on *which day* was "Urania" seen by Tycho?

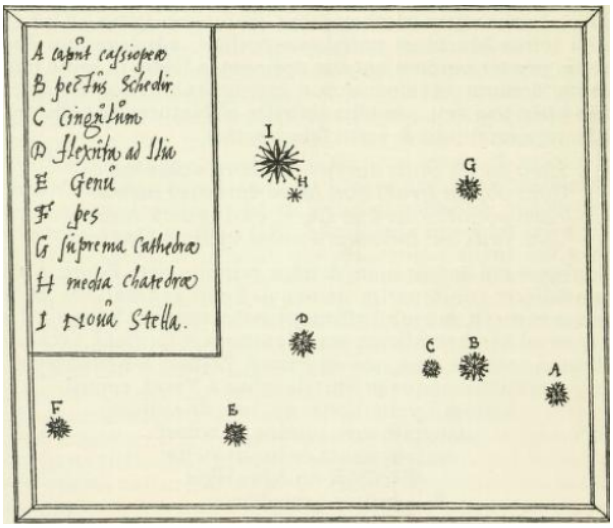

Fig. 7. The "new star" and the celestial "M/W" formed by the stars of Cassiopeia; Tycho Brahe, *De nova stella*, 1573 in: John L. E. Dreyer (ed.), Vol. I, Copenhagen 1913, p. 20

En nova sublimi spectatur in aethere Stella, (121)
Qua sedet ad boreum Cassiopea Polum.

There are initially two dates that narrow down the time period: The "nova" can already be seen (*Fig.* 7), where *Cassiopeia is sitting*, towards the *North Pole* (vv. 121f.); Tycho spotted it for the first time on November 11, 1572, as we know from his essay on the New Star. The completion of his book (including his most recent observations of the supernova) can be dated to May 5, 1573 at the latest, as explicitly stated in "De nova stella" (which does not rule out the possibility that it was already partly in print by then).[47] Moreover: In early 1573, he is said to have met in Copenhagen with his friends, who had not yet noticed the new star, but encouraged Tycho to publish his book project under his own name.[48]

Furthermore: In verse 121, "Urania" points to the new star: "En nova" - *Behold!* Since the apparition of the goddess began shortly after sunset, i.e., in civil twilight (which lasts until the sun is 6° below the horizon), the supernova mentioned soon must have been well visible - which would be given best in November and December as we know from Tycho himself: the "nova" was then at least as bright as planet Jupiter and thus far brighter than any other star. In January it was already less, although still brighter than fixed stars of the first magnitude, at the beginning of May it was no longer brighter than stars of the second magnitude - then one could not simply make it out in nautical twilight (the sun being 6° to 12° below the horizon).[49] Nota bene: An identification of the Urania apparition with the "new star" or an allegorization of the supernova as Urania (note 43) is against the statements in the text that presuppose two entities (e.g., v. 121). Are there any other hints as on which day exactly the encounter with "Urania" might have taken place?

Demonstrans alijs dirum non esse Cometam, (127)
Sed numero stellas hanc sociasse suo.
Nam quia nil veteres mortalia pectora tangunt,
Haec nova, quod veteres non monuere, monet.
Insuper Annus adest renovatis orbibus, ex quo (131)
Est Deus è casta Virgine natus Homo.
Huic volo designes labentia tempora coelo, (133)
Aptabisque suos ad vaga signa dies.
Astrorum positus Solis Lunaeque recursus
Lapsaque sub terras, ortaque signa nota.

The visible *performance* of "Urania" comprises a good 120 lines of verses (vv. 33-154), in the last third the specific tasks are set for Tycho; e.g., he is asked to prove that the *nova* is not a *comet*, but belongs to the *fixed stars* (vv. 127f.). However, the goddess demands even more: Tycho is commissioned to *adapt* ("aptabisque") the "labentia tempora" to the actual conditions in the sky (vv. 133ff.) - here, "labentia" is aimed more at the *errant* course of time (while "lapsaque" is in contrast to "ortaque", v. 136). The driving idea behind this desire is to provide astrological weather prognostications on an astronomically correct basis in future (vv. 137-144): Tycho completed the calculation for the example year 1573 in December 1572 at Herrevad *Museum* (in the classical sense of *temple*), as can be seen from the so-called *dedication letter* which was included in the first edition of “De Nova Stella” – in contrast to the extensive tables and figures.[50]

These "appendices", which "the author has worked out with unique diligence", as it says in the table of contents, clearly show that Tycho has implemented (already) Urania's order: What is immediately noticeable is that the solstices and equinoxes are all calculated astronomically, i.e., they are specified - starting with the beginning of winter in December 1572 - to the minute for the dates December 11, March 10, June 12 and September 13. It is known at the time that the Julian calendar was virtually ten days behind compared to the vernal equinox, which was set on March 21st under Emperor Constantine the Great (d. 337); the Gregorian calendar reform will remedy this lag in 1582, its establishment took centuries - but Tycho always had a positive attitude towards it, which was not a given in the Protestant camp.[51] Of course, he uses the common Julian calendar for his "new and learned method": but the empirical adaptation of the celestial conditions to the earthly data is carried out radically and consistently for all days of the year for the sun, moon,

planets as well as many stars - and the (traditional) astro-meteorological interpretations by Tycho are based then on this information.[52]

When "Urania" now says in verses 131 and 132 that the year - in astronomically *renewed or restored orbits* ("renovatis orbibus") - stands exactly where God once became man in the Holy Night ("Annus adest ... ex quo/ Est Deus è casta Virgine natus Homo"), then one has to conclude that the Julian calendar is just showing 1572 December 14; and in verse 134 a day-accurate adjustment is explicitly demanded. Tycho Brahe celebrated his 26th birthday on this very day - but in Urania's sky it is actually already Christmas, based on the tropical phase. It cannot be ruled out that the wording of "Urania" instead alludes to the Solemnity of the Nativity, then December 15 (Julian) would be meant.

If so, this quasi second birthday, the date of Tycho's re-naissance in Urania's realm (vv. 223ff.) should also fit the scenario outlined earlier: Indeed, on December 14, in the area of Herrevad at 3:25 p.m. local time, the three-quarter full moon was almost 18° high in the ESE when the sun was setting in the SW; on December 15, the 85% illuminated moon stands 15° above horizon in the east at sunset; (NB: on Dec 24 and Dec 25, Julian style, the moon would not have been in the evening sky). A walk - mainly during civil twilight and beginning nautical twilight, i.e., until around 4:30 p.m. - upstream along the Rönne would take Tycho straight to *Luna's horses* and to "DEA" (vv. 32f.).[53]

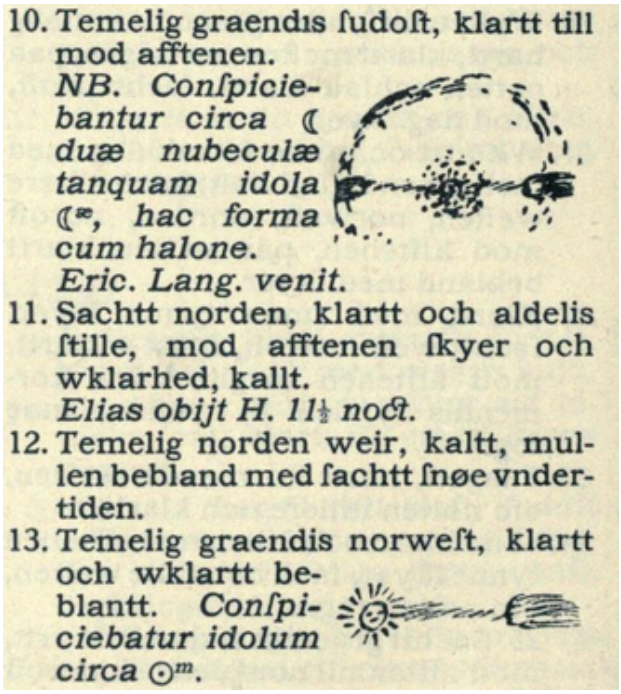
10. Temelig graendis ſudoſt, klartt till mod afftenen.
NB. Conſpiciebantur circa ☾ duæ nubeculæ tanquam idola ☾∞, hac forma cum halone.
Eric. Lang. venit.
11. Sachtt norden, klartt och aldelis ſtille, mod afftenen ſkyer och wklarhed, kallt.
Elias obijt H. 11½ noct.
12. Temelig norden weir, kaltt, mullen bebland med ſachtt ſnøe vndertiden.
13. Temelig graendis norweſt, klartt och wklartt beblantt. *Conſpiciebatur idolum circa ☉m.*

Fig. 8. Details from the meteorological diary of March 1590 - including halo phenomena; Tycho Brahe, *Mutationes Aeris*, in: John L. E. Dreyer (ed.), Vol. IX, Copenhagen 1927, p. 82

Sol erat Hesperias se tunc missurus in undas,
Lunaque nocturnos acceleravit equos. (32)

Now verse 32 is examined more closely, it is roughly rendered by Thoren (with Christianson, 1990) as "and the great chariot of Luna was mounting the sky".[54] Even if there is no real mention of the *great chariot*, but only of "nocturnos equos", the association is the same: the moon comes with company. The only possible companions of the moon that could somehow be associated with *horses* are the 22° paraselenae with pronounced long tails (they can reach up to about 20° if the moon has an altitude below 30°): These usually whitish glowing halo effects, which extend the (sometimes colorful) patches of the paraselenae and resemble somewhat a typical comet's tail, obviously represent them as *pars pro toto*.

