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European Networks and the Reformation of the University of Edinburgh

Astronomical disputations from the graduating class of 1612–16. Lecturer: William King

David McOmish

Introduction

The *Theses Philosophicae* of the University of Edinburgh are the published records of the public student disputations delivered by each graduating class of students and their lecturers at laureation.[1] The surviving editions of the Edinburgh disputations run from 1596 until 1705 and amount to seventy in total.[2] The practice of public disputation at graduation was common to all of Scotland's early modern universities. They were largely ceremonial events, not a formal requirement for degree attainment. At Edinburgh, however, disputations were a core component of continuous assessment each day and the means for summative examination for the students each autumn.[3] Extant student notes taken throughout the academic year reveal that the content of the published *Theses Philosophicae* are extracts taken from the daily disputational exercises and lectures that were edited for public performance at graduation.[4] Consequently the published *Theses* reflect the day-to-day formal processes the students were subject to. Additionally, the public disputation offered a platform for students to impress potential employers. This was especially important at Edinburgh, where the public audience was largely made up of its expanding vocational class of lawyers, politicians, academics and ministers.[5] This can be seen from the guests of honour at the 1612 ceremony at Edinburgh, where the students addressed their disputations to a senior advocate in the Supreme Court of Scotland and the Commissary for Edinburgh.

In form, the disputations for Edinburgh across the seventeenth century were divided into theses on logic, physics, ethics and astronomy, and arranged sequentially in that order. This formal division reflected the year-on-year

structure of the four-year degree programme, with astronomy, deemed the most challenging subject for the students, explored in the final year.[6] Each individual subject was explored through a series of formal statements (*theses*) by the lecturer (called 'a regent') and a series of corollary student responses (called *appendices*, often abbreviated to *app.*), with each student given a specific topic to practise and recite (see note 4). The student responses developed the main headline thesis in a variety of ways, from the familiar method of scholastic oppositional and synthetic reasoning to, especially in Edinburgh's case, an increasingly hostile cross-examination of philosophical conjecture via observational and mathematical proofs. Within each subject, a further subdivision was made into varying subject-specific topics (e.g., geometry, optics, astrology etc. in the case of astronomy).

The present edition of the Edinburgh *Theses* focuses solely upon a section of the astronomical theses. There are two main reasons for this. Firstly, as modern scholars agree, the detailed nature of, and depth of understanding in, cosmological and astronomical studies at Edinburgh is relatively unusual in a Scottish context.[7] A critical edition of the astronomical material provides an opportunity to explore this anomaly. Secondly, and most importantly, recent work on a manuscript (University of Edinburgh Library, shelfmark Dk.7.29) written by Adam King, the Commissary of Edinburgh in attendance at the 1612 graduation, has necessitated a reappraisal of the nature of the *Theses* more generally and especially in relation to the astronomical material. King's manuscript contains a large (160,000 words) commentary on the didactic cosmological poem *De Sphaera* of Scottish educationalist and writer George Buchanan (1506–82). Yet the form and content of Buchanan's poem serve as little more than structural support for King's detailed introduction to cosmology. What is truly remarkable about the commentary is that, beginning with the 1612–16 undergraduate class and continuing in an unbroken chain until at least 1644, it was the foundational text for instruction in astronomy and mathematics at Edinburgh and a key component of its teaching in natural philosophy more generally. Cross-reference between the manuscript and the published disputations and student notebooks (from daily lectures) show that King's commentary was read aloud in the lecture hall, formed the core material for student disputations across the year and consequently is replicated verbatim and ubiquitously in the published records of the graduation ceremonies.[8] The present edition represents the first detailed examination of the relationship between the manuscript and the student disputations.

King composed the commentary between 1595 and 1616, after his return from Paris, where he had been Professor of Mathematics and philosophy at the University of Paris for many years (*c.* 1580–95).[9] The commentary itself, however, must be viewed in the context of the educational reforms of King's network of friends and families, who had links to educational centres across Europe, from Denmark to Germany and down to Italy (and through Venice to Asia).[10] The commentary was produced at a time when this network held a remarkable degree of influence in Edinburgh at a cultural, administrative and financial level.[11]

The language in the text is an eclectic mix of different literary styles that is difficult to categorize. Many theses and appendices (student responses) are direct quotes that Adam King takes from an assortment of mathematicians, philosophers and literary figures ranging across the sixteenth and seventeenth centuries. King's own Latin prose is classical and clear. George Buchanan is his literary model. However, the lexical hinterland of his own specialist field in mathematics and philosophy is in evidence throughout, from both pervasive Greek sources like Plato, Aristotle, Euclid and Cleomedes to predominant Latin authors like Ficino, Copernicus, Clavius, Commandinus, Galileo and Kepler.