In *Fig.* 4 the "tails" are depicted, each directed away from the real moon and its satellites, while *Fig.* 8 shows details from the meteorological diaries that Tycho Brahe kept together with his colleagues and collaborators for the years 1582 until 1597: The paraselenae on 1590 March 10 (Julian) are described as "two cloudlets like shadow images (*idola*)"; the parhelion on March 13 (Julian) as a "shadow image (*idolum*)"; the “tails” are not particularly long here (even if moon and sun were sufficiently low - the length also depends on the conditions in the atmosphere).[55]

If the moon also has a 22° ring, which is optically possible (see *Fig.* 8), it could be said that the moon in its chariot is pulled by two horses along the ecliptic - perhaps Tycho's formulation includes Luna's chariot. At least, the moon Tycho saw on 1572 December 14 or 15 had two mock moons, each with a distinct tail.

The idea of horses connected to the moon or, analogously, to the sun can be found in many figurative texts - as here by King James VI of Scotland after a visit to Tycho in Uraniborg on the Island of Hven (which took place only a few days after the observations of the halo phenomena, see *Fig.* 8, namely on 1590 March 20):[56]

What Phaethon dared was by Apollo done,
Who ruled the fiery horses of the sun.
More Tycho doth, he rules the stars above,
And is Urania's favorite, and love.

In Greco-Latin antiquity, the so-called Dioscuri motif was widespread, which already has its roots in the Orient: the two Dioscuri (sons of Zeus) are heavenly combat assistants who ride on *white horses*. After a decisive victory at the beginning of the 5th century BC, the Romans have consecrated a temple to them (who were known there as Castor and Pollux). The Dioscuri motif can be found well into the Early Modern Period, although it has been overwritten several times.[57]

Broadsheets from the 16th and 17th centuries clearly show that these transmissions are a mythical appropriation of specific halo effects beside sun or moon: Now two young men with long swords or sabers fight for a heavenly victory, for example, as seen on 1546 February 26 above Ofen (Budapest), *Fig.* 9. The accompanying text builds a whole suspenseful story based on the sign-language of various halo phenomena which appear and disappear over the course of around an hour and a half - albeit with a blatantly political interpretation. Even if the depiction is more of an illustration of this message, the 22° halo is rendered correctly in terms of color: the inner arc of the so-called "Regenbogen" shimmers red; cataloging this event as "Fiktion" is not justified (even if there was a similar sighting ten years earlier).[58]

Anno 1546. den 26. Februarij vmb 8. vhr vormittag/ ist dises wunderbar vnnd
seltzam gesicht/ von einem Ersamen vnd wolweysen Burger/ in der Stat Bascha genant/ gelegen im Land zu

Fig. 9. Broadsheet giving a "Gesicht" above Ofen (Budapest) on 1546 February 26; Stiftung Schloss Friedenstein Gotha, *Fliegende Blätter*, Band II, p. 501, No. 449, Inv. Nr.18,52

If Parhelia or Paraselenae have pronounced tails, there is already a significant concentration of tiny hexagonal ice crystals in very high air layers - and further halo effects are likely. But how does this fit together, since the text speaks of "coelo sereno" (v. 33), which Thoren (with Christianson, 1990) renders roughly as "cloudless sky"?[59] In verse 107, the term is specified in principle: "Nostra oculis coelo fulgent spectanda sereno", i.e., if the sky is *serene*, the stars in the sky can be seen. In relation to the situation on December 14 or 15, when night was falling, this means that despite the halo apparition, stars should also become visible: In verse 121, "Urania" refers directly to the supernova ("En nova"), but the starry sky is also mentioned in passing.

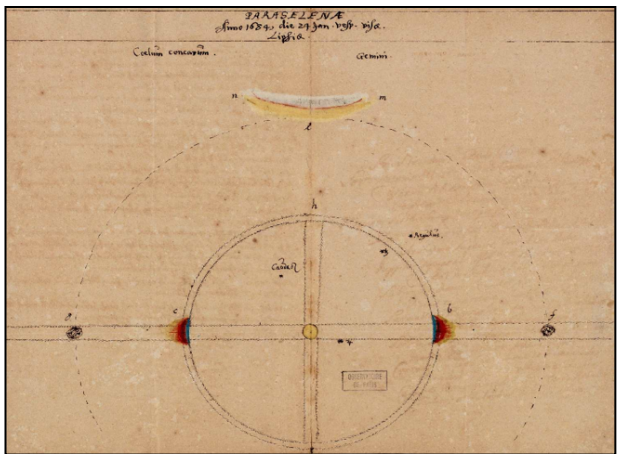

Fig. 10. Lunar halo cross above Leipzig on 1684 January 24, drawn by Gottfried Kirch in a letter to Johannes Hevelius (K.-D. Herbst 2006, no. 256); provided as a digital copy from Paris Observatory, C.1.16, no 29, folio 2299r-v and no 30, folio 2300

The lunar halo features observed with the naked eye by Johannes Hevelius (*Fig.* 4) and Gottfried Kirch (*Fig.* 10) show that this does not have to be a contradiction: Both have included some bright stars and planets in their illustrations, probably for reasons of orientation and completeness (as well as following old traditions). Overall, halo phenomena can also occur when the impression of a (still) almost clear sky prevails, i.e., the upcoming cirrus clouds have not yet developed their typical milky-white veil (see difference between *Figs.*1 and 2).

En DEA (nescio quae) coelo delapsa sereno, (33)
Protinus hîc oculos constitit ante meos.
Extimui, et rigido stabant horrore capillj;
...
HAEC ubi Diva Poli, celsis quae praesidet astris, (151)
Dixerat, humanos sic imitata sonos,
Protinus ex oculis fugiens repetivit Olympum,
Ingenio sensi numen adesse meo.

Before attempting to (re-)visualize the size and shape of the "goddess" - the behavior and duration of the presence should be constrained with the help of statements in the elegy: *How variable* and *how long* was Tycho's "Urania" vision? Verse 34 - "protinus hîc oculos constitit ante meos" - emphasizes the suddenness and immediacy of the apparition, which took place directly in front of Tycho's eyes. Despite the great distance from the light-reflecting and -refracting ice crystals, halo phenomena are characterized by the fact that they radiate a relative proximity. Especially, when such effects emerge near the horizon, they seem to touch the earthly world - comparable to the rainbow that appears around the opposite point of the sun or moon.

The description that the phenomenon suddenly *glides into* the sky or *descends from* the serene sky ("coelo delapsa sereno", v. 33, cf. v. 113) is also typical for these ice crystal images; and just as (more or less) instantly such a light image pops up, it also disappears again - in verse 153 "protinus" is used again: "protinus ex oculis fugiens repetivit Olympum". At first, Tycho is surprised and somewhat shocked by this heavenly performance - even if he exaggerates a little (v. 35), current and historical observational reports make his genuine emotion understandable (see end of first part).

The impression is that Tycho did not see his "Urania" for too long - it is neither an event of a second nor an hour. If one takes the reading length of around 120 lines of verse as a guide, it is a matter of several minutes, perhaps up to a quarter of an hour. In principle, the progression of halo phenomena is slow, but due to atmospheric conditions (wind speed etc.), changes can also occur in a short time-scale; for example, one or the other halo effect can light up, but also disappear quickly - the text certainly leaves room for some associative speculation here.

But *what* did Tycho see as "Urania"? "En DEA" - *behold, a goddess* - is obviously his first association. To put it soberly: What he saw and initially called "DEA" must have spontaneously left a somehow figuratively feminine and particularly beautiful and at the same time overwhelming impression: "Urania" is *really* standing before his eyes - she is suddenly facing him (v. 34). Although Tycho reveals a lot about his vision through this divine name alone, and some other characteristics (cf. vv. 53f.,

83f.), including the fact that "Urania" somehow speaks, support this quasi personal note, we would like to know more. An example will illustrate this, even if it dates back many centuries; but it obviously belongs - in a convoluted way - to the same intelligible world to which Tycho also pays homage towards the end of his Urania Elegy (after he had realized his calling and said goodbye to a purely earthly life, he gives the following two verses, 223 and 224): "But there are few, indeed, far too few, to whom the gentle Apollo gave the gift, that they can see what Olympus possesses."

Sed pauci, heu nimiùm pauci, quibus almus Apollo (223)
Hoc dedit, ut videant id quod Olympus habet.

As mentioned in the first part of this article, Emperor Constantine the Great and his soldiers witnessed a solar halo phenomenon in 310, most likely above the Apollonian source sanctuary of Grand (Vosges). Church Father Eusebius of Caesarea recounts the vision in his Vita Constantini (c. 340) as follows:

"Around the southernly/midday hours of the sun, when the day began to wind down, he had seen with his own eyes, as he said, that on sky the victorious sign of the cross, which was made by light, lied across the sun, and with it a text phrase was connected: 'Win with this!' He was astonished by the spectacle, as was the entire army that followed him when he was on the march somewhere and became spectators of the miracle."[60]

Historical research has shown that there is a second, earlier source about this event (note 14). An unnamed Panegyricus took the same vision as the occasion for a laudation in 310 and interpreted it in the context of the Roman religious Pantheon:

"... after you had turned off from the large street, taking the path to the most beautiful *templum* on the whole Earth, to the One, as you have seen, the really present God. Namely, as I believe, Constantine, you have seen your Apollo, who - accompanied by Victoria - presented to you laurel wraths ... And why do I say 'I believe'? You have seen him and recognized yourself in the vision [specie] of the One to whom power belongs throughout the world, as the divinely inspired poets sang."[61]

Both strands of transmission emphasize that the emperor himself (and others) could *see* something - "the ... sign of the cross, ... made by light, ... across the sun", on the one hand, "the really present God ... your Apollo", on the other: If we combine these two pieces of descriptions, which is supported by the fact that a cross of light can obviously bring a visual-figurative impression (as associated, for example, by the alpinist Edward Whymper, see end of the first part), then we can imagine Tycho's "Urania" in a analogous way - as a goddess, made of moon light crystals.

Last considerations: Could Tycho have seen a more extended and complex halo feature than just two - not so rare - paraselenae? Although Tycho Brahe later carried out daily weather observations, which he also published (note 55), unfortunately no such data is available for the period 1572/73 - perhaps they are just missing in the same way that the original hand-written records of the supernova have not come down to us. What can be said is that the winter of 1572/73 was particularly cold and severe; there may also have been conditions for ice fog halos, but these *diamond dust* features are not even necessary.[62]

On the evening of December 14 or 15, 1572, a few days before full moon (Dec 19 at 9:48h UT), the illumination of the lunar disk would be already more than 75%. Observational records from the Babylonian Diaries (note 16) show that halos can reliably occur up to seven days before and after the full moon, so that even the light of the half moon is sufficient. The huge halo spectacle, see *Fig.* 10, that Gottfried Kirch witnessed above Leipzig in the first half of the night of 1684 February 3 (given in the Julian calendar for 1684 January 24) appeared almost three days after full moon (Feb 1 at 6:03h UT).[63]

Johannes Hevelius' information about the sighting on 1660 December 17 above Gelansk underlines that he was able to see the lunar halo *cross* "until the sun rose" (see end of first part). This is similar to the situation described by Tycho in his elegy: immediately or soon after sunset he saw the moon with its paraselenae-*horses*. The difference, however, lies in the altitude of the moon, for Hevelius it is at the end close to the horizon, for Tycho it stands at least 15° above the horizon.

The display observed by Gottfried Kirch reveals that crosses of light can also appear when the moon is already higher than, for instance, at the beginning of Hevelius' sighting: Johannes Hevelius states that his isosceles cross had a maximum extension of 30° (note 35), which roughly corresponds to the depiction (see *Fig.* 4), so the moon was at most 15° high, while Kirch's drawings show a lunar altitude of about 22° and more (*Figs.* 10 and 11). The higher the moon, the rarer such crosses are, but they are nevertheless possible under appropriate weather conditions.[64]

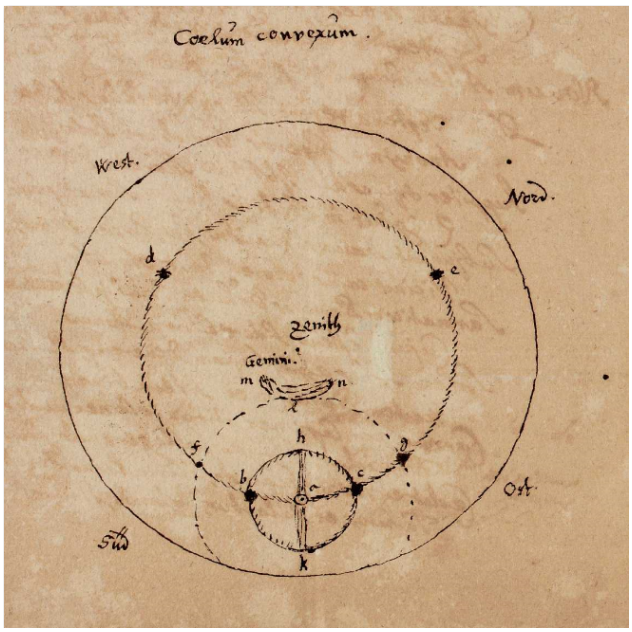

Fig. 11. Lunar halo cross above Leipzig on 1684 January 24 (all-sky view), drawn by Gottfried Kirch in a letter to Johannes Hevelius (K.-D. Herbst 2006, no. 256); provided as a digital copy from Paris Observatory, C.1.16, no 29, folio 2299r-v and no 30, folio 2300

Since paraselenae with pronounced tails were obviously seen by Tycho and almost certainly also a figurative cross of light, very small hexagonal ice crystals - thin plates as well as longer columns - should have been present in high concentrations, floating, rotating, and falling with different orientations in more or less turbulent air. Similar to Gottfried Kirch's display (*Figs.* 10 and 11), the brightly colored circumzenithal arc, which looks like an inverted rainbow but smaller and made of the same crystals as the paraselenae, may also have been visible. At its apex, this arc is at least 46° above the moon and is still powerful at a lunar altitude up to 25°. In the evening of December 14 or 15, 1572, this *diadem*-bow of Urania could have almost touched the "new star"; the moon was in the ecliptic range of Taurus where the supernova appeared. It is very likely that the 22° ring was visible (the "chariot" associated with the "horses") and also other effects, such as the 22° upper tangent arc (see *Fig.* 4), a light pattern that could shape the head, especially the mouth of "Urania", who has so much to say to Tycho. Such a halo phenomenon has quite impressive dimensions, as the image by Alan Dyer demonstrates (see *Fig.* 1): even if this is photographically exposed for a while - lunar halo displays can be observed very well and also safely with the naked eye (note 64).

Fig. 12. Front view and floor plan of Uraniborg; Tycho Brahe, *Astronomiae instauratæ mechanica*, Self-published, Wandsbek bei Hamburg 1598, p. 80

Addendum: If Tycho truly stands in the subtle and time-honored poetic tradition of the halo visionaries, more inspirations should be found than just his wonderful elegy "In Uraniam": Did he not call his later observatory *Uraniborg* a temple of the muses? And if one look at the floor plan of this *museum* (see *Fig.* 12), formed by an isosceles cross and symmetrically arranged arcs, one can get the impression that it is a concrete realization of his spiritual vision on that Holy Evening in 1572: when Tycho was welcomed by Urania as a friend and priest on Earth and called to be her worshipper (and worker).

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Notes

[1] Ralph Neuhäuser, Dagmar L. Neuhäuser, Thomas Posch, "Terra-Astronomy - Understanding historical observations to study transient phenomena", in: Teresa Lago (ed.), *Astronomy in Focus - Proc. Focus Meetings IAU GA* (held August 2018, Vienna, Austria), Cambridge: University Press, 2020, pp. 145-147. Further information, an introduction and all publications on Terra-Astronomy: https://www.astro.uni-jena.de/terra-astronomy

[2] E.g., Dagmar L. Neuhäuser, Ralph Neuhäuser, Markus Mugrauer, Amir Harrak, Jesse Chapman, "Orbit determination just from historical observations? Test case: The comet of 760 CE is identified as 1P/Halley", *Icarus International Journal of Solar System Studies* 364, 114278, 2021, pp. 1-29; recently also mass and age of Betelgeuse could be constraint due to color changes in historical time: Ralph Neuhäuser, Guillermo Torres, Markus Mugrauer, Dagmar L. Neuhäuser, Jesse Chapman, Daniela Luge, Matteo Cosci, "Colour evolution of Betelgeuse and Antares over two millennia, derived from historical records, as a new constraint on mass and age", *Monthly Notices of the Royal Astronomical Society* 516, 2022, pp. 693-719.