Notes

1 The following edition of the *Theses Astronomicae* from the University of Edinburgh is one of a series of *Theses* editions of Edinburgh's cosmological disputations produced as part of a larger research project, all of which will be included in the appendices to McOmish (forthcoming). This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 892528.

2 Shepherd (1974: 344–98) provides a detailed list of all extant documents and a comparison with those of other Scottish universities of the period. Likewise, Gellera (2012: 246–55), who also gives an extensive list of extant contemporary works related to the published educational material and a helpful bibliography of secondary literature. Edinburgh's published theses are also the first of their kind in Scotland that we have evidence for (Gellera 2012: 15–16).

3 For statutes of the University prescribing disputations as daily exercise: Morgan 1937: 118–19. For use of disputations as annual summative assessment: ibid.: 115–17. See also Shepherd 1974: 24–9.

4 Surviving students' dictates from 1606 onwards (e.g. William Drummond 1606, George Livingston 1620, William Adair 1634) contain disputational exercises and lecture notes from across each academic year, which are reproduced verbatim in the graduate disputations and resulting published *Theses*. These student notes show that each student was allocated a specific part from a specific topic, on either logic, ethics, physics or astronomy.

5 Shepherd 1974: 10. The guests of honour addressed at each ceremony from 1600 until 1632 comprised a range of senior political figures, including the Lord Chancellor of Scotland (1605, 1624), guardian of crown estates in Scotland (1616), royal secretaries and privy councillors (1610, 1614, 1618, 1624, 1626), lords, advocates and members of the Supreme Court of Scotland (1600, 1612, 1615, 1621, 1623, 1625) and the council members from across the vocational and social spectrum who ran the university (1607, 1619, 1620, 1627, 1629, 1631, 1632).

6 Particularly insightful and detailed accounts of the curriculum can be found in Shepherd (1974) and Gellera (2012). Shepherd offers a helpful overview of the structure of the degree programme (esp. 32–4) and Gellera the most up-to-date and insightful appraisal of the content, especially in relation to natural philosophy. For a general orientation in the culture of early-modern astronomical disputations in the Renaissance, see A. Bardi and P. D. Omodeo, 'The Disputational Culture of Renaissance Astronomy: Johannes Regiomontanus's "An Terra Moveatur An Quiescat"', in Friedenthal et al. 2021: 234–55.

7 Gellera 2012: 17.

8 Each and every thesis below is a verbatim section taken from Adam King's commentary. King's point of reference is lost in the editorial process of reduction for public performance. Consequently, at the start of each new *Thesis* below, there will be a citation to the lemmata from Buchanan's poem to allow readers to see King's points of reference. For the Latin text of Buchanan's poem, based upon the text found in Dk.7.29, see T. Ruddiman (ed.), *Georgii Buchanani Opera Omnia. Vol. 2*, Edinburgh 1725: 427–535. – NB: Book 2 of Ruddiman's contains two extra lines (84 and 376). The reference to line numbering in this edition will follow Adam King and will at times be two lines short of Ruddiman. For an English translation of Buchanan's poem, see J. Naiden, *The Sphera of George Buchanan*, Washington 1952.

9 For King's professional background and the sources, see 'Adam King', in C. McCraken-Flesher and A. Riach (eds), *The Edinburgh Biographical Dictionary of Scottish Writers*, Edinburgh 2021. A fuller account will appear in McOmish (forthcoming). Also, see Durkan 2001.

10 For a provisional introduction to some of the group see McOmish 2016. Their social and epistemological background is dealt with in much greater detail in McOmish (forthcoming). Other key members were the future principal of the University of Edinburgh, Patrick Sands, the University's legal officer (assessor), Thomas Nicolson, who were both educated in the Republic of Venice, Adam's elder brother, Alexander King (the University's other senior legal officer), his younger brother, Clement King (educated in Italy and France), and their life-long mutual friend Thomas Seget, the Venice-based scholar.

11 Adam King's son-in-law Alexander Aikinhead and his brother David Aikinhead (who was also Patrick Sands' brother-in-law) dominated the offices of the town council that ran the University. Adam's brother-in-law David Heriot, the goldsmith, brother of George Heriot, jeweller and goldsmith to King James I and VI, had financial liability for lecturers at Edinburgh, and a key supporter of Adam's work was the Lord Chancellor, Alexander Seton, who read King's commentary and recommended it for educational use in a prefatory letter sent from his official residence at Holyrood Palace (Dk.7.29, f. iv verso).

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Source of the Latin text

The text is reproduced from the *Theses Astronomicae*, contained in *Theses Philosophicae*, published by Andro Hart (Edinburgh 1616). The King manuscript is contained in the Centre for Research Collections, University of Edinburgh, shelf mark Dk.7.29. All punctuation has been modernized.