[3] E.g., Ralph Neuhäuser, Dagmar L. Neuhäuser, Jesse Chapman, "'Novae, supernovae, or something else?' - (Super-)nova highlights from Hoffmann & Vogt are quite certainly comets (AD 668 and 891)", *Monthly Notices of the Royal Astronomical Society* 501, 2021, pp. L1-L6; cf. Dagmar L. Neuhäuser, Ralph Neuhäuser, Jesse Chapman, "New sunspots and aurorae in the historical Chinese text corpus? Comments on uncritical digital search applications", *Astronomical Notes* 339, 2018, pp. 10-29.

[4] E.g., Ralph Neuhäuser & Dagmar L. Neuhäuser, et al., "The Mira discovery problem - Observations by David Fabricius in 1596 and 1609 (and by others before?): Positional accuracy, brightness, color index, and period", *Astronomical Notes* 345, 2024, e20230131; Ralph Neuhäuser & Dagmar L. Neuhäuser, "Sunspot numbers based on historic records in the 1610s - early telescopic observations by Simon Marius and others", *Astronomical Notes* 337, 2016, pp. 581-620.

[5] E.g., to distinguish between (super)novae and comets: Ralph Neuhäuser & Dagmar L. Neuhäuser, "Critical comments on publications by S. Hoffmann and N. Vogt on historical novae/supernovae and their candidates", *Astronomical Notes* 342, 2021, pp. 675-695; or between auroral and meteoritic phenomena: Dagmar L. Neuhäuser, Ralph Neuhäuser, Amir Harrak, "Reports and drawings of celestial observations in the 8th century Syriac Chronicle of Zuqnin (auroral and meteoritic phenomena)", *Journal of the Canadian Society for Syriac Studies* 18, 2018, pp. 67-90.

[6] Dagmar L. Neuhäuser & Ralph Neuhäuser, "'A red cross appeared in the sky' and other celestial signs: Presumable European aurorae in the mid AD 770s were halo displays", *Astronomical Notes* 336, 2015, pp. 913-929. https://arxiv.org/pdf/1508.07955.pdf - Cf. Ralph Neuhäuser & Dagmar L. Neuhäuser, "Solar activity around AD 775 from aurorae and

radiocarbon", *Astronomical Notes* 336, 2015, pp. 225-248; Ralph Neuhäuser & Dagmar L. Neuhäuser, "Variations of 14-C around AD 775 and AD 1795 - due to solar activity", *Astronomical Notes* 336, 2015, pp. 930-954.

[7] Ralph Neuhäuser, Dagmar L. Neuhäuser, Thomas Posch, "Terra-Astronomy - Understanding historical observations to study transient phenomena", in: Teresa Lago (ed.), *Astronomy in Focus - Proc. Focus Meetings IAU GA* (held August 2018, Vienna, Austria), Cambridge: University Press, 2020, pp. 145-147, cit. p. 146.

[8] Sigmund Freud, *Die Traumdeutung*, Leipzig/Wien: Franz Deuticke, 1900, pp. 30ff.: "Die vorwissenschaftliche Traumauffassung der Alten stand sicherlich im vollsten Einklang mit ihrer gesamten Weltanschauung, welche als Realität in die Außenwelt zu projizieren pflegte, was nur innerhalb des Seelenlebens Realität hatte." - "Es war bei ihnen Voraussetzung, daß die Träume mit der Welt übermenschlicher Wesen, an die sie glaubten, in Beziehung stünden und Offenbarungen von seiten der Götter und Dämonen brächten. Ferner drängte sich ihnen auf, daß die Träume eine für den Träumer bedeutende Absicht hätten, in der Regel, ihm die Zukunft zu verkünden."

[9] Carl Gustav Jung, *Die Archetypen und das kollektive Unbewußte*, Gesammelte Werke 9/1, Zürich: Rascher/ Olten: Walter, 1976, e.g., § 261: "Die Mythen sind ursprünglich Offenbarungen der vorbewußten Seele, unwillkürliche Aussagen über unbewußtes seelisches Geschehen, und nichts weniger als Allegorien physischer Vorgänge." Cf. note 26.

[10] E.g., Leo Frobenius, *Das Zeitalter des Sonnengottes*, Band 1, Berlin: Georg Reimer, 1904, pp. 34f.: Frobenius sketches an "Zeitalter des Sonnengottes" (title), particularly with regard to the "Erhaltung der Mythologie", because "das Problem der Mythologie beruht ja nicht in der Entstehungsgeschichte allein": "Ich glaube nur eine einzige Lösung dieses Problemes gefunden zu haben. Die Geschichten, die die Menschen zu so großartiger Gedächtnisstärke erzogen haben, müssen einerseits von einer enormen Eindruckskraft gewesen und anderseits noch durch ständige Befruchtung des Gedächtnisses am Leben erhalten worden sein. Und da komme ich eben darauf, wohin ja jede Erkenntnis in zehnjähriger Arbeit am Stoffe geführt hat, daß es nämlich in der Natur kein so großartiges Schauspiel gibt, wie Sonnenauf- und -untergang und Nachtgröße für ein Volk in den Tropen. Hat sich hier wirklich die Mythologie ausgebildet, war wirklich die Sonnenfahrt die Anregung, dann verstehen wir auch die Erhaltung der Mythologien durch die vielen, vielen Jahrtausende bis auf unsere Zeit. Denn an jedem Tage wurde die Sonne einmal verschlungen, an jedem Morgen wurde sie einmal geboren, und wenn die ehrfurchtsvolle Scheu und die Empfindung für die Heiligkeit überhaupt erst geweckt war, dann konnte jede einzelne Geschichte aus dem schicksalsreichen Dasein des Sonnengottes täglich, ja stündlich mit dem Anblick der Sonne in das Gedächtnis zurückgerufen werden."

[11] E.g., Giorgio de Santillana/Hertha von Dechend, *Hamlet's Mill*, Boston: Gambit, 1969, German edition, *Die Mühle des Hamlets*, Wien: Springer, 1994 - in "Hamlet's Mill/Die Mühle des Hamlets" the authors attempt to understand various mythological traditions, including Platonic "visions" and "cosmologies" ("who could still speak the language of archaic myth", p. 6, translated from the preface in the German edition), *cosmographically*, in the sense that they communicate the knowledge of precession, more precisely, "the secular shift of the points of the year along the zodiac, whereby the ages of the world are determined" (p. 2). - Cf. Laetitia Rimpau, *Visionen neuer Wissenschaft, Zur dialogischen Dichtung von Dante Alighieri und Johannes Kepler*, Heidelberg: Universitätsverlag Winter, 2021, pp. 20f.: "*Dichtung, Aschenputtel der Wissenschaftsgeschichte*. Die Bedeutung, die man der Dichtung innerhalb ... der Astronomie beimisst, ist ... äußerst gering. Unter Wissenschaftshistorikern überwiegt die Auffassung, dass ausschließlich die exakte Naturwissenschaft durch Experimente seriöse Erkenntnisse produziere. Die Literatur greife diese dann auf und reflektiere sie nur. Die vorliegende Arbeit widerspricht dieser Auffassung ... Dialogische Dichtung stellt eine 'Bühne' für Hypothesen, einen 'Speicher' von Hypothesen und einen 'Verteiler' von neuem Wissen dar. Insofern sind die Funktion und die Leistung der Dichtung weit mehr als nur eine reaktive. Die literarische Wissenschaftsgeschichte muss erst noch geschrieben werden. Das vorliegende Buch stellt erste Bausteine bereit." Among other things, Laetitia Rimpau attempts to show that Dante Alighieri (died 1321) already developed a heliocentric view of the world in his *Divina commedia* and disseminated it through his poetry in Italian.

[12] E.g., Gregor Weber, *Kaiser, Träume und Visionen in Prinzipat und Spätantike*, Stuttgart: Franz Steiner Verlag, Historia Einzelschriften 143, 2000, pp. 11f.: "[Es] ist in Rechnung zu stellen, daß die vorliegenden Träume und Visionen primär *Texte* sind, d.h. uns liegt immer nur der *Bericht* von einem Traum oder einer Visionserfahrung und niemals, selbst wenn man das Erlebnis als authentisch einstuft, der Traum bzw. die Vision selbst vor." "Hieraus ergeben sich nachhaltige Konsequenzen für die Behandlung des Materials: Es geht nicht um den Versuch, möglichst viele der überlieferten Träume als *tatsächlich* geträumt oder möglichst viele Visionen als *tatsächlich* erfunden [!] zu klassifizieren, sondern im Zentrum muß die Frage nach der Bedeutung und der Funktion oder besser: nach den *Bedeutungen* und *Funktionen* von Träumen und Visionen stehen, die ihnen in den Augen der sie Aufschreibenden, der überlieferten Autoren sowie möglichen Lesern … zukam." - Cf. Christoph Jamme & Stefan Matuschek, *Handbuch der Mythologie*, Darmstadt: Wissenschaftliche Buchgesellschaft, 2014, pp. 12f.: "Mythen sind historisch nicht überprüfbare oder durch ihren fantastischen Charakter wunderbare Erzählungen, die dennoch als Erklärungen, Deutungen oder Sinnstiftungen funktionieren. Der Begriff hat damit eine negative und eine positive Seite: Negativ ist er, wenn er als Hinweis auf die Unwahrheit des Erzählten verstanden wird. … Positiv ist der Begriff dagegen dort, wo er als Hinweis auf die Wirkung einer Erzählung verstanden wird." "Mythen als Mythen zu verstehen heißt nicht, sie zu beseitigen, sondern ihre spezifische Funktion und Wirksamkeit zu erkennen."

[13] E.g., Gregor Weber, *Kaiser, Träume und Visionen in Prinzipat und Spätantike*, Stuttgart: Franz Steiner Verlag, Historia Einzelschriften 143, 2000, pp. 274-300; cit. "test", see pp. 10f.: "[Es] gibt für den modernen Historiker keinen stichhaltigen Test, mit dem zwischen echten und fiktiven Träumen [und Visionen] unterschieden werden kann. Es stehen somit keine *formalen* Kriterien zur Verfügung, etwa im Bereich der Struktur oder der sprachlichen Gestalt, mit Hilfe derer entschieden werden kann, ob ein Traum oder eine Vision wirklich in der vorliegenden Form auf ein reales Erlebnis des Träumenden zurückgeht oder eine Erfindung bzw. "Konstruktion" - durch den vorgeblich Träumenden oder durch einen antiken Autor - vorliegt." - Cf. note 12.

[14] Peter Weiss (translated by A. R. Birley), "The Vision of Constantine", *Journal of Roman Archaeology* 16, 2003, pp. 237-259, contains a discussion that arises after an earlier version of the article in German: *id.*, "Die Vision Constantins", in: Jochen Bleicken (ed.), *Colloquium aus Anlaß des 80. Geburtstages von Alfred Heuß[Heuss]*, Kallmünz/Opf.: Verlag Michael Lassleben, 1993, pp. 143-169; Klaus-Martin Giradet, *Der Kaiser und sein Gott, Das Christentum im Denken und in der Religionspolitik Konstantins des Großen*, Berlin/New York: Walter de Gruyter, 2010, pp. 34-43.

[15] E.g., Ho Ping-Yü, Joseph Needham, "Ancient Chinese observations of solar haloes and parhelia", *Royal Meteorological Society* 14, 1959, pp. 124-134.

[16] Hermann Hunger (ed.), *Astrological Reports to Assyrian Kings*, State Archives of Assyria VIII, distributed by Penn State University Press, 1992, cit. 413. - the recognition of recurring weather patterns, such as those found in the astronomical diaries of Babylon, may have led to such omina, see: Abraham Sachs/Hermann Hunger (eds.), *Astronomical diaries and related texts from Babylonia*, Wien: Österreichische Akademie der Wissenschaften, 1988, Vol. I., BCE 652 (month unknown): "The 1st, the sun was surrounded by a halo (*šamáš* TÙR NIGÍN). Night of the 2nd, (and) the 2nd, overcast. The south wind blew. The 3rd, very overcast. In the afternoon it rained. Night of the 4th, (and) the 4th, it rained". - Cf. Marcel G.J. Minnaert, *Light and Color in the Outdoors*, first edition 1937 in Dutch, translated and revised by Len Seymour, New York: Springer-Verlag, 1993, pp. 213f.: "According to a popular belief, the small halo [22° ring] is a forerunner of rainy weather, and the saying 'the larger the halo, the sooner we shall have rain', means that the small halo, and not the corona, predicts rain. And, indeed, cirrostratus clouds are often the forerunners of a region of depression."

[17] Aristotle, *Meteorologica*, translated by H. D. P. Lee, Cambridge/ London: Harvard University, 1952, see Book III, Chapter II, III, VI.

[18] Martin Luther/Johann G. Walch: *Martin Luthers sämtliche Schriften: Auslegung des Ersten Buches Mose*, Groß-Oesingen: Verlag der Lutherischen Buchhandlung, 1986, cit. No. 56, slightly modified translation from German: "Ich aber habe keinem Buche mein Leben lang weniger geglaubt, als diesem 'Ueber die Meteore' darum, daß es durchaus aus diesem Grund daher geht, als trage sich in der Natur Alles aus natürlichen Ursachen zu"; cf. No. 57: "wiewohl sie sagen, daß [der Regenbogen, see No. 58] bedeute dreier Tage Regenwetter, welches ich auch zugebe". - In No. 58, Luther then gives his (unconvincing) argument against Aristotle: "[Es] können wohl solche Wolken sein, wenn kein Regenbogen wird; wie aus dem Mittel, nachdem es dick oder dünn ist, der Regenbogen auch größer oder kleiner werden kann. So habe ich allhier zu Wittenberg einen Regenbogen gesehen, der gar rund und in einander geschlossen war, nicht also abgeschnitten auf der Ebene der Erde, wie er gemeiniglich erscheint. Wie geht es denn zu, daß die Regenbogen anders und aber anders gesehen werden?"

[19] Cf. Marcel G.J. Minnaert, *Light and Color in the Outdoors*, first edition 1937 in Dutch, translated and revised by Len Seymour, New York: Springer-Verlag, 1993, pp. 208ff.

[20] Michaela Schwegler, *"Erschröckliche Wunderzeichen" oder "natürliches Phänomen"? Frühneuzeitliche Wunderzeichenberichte aus der Sicht der Wissenschaft*, München, 2002, pp. 63 f., broadsheet on p. 65 (Germanisches Nationalmuseum GNM, HB 838/1204).

[21] Dagmar L. Neuhäuser & Ralph Neuhäuser, "Himmelspredigt: Halo-Erscheinungen in der Reformationszeit", in: Sascha Salatowsky & Karl-Heinz Lotze (eds.), *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit*, Gotha: Universität Erfurt, Forschungsbibliothek Gotha, 2015, pp. 12-23, see ch. 5, pp. 20-22. https://www.astro.uni-jena.de/images/stories/aiu/terra/Neuh%C3%A4user-Halo.pdf

[22] Cf. Hans-Jürgen Goertz, "Träume, Offenbarungen und Visionen in der Reformation", in: Rainer Postel & Frank Kopitzsch (eds.), *Reformation und Revolution. Beiträge zum politischen Wandel und den sozialen Kräften am Beginn der Neuzeit*, Stuttgart: Franz Steiner, 1989, pp. 171-192.

[23] Dagmar L. Neuhäuser & Ralph Neuhäuser, "Himmelspredigt: Halo-Erscheinungen in der Reformationszeit", in: Sascha Salatowsky & Karl-Heinz Lotze (eds.), *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit*, Gotha: Universität Erfurt, Forschungsbibliothek Gotha, 2015, pp. 12-23, see figure 4, p.15, with Latin text and explanations to the added letters, ch. 2, pp. 14-16, https://www.astro.uni-jena.de/images/stories/aiu/terra/Neuh%C3%A4user-Halo.pdf (A: Sun, B: horizontal/parhelic arc/circle, C: 22° parhelia, D: 22° ring, E: upper tangent arc, F: unclear, G: part of 46° ring or - more likely - part of the supralateral arc, H: circumzenithal arc, I: unclear, J: Parry arc). - Cf. Bernd Schäfer/ Ulrike Eydinger/ Matthias Rekow, *Fliegende Blätter. Die Sammlung der Einblattholzschnitte des 15. und 16. Jahrhunderts der Stiftung Schloss Friedenstein Gotha*, Stuttgart: arnoldsche ART PUBLISHERS, 2016, Band I: Katalog, p. 333, No. 450, Inv. Nr.18,4; Band II: Abbildungen, p. 502.

[24] Own translation into English. Cf. Dagmar L. Neuhäuser & Ralph Neuhäuser, "Himmelspredigt: Halo-Erscheinungen in der Reformationszeit", in: Sascha Salatowsky & Karl-Heinz Lotze (eds.), *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit*, Gotha: Universität Erfurt, Forschungsbibliothek Gotha, 2015, pp. 12-23, Melanchthon is even more explicit in a letter to the Hildesheim preacher Laurentius Mollerus, ch. 5, ref. in footnote 65: "Heute hat dein Bote vor meinem Haus eine Parhelia-Erscheinung gesehen, die fast über zwei Stunden hinweg von einer großen Menge Gelehrter und Bürger beobachtet worden ist. Denen gegenüber waren verkehrte Regenbögen, die weniger physische [physikalische] Ursachen haben. Gott möge uns beistehen und das Unheil lindern". Cf. note 18.

[25] Donald H. Menzel, *Flying saucers*, London: Putnam, 1953, cit. p. 132; also, p. 125: "The agreement between Ezekiel's vision and a [halo display] is, to my mind, completely convincing. The correspondence is so unique that it seems to me someone cannot have failed to note it and point it out. But, so far, I have not been able to find a reference."

[26] *Ibid.*, cit. p. 125; preface vii: "I shall use the phrase 'true flying saucers' to refer to the 20 per cent that the Air Force lists as unexplained. And in this sense I have adopted the thesis that: flying saucers are real; people have seen them; they are not what people thought they saw. I present evidence to show that this mysterious residue consists of the rags and tags of meteorological optics: mirages, reflections in mist, refractions and reflections by ice crystals [= halo-phenomena]. Some phenomena are probably related to the aurora; others are unusual forms by shooting stars. A few … probably represent natural phenomena that we still do not fully understand." - The late C. G. Jung (1958) refers among others to D. H. Menzel (1953) in: *Ein moderner Mythus. Von Dingen, die am Himmel gesehen werden*: "Als Psychologe entbehre ich der Mittel und Wege, um zu der Frage nach der physischen Wirklichkeit der Ufos Nützliches beizutragen" (preface); nevertheless Jung later states: "[Dem] Astrophysiker, Professor Menzel, [ist es] nicht gelungen, trotz aller Mühe, die er sich in dieser Hinsicht gegeben hat, auch nur einen einzigen beglaubigten Bericht mit rationalen Mitteln befriedigend zu erklären" (p. 105).

[27] Donald H. Menzel, *Flying saucers*, London: Putnam, 1953, cit. p. 126 (Book of Ezekiel, Chapter 1, verses 4 f.). - A classification as a Aurora borealis was suggested, e.g., František Link, "Observations et catalogue des aurores boréales apparues en Occident de -626 à 1600", in: *Geofysikalni Sbornik*, 1962, 10, pp. 297-392, but is not justified: The phenomenon itself - which occurred most likely during daytime - did not emerge in the north, which would be required for low-latitude northern lights, but it is only said that the "whirlwind" comes from the north, which is typical for this region in summer.

[28] Donald H. Menzel, *Flying saucers*, London: Putnam, 1953, cit. p. 130.

[29] Cf. note 13 regarding the "test".

[30] E.g., Dagmar L. Neuhäuser, "Halo-Visions: From Ezekiel in Mesopotamia via John on Patmos to the Early Modern Period", paper presented at 33. Deutscher Orientalistentag (DOT) "Asien, Afrika und Europa", Jena, 18-22 Sep 2017, Panel 12: *Stars, gods, and rainbows: Relevance of historical observations* (convenors: Dagmar L. Neuhäuser & Ralph Neuhäuser). - Cf. Regarding similarities and differences in the visions of Ezekiel and John on Patmos: Dagmar L. Neuhäuser & Ralph Neuhäuser, "Himmelspredigt: Halo-Erscheinungen in der Reformationszeit", in: Sascha Salatowsky & Karl-Heinz Lotze (eds.), *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit*, Gotha: Universität Erfurt, Forschungsbibliothek Gotha, 2015, pp. 12-23, ch. 4 ("Regenbogenartige Halos in der Bibel") - https://www.astro.uni-jena.de/images/stories/aiu/terra/Neuh%C3%A4user-Halo.pdf

[31] Re-visualizations by Mark Vornhusen (details can be disputed): See "Die Offenbarung des Johannes", but also "Hildegard von Bingen" on https://www.meteoros.de/themen/halos/geschichte

[32] Marko Riikonen, *Halot. Jääkidepilvien valoilmiöt [Halos. The optical phenomena of ice crystal clouds]*, Helsinki, URSA, 2011, cit. of translation into English (by MR, private communication).

[33] Cf. Rudolf Otto, *Das Heilige*, 1917 (English version: *The idea of the Holy*, 1923).

[34] Marcel G.J. Minnaert, *Light and Color in the Outdoors*, first edition 1937 in Dutch, translated and revised by Len Seymour, New York: Springer-Verlag, 1993, cit. pp. 222f.; No.168, p. 222: "When a vertical pillar and a part of the horizontal circle occur at the same time, we see a cross in the sky. Needless to say, the superstitious have made the most of this!" The impression of three crosses appears, when the horizontal circle or arc also crosses the 22° ring.

[35] Johannes Hevelius, *Mercurius in Sole Visus*, Gdansk, 1662, cit. p. 173 (own translation), fig. I (between pp. 172/173) provides three observations of halo displays; Latin text: https://www.digitale-sammlungen.de/de/view/bsb10861023?page=197 - Cf. Dagmar L. Neuhäuser & Ralph Neuhäuser, "'A red cross appeared in the sky' and other celestial signs: Presumable European aurorae in the mid AD 770s were halo displays", *Astronomical Notes* 336, 2015, pp. 913-929, fig. 6; https://arxiv.org/pdf/1508.07955.pdf

[36] Tycho Brahe, "De nova ... stella, ...", 1573, in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. I, Copenhagen: Havniae in libraria Gyldendaliana, 1913, pp. 1-72; pp. 65-70: "In Uraniam Elegia Autoris". - John R. Christianson, *Tycho Brahe and the Measure of the Heavens*, London: Reaktion Books, 2020, sums up the book as follows, p. 58: "Latin poetry, epistolary dialogue, astronomical *observatio*, astrological prophecy and humanist oration: all these genres of Renaissance rhetoric came together in Tycho's slender, elegantly printed volume." - Cf. note 44.

[37] Cf. Dagmar L. Neuhäuser & Ralph Neuhäuser, "The shifting hues of Betelgeuse", *Astronomy & Geophysics* 64, 2023, p. 1.38-1.42, in it, we also discuss historical key observations by Tycho Brahe regarding the supernova of 1572.

[38] In this article, "Tycho" is often mentioned without his surname "Brahe" - this is not meant to be disrespectful, but is only due to a culture that gives the first name its individual weight.

[39] Victor E. Thoren (with contributions by John R. Christianson), *The Lord of Uraniborg - A Biography of Tycho Brahe*, Cambridge: Cambridge University Press, 1990, cit. p. 71.

[40] Cf. Peter Zeeberg, "Tycho Brahes Urania Elegi, Nyoversættelse, tekst og kommentarer" (The Urania Elegy by Tycho Brahe: New Translation, Critical Edition and Commentary) in: Marianne Pade i samarbejde med / in collaboration with Eric Jacobsen, Hannemarie Ragn Jensen, Lene Waage Petersen, Lene Schøsler, Minna Skafte Jensen, Peter Zeeberg, Lene Østermark-Johansen (eds.), *Album Amicorum, Festskrift til Karsten Friis-Jensen i anledning af hans 60 års fødselsdag / Studies in Honour of Karsten Friis-Jensen on the Occasion of his Sixtieth Birthday*, Renæssanceforum (now: Nordic Journal of Renaissance Studies) 3, 2007; https://www.njrs.dk/3_2007/19_zeeberg.pdf - In the English abstract, the fictional-literary approach becomes clear: "The 'Elegy on Urania by the author' ... is an allegorical description of the astronomer's decision to devote his life to science, specifically astronomy. ... The introduction analyzes the function of the poem within the book as a whole. Whereas the introductory correspondence between Tycho and his friend Johannes Pratensis presents Pratensis as the initiator to the publication, thus safeguarding Tycho against criticism from his fellow noblemen, the elegy attacks the ideals of the nobility as opposed to his own scientific ideals."

[41] John R. Christianson, *Tycho Brahe and the Measure of the Heavens*, London: Reaktion Books, 2020, cit. pp. 57-58. The fact that Tycho

wrote his Urania-Elegy in the style and model of Ovid is often emphasized in recent research, cf. note 46.

[42] Håkon Håkonsson, "Tycho the Apocalyptic: History, Prophecy and the Meaning of Natural Phenomena", in: J. Zamrzlová (ed.), *Science in Contact at the Beginning of the Scientific Revolution*, Prag: National Technical Museum, 2004, pp. 211-236.

[43] Citation given as in note 41. In *On Tycho's Island: Tycho Brahe and his assistants, 1570-1601*, Cambridge: Cambridge University Press, 2000, ch. 3, pp. 44-57, John R. Christianson circles around the problem of "Urania", it seems that he understands the appearance as an allegory of the supernova, pp. 52f.: "When Tycho Brahe told in poetic language about the epiphany of Urania at Herrevad Abbey, he was using allegory to describe the appearance of the supernova of 1572. He did not literally mean that a goddess in human shape had come down from the skies to chat beside Rönne Brook. On the other hand, he certainly did believe that the stars exerted influence upon the lives of human beings, and that the supernova did indeed play the role of divine messenger in his own life, reshaping its whole direction. Tycho did also truly believe that there was a spark of divine power in the human intellect, and that the person who used his or her mind could penetrate to a knowledge of the hidden, nonmaterial, forces within nature. ... In his poetry, Tycho Brahe used the language, imagery, and convention of Augustan Rome, but this poetry was not mere fantasy or play. His vivid, allegorical language expressed what Tycho considered to be truth about man and nature." Cf. note 46.

[44] Tycho Brahe, "De nova ... stella, ...", 1573, in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. I, Copenhagen: Havniae in libraria Gyldendaliana, 1913, pp. 1-72; pp. 65-70: "In Uraniam Elegia Autoris". - Peter Zeeberg, "Tycho Brahes Urania Elegi, Nyoversættelse, tekst og kommentarer" (The Urania Elegy by Tycho Brahe: New Translation [into Danish], Critical Edition and Commentary), in: Marianne Pade i samarbejde med / in collaboration with Eric Jacobsen, Hannemarie Ragn Jensen, Lene Waage Petersen, Lene Schøsler, Minna Skafte Jensen, Peter Zeeberg, Lene Østermark-Johansen (eds.), *Album Amicorum, Festskrift til Karsten Friis-Jensen i anledning af hans 60 års fødselsdag / Studies in Honour of Karsten Friis-Jensen on the Occasion of his Sixtieth Birthday*, Renæssanceforum (now: Nordic Journal of Renaissance Sudies) 3, 2007; Latin text on: https://www.njrs.dk/3_2007/20_zeeberg_norm.pdf "med normaliseret interpunktion". In this article, however, the following small changes are made: if the "v" means a "u", then this letter is specified; and also "æ" is written "ae". - Longer sections of Tycho's elegy (vv. 53-66, 81-108, 221-232) are rendered into English (sometimes a little freely) and discussed in some aspects in John R. Christianson, *On Tycho's Island: Tycho Brahe and his assistants, 1570-1601*, Cambridge: Cambridge University Press, 2000, ch. 3, pp. 44-57, but only a few of the verses that are the focus of this article are reproduced there; the previous translations by John R. Christianson and, in addition, verses 1 to 52 (copyright by J.R. Christianson) - of which some lines considered in detail in this study - are presented now in Clifford J. Cunningham, "Tycho's Conversation with Urania, and other engagements with the Muse", *Journal of Astronomical History and Heritage*, 27(1), 2024, pp. 105-125.

[45] E.g., Victor E. Thoren (with contributions by John R. Christianson), *The Lord of Uraniborg - A Biography of Tycho Brahe*, Cambridge: Cambridge University Press, 1990, p. 71: "Tycho reported having been wandering along a brook in the forest of Herrevad". Similar: John R. Christianson, *On Tycho's Island: Tycho Brahe and his assistants, 1570-1601*, Cambridge: Cambridge University Press, 2000, pp. 46 and 51: "... Tycho himself, wandering one evening at sunset in the forests of Herrevad along Rönne Brook", "the divine Muse, Urania, speaking to him in the forests of Herrevad along Rönne Brook". It seems that these formulations emphasize "in the forest" - but Tycho's verses point in a slightly different direction: At the very least, it can be assumed that the edge of the forest is meant - he moves away ("digressus") from the borders ("limina") of the shady forest (v. 29) to stroll by the refreshing water (v. 30); the next verses - the setting of the sun, as well as the rising moon - also do not fit with a stay within the forest, but need a low, free horizon; the "Rönne" is more of a (small) river ("Rynae ... fluminis", v. 1) than a "brook" (this is also what the current Swedish name "Rönne å" refers to). - John R. Christianson's translation in Clifford J. Cunningham, "Tycho's Conversation with Urania, and other engagements with the Muse", *Journal of Astronomical History and Heritage*, 27(1), 2024, pp. 105-125, p. 110 has: "One day, while I was strolling on the shaded forest edge / All by myself, along the bubbling stream" (vv. 29 and 30).

[46] Karsten Friis-Jensen & Minna Skafte Jensen, "Tycho Brahes elegier", in: Peter Brask (ed.), *Dansk litteraturhistorie, Bind 2: Lærdom og Magi 1480-1620*, Copenhagen, [1984] 1990, pp. 404 - 412, regarding the Urania-Elegy see pp. 404 - 407; this short article, which does not offer a precise comparison of Ovid's poem with Tycho's Urania Elegy, is cited in the secondary literature as assuming that Tycho based his vision on Ovid's epiphany (*Amores 3, 1*), e.g.: John R. Christianson, *On Tycho's Island: Tycho Brahe and his assistants, 1570-1601*, Cambridge: Cambridge University Press, 2000, cit. p. 46: "Two Danish scholars have shown that Tycho based this elegy on a poem by Ovid that used the theme of "epiphany", the appearance of a divine being. Ovid's poem described the author wandering in an ancient forest by a spring, where he suddenly meets the Muses of Elegy and Tragedy, who ask him to dedicate his life to them. ... The poem moved on to a picture of Tycho himself, wandering one evening at sunset in the forests of Herrevad along Rönne Brook. Suddenly, the Muse Urania comes down from the heavens, ...". - Cf. Minna Skafte Jensen, "Tycho Brahe's double identity as a citizen of Denmark and of the world", in: Dirk Sacré & Jan Papy (eds.), *Syntagmatia: Essays on neo-Latin literature in honour of Monique Mund-Dopchie and Gilbert Tournoy*, Supplementa Humanistica Lovaniensia XXVI, Leuven: University Press, 2009, pp. 569-577, cit. p. 570: "Already as a young man he decided to dedicate his life to the study of astronomy, and he became famous right from the start for his observation of a new star. He published his discovery in a small book in 1573, De nova Stella, and one of the texts in this publication is an elegy closely modelled over one of Ovid's Amores (3, 1). Just as the young Roman poet had met his protectress, the goddess Elegy, and taken orders from her personally, young Tycho Brahe met the muse Urania on an evening's walk in the woods of his homeland Scania, and promised her to spend his life in her service." - Cf. Peter Zeeberg, "Tycho Brahes Urania Elegi, Nyoversættelse, tekst og kommentarer" (The Urania Elegy by Tycho Brahe: New Translation, Critical Edition and Commentary), in: Marianne Pade et al. (eds.), *Album Amicorum, Festskrift til Karsten Friis,* Renæssanceforum 3, 2007, on pp. 19-21 the author gives possible further examples of dependence on Ovid. - Peter Zeeberg (2007) and Minna Skafte Jensen (2009) are also referred to by Clifford J. Cunningham, "Tycho's Conversation with Urania, and other engagements with the Muse", *Journal of Astronomical History and Heritage*, 27(1), 2024, pp. 105-125, and ch. 2.3 emphasizes further dependencies on Hellenistic and Roman influences. -

Some reflections: The situation given by Ovid at the beginning of *Amores 3, 1* is different and altogether less real than the seemingly corresponding verses in Tycho's elegy. The forest Ovid speaks of is uncut and old (v. 1); where it is assumed that there is a "numen" (2). Then there is talk of a sacred spring in the middle, a cave, which seems to be somewhat special, and of birds that somehow complain (3 f.). In Ovid's poem appears "Elegy" (7) and then soon also "Tragedy" (11); in particular, the appearance of "Elegy" is described in some detail, but both are obviously not *earthly*. It is not so clear whether the poetic "I" really walks through the shady forest (5), how often the verse is rendered, or whether the poet does not rather secretly spread out in the shadow of the forest, whereby "umbris" could also mean *nocturnal apparitions* – the next verse would also fit in with this (6); the context also suggests that the cave, the spring and the birds are already apparitions. In contrast, Tycho leaves the (real) forest to stroll along the (real) riverside of Rönne. There is no mention of a cave, a spring, or birds. Although the Rönne and its landscape are described as so beautiful that the muses live there, the vision of "Urania" is not connected to the river, the meadows or the forest, but instead to the sky. In Tycho's elegy the goddess Urania suddenly appears and disappears, and there are clear clues to the place, the time of day and indirectly also to the date and other circumstances - as will be shown in this article. Of course, Tycho has been familiar with Latin poetry since his youth and may also draw inspiration from Ovid in his own poems. While the Dane clearly delineates the apparition, Ovid provides much more detail about what appears. It is beyond the scope of this article, but the verses by Ovid show typical elements of a halo narrative.

[47] Tycho Brahe, "De nova ... stella, ...", 1573, in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. I, Copenhagen: Havniae in libraria Gyldendaliana, 1913, p. 15; this date, 1573 May 5, would be consistent with the information in the chapter on size, brightness and color: the beginning of May is given twice, p. 29.

[48] Gábor Almási, "Tycho Brahe and the Seperation of Astronomy from Astrology: The Making of a New Scientific Discourse", *Science in Context*, 26(1), Cambridge: Cambridge University Press, 2013, pp. 3-30, reflects also in depth on the process of creating "De nova stella", in particular on how Tycho wanted to see himself when "entering the public domain", pp. 7-10; cf. Victor E. Thoren (with contributions by John R. Christianson), The Lord of Uraniborg – A Biography of Tycho Brahe, Cambridge: Cambridge University Press, 1990, pp. 61ff.

[49] Tycho Brahe, "De nova ... stella, ...", 1573, in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. I, Copenhagen: Havniae in libraria Gyldendaliana, 1913, pp. 28-30.

[50] *Ibid.*, p. 3, pp. 35-44; originally envisaged with appendices: pp. 73-130. - Cf. Victor E. Thoren (with contributions by John R. Christianson), *The Lord of Uraniborg – A Biography of Tycho Brahe*, Cambridge: Cambridge University Press, 1990, pp. 59f.: "In his salutation, Tycho invoked the classical muse of astronomy, Urania, ... Tycho expressed the traditional Renaissance conviction that God created humans in his image and placed them on earth in the center of the universe to contemplate, as in a mirror, the nature and constitution of the whole of creation, so that during their mortal life they might learn to know the majesty and wisdom of the invisible, incorporeal God through the visible objects of his creation."

[51] E.g., Tycho Brahe ad Iohannem Maiorem [Epistolae astronomicae], 1584, in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. VII, Copenhagen: Havniae in libraria Gyldendaliana, 1924, pp. 86f.

[52] Cf. Victor E. Thoren (with contributions by John R. Christianson), *The Lord of Uraniborg – A Biography of Tycho Brahe*, Cambridge: Cambridge University Press, 1990, pp. 59f.: Interestingly, Tycho was particularly preoccupied with the moon towards the end of 1572 - partly because he wanted to predict the lunar eclipse in December 1573 (the one of December 19, 1572, was almost invisible in Herrevad) and partly because he believed that the moon might have an influence on the weather. - For a general review, see, Craig Martin, *Renaissance meteorology: Pomponazzi to Descartes*, Baltimore: The Johns Hopkins University Press, 2011; chapter 1 is recommended as an introduction to this important but neglected topic.

[53] Times and altitudes obtained with the Software *Stellarium*, Version 0.18.1.

[54] John R. Christianson in Clifford J. Cunningham, "Tycho's Conversation with Urania, and other engagements with the Muse", *Journal of Astronomical History and Heritage*, 27(1), 2024, pp. 105-125, p. 110 gives here: "Just as the Moon began to speed its nightly ride" (v. 32).- Cf. Peter Zeeberg, "Tycho Brahes Urania Elegi, Nyoversættelse, tekst og kommentarer" (The Urania Elegy by Tycho Brahe: New Translation, Critical Edition and Commentary), in: Marianne Pade et al. (eds.), *Album Amicorum, Festskrift til Karsten Friis,* Renæssanceforum 3, 2007; https://www.njrs.dk/3_2007/19_zeeberg.pdf - p. 7: "nocturnos equos" is translated in Danish as "natlige spand" (v. 32).

[55] Tycho Brahe, "Mutationes aeris a mense Octobri anni 1582 ad mensem Aprilem anni 1597", in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. IX, Copenhagen: Havniae in libraria Gyldendaliana, 1927, pp. 3-146, cit. p. 82 (own translation). - Cf. Dagmar L. Neuhäuser & Ralph Neuhäuser, "In den Himmeln erschien ein rotes Kruzifix: Halo-Code und Halo-Vergessenheit", in: Gudrun Wolfschmidt (ed.), *Der Himmel über Tübingen. Barocksternwarten - Landesvermessung - Astrophysik*, Hamburg: tredition, 2014, pp. 470-517, fig. 23.1, p. 470, translation from Latin into German on p. 478; for April 6, 1660, the Gdansk astronomer Johannes Hevelius noted, among other things: "In these (arcs) two pseudo-suns were seen on either side, also colorful, with rather long and white shimmering tails, which were turned away from the sun" (own translation into English).

[56] John Robert Christianson, *On Tycho's Island: Tycho Brahe and his assistants, 1570-1601*, Cambridge: Cambridge University Press, 2000, cit. p. 141; regarding date, see: Tycho Brahe, "Mutationes aeris a mense Octobri anni 1582 ad mensem Aprilem anni 1597", in: John L. E. Dreyer (ed.), *Tychonis Brahe Dani Opera Omnia* [collected works of Tycho Brahe the Dane], Vol. IX, Copenhagen: Havniae in libraria Gyldendaliana, 1927, p. 83.

[57] Dagmar L. Neuhäuser & Ralph Neuhäuser, "'A red cross appeared in the sky' and other celestial signs: Presumable European aurorae in the mid AD 770s were halo displays", *Astronomical Notes* 336, 2015, pp. 913-929, ch. 5 to the ideological background of the motive "two young men on white horses". https://arxiv.org/pdf/1508.07955.pdf

[58] Bernd Schäfer/Ulrike Eydinger/Matthias Rekow, *Fliegende Blätter. Die Sammlung der Einblattholzschnitte des 15. und 16. Jahrhunderts der Stiftung Schloss Friedenstein Gotha*, Stuttgart: arnoldsche ART PUBLISHERS, 2016, Band I: Katalog, No. 449, Inv. Nr.18,52, p. 332: "... Erstlich einen scheinbarlichen Regenbogen/ darinnen an yedweder seyten/ ein klar scheinende/ vnd helle Sonnen/ vnd ob dem selben Regenbogen/ auß etlichen schwebenden wolcken/ haben sich zwen Jüngling herfür gethan/ hefftigklich mit einander streytende/ vngeferlich zwu oder drithalbe stund lang/ welche bayd in der Rechte hand ein schwert/ ..." (spelling slightly modified); Band II: Abbildungen, p. 501. - Cf. Dagmar L. Neuhäuser & Ralph Neuhäuser, "Himmelspredigt: Halo-Erscheinungen in der Reformationszeit", in: Sascha Salatowsky & Karl-Heinz Lotze (eds.), *Himmelsspektakel. Astronomie im Protestantismus der Frühen Neuzeit*, Gotha: Universität Erfurt, Forschungsbibliothek Gotha, 2015, pp. 12-23, see figure 5. https://www.astro.uni-jena.de/images/stories/aiu/terra/Neuh%C3%A4user-Halo.pdf

[59] Victor E. Thoren (with contributions by John R. Christianson), *The Lord of Uraniborg - A Biography of Tycho Brahe*, Cambridge: Cambridge University Press, 1990, cit. p. 71, verbatim: "Suddenly from the cloudless skies a goddess appeared"; John R. Christianson in Clifford J. Cunningham, "Tycho's Conversation with Urania, and other engagements with the Muse", *Journal of Astronomical History and Heritage*, 27(1), 2024, pp. 105-125, p.110, gives the two verses (33 and 34) as follows: "And look! A goddess descended - I didn't know who - / From the clear heavens and suddenly stood before me."

[60] Gregor Weber, *Kaiser, Träume und Visionen in Prinzipat und Spätantike*, Stuttgart: Franz Steiner Verlag, Historia Einzelschriften 143, 2000, p. 288, footnote 251, Eusebius of Cesarea, *Vita Constantini*, 1,27,1-29,1, own translation of the corresponding sentences from Greek.

[61] *Ibid.*, p. 279, footnote 192, Panegyrici Latini, here 6(7), 21, 3-6, own translation of the corresponding sentences from Latin.

[62] E.g., Christian Pfister & Rudolf Brázdil, "Climatic variability in sixteenth-century. Europe and its social dimension: A synthesis", *Climatic Change*, 43: 5-53, Kluwer Academic Publishers, 1999; this comprehensive study focuses on Central Europe, but is also likely to be valid for southern Scandinavia.

[63] Moon phases courtesy of Fred Espenak, www.Astropixels.com

[64] Robert Greenler, *Rainbows, halos, and glories*, Cambridge: Cambridge University Press, 1980, pp. 65-72, with regard to the problem that "sun/moon pillars" due to flat-plate-crystals are optically only possible when the sun/moon is low; if the sun or moon is more than ~10° above the horizon, the light pillars are created with the help of ice crystal columns that are aligned horizontally with their longitudinal axis and are randomly oriented in rotation; cf. p. 72: "I recall one crisp evening many years ago when, on the last run down a ski slope, I watched the rising moon's shimmering column of light, formed by myriad crystals sparking in the moonlit air. It was the first pillar - sun or moon - I had ever seen. I wonder if my vivid memory of the beauty of that scene sparked my later interest in understanding these effects."