Latin text

Thesis I[1]

Communi Astronomorum calculo, utrobique terra marique sub eodem parallelo quindecim graduum differentia unius horae anticipationem et retardationem in ortu et occasu siderum, atque eclipsium apparitione parit: et sub eodem meridiano 62[2] millium passuum iter, poli elevationem uno gradu variat.
App. I. Siderum ortus et occasus, polorum elevatio et depressio, eclipsium observationes, sive terra, sive mari fiant, eandem ubique Analogiam servare deprehenduntur.

2. Hinc efficitur terram et aquam continuatis ubique extremitatibus in unum globum coire, et sibi invicem quaquaversum mutuo amplexu cedere et excipi; licet unita moles, non tam Sphaera, quam σφαίρωηδης sit.

3. Cum pondera terrae, ita et aquae, ex eodem loco e sublimi demissa libere ubique per eandem rectam lineam ad centrum gravitatis descendant, idem erit utriusque gravitatis centrum.

4. Ergo etiam magnitudinis, cum in sphaeris idem sit centrum gravitatis et magnitudinis: ut demonstrat Commandinus propositione 16. libro de centro gravitatis solidorum.[3]

5. Nihilominus, cum terra gravior sit, locum centro propiorem occupabit.

6. Sicuti sub omni aqua necesse est terram subesse, non contra, ita Analogia profunditatis et gravitatis sufficienter evincit, multo minus esse aquae quam terrae.[4]
7. Quam ridicule quidam aquas censent[5] mole terra maiores ad universi centrum subsidere, et in his terram innatare, non tamen fluitare, propter vastitatem et quam his[6] tribuit opifex stabilitatem.

8. Quin et vero tamen simillimum est maiorem terrae partem ab aquis liberam esse, ut patet ex mensura terrarum exploratarum deducta ex totius globi terrae et aquae dimensa superficie.[7]

English translation

Thesis 1[1]

By the general reckoning of astronomers, on both land and sea, under the same parallel a difference of fifteen degrees creates a precession and retardation of one hour in the rising and setting of stars and in the appearance of eclipses. Also, under the same meridian, a journey of 62 miles[2] represents a change in the elevation of the pole by one degree.
Appendix 1. The risings and settings of the stars, the elevation and the depression of the poles, the observations of the eclipses, whether they may happen on land or sea, are [all] found to maintain correspondence in all directions.
2. Hence it follows that the earth and sea, with their surface areas intertwined in all parts, cohere into one globe, and in mutual embrace yield to each other in alternation across every part and are brought together; although the unified mass is not so much a sphere, but rather sphere-like.
3. Since the body of earth, and also of water, after moving downwards from the same location on high without impediment, descends everywhere through the same straight line towards their centre of gravity, then the same centre of gravity will exist for both.
4. Consequently, it is the same for magnitude: since there is the same centre of gravity and magnitude in the spheres, as Commandinus demonstrates in the sixteenth proposition in his book on the centre of gravity of solids.[3]
5. Nevertheless, since the earth is heavier, it will hold a place closer to the centre.
6. Just as it is necessary that there is the earth under all water, similarly, so the correspondence between their weight and depth demonstrates sufficiently that there is much less water than earth.[4]
7. Certain people[5] quite laughably reckon that the water, being greater in mass than the earth, sinks down towards the centre of the world and that the earth rests upon this [the water], but that it does not float about [on the water] because of its size and immovability, which the creator gave to them.[6]
8. Indeed it is yet very likely that the greater part of land is free from water, as it is clear from measurement taken of the known earth and from the measured surface area of the entire globe of earth and water.[7]

Thesis II[8]

Ignis et aeris circumductus non a propria intelligentia, sed caelestis conversionis tractu et impulsu fit: nec is quidem uniformis est, sed mixtus, hic concitatior, illic remissior.

App. 1. Nec est violentus motus, nec continuo naturalis: sed praeter naturam, et a causa perenni cohaerente, nempe conversione caelesti perpetuus.

2. Plotini[9] sententia tam igni quam Caelo motum circularem natura insitum esse asserentis; triplici ex causa: providentiae divinae, naturae, et necessitatis: sapit pigmenta Platonicorum, quibus in fronte plus inest venustatis, quam in recessu veritatis.

Thesis III[10]

Visio nostra corporeo addicta et exercita organo, actionem certis quibusdam circumstantiarum quasi terminis definitam, et circumscriptam a natura obtinuit: quos ultra citrave sese expedire, aut officio suo apte defungi nequeat.

App. 1. Multis modis eam hallucinari necesse est, ex sua intemperie vel medii, obiecti quantitate vel situ, aliarumque circumstantiarum vitio.

2. Hinc parallaxium et refractionum varietas, hinc dispares plerumque Astronomorum in siderum magnitudine et motu observandis dissentientes sententiae, ut nisi vivaciore mentis opera ad geometricarum demonstrationum trutinam expendantur, certi quicquam de iis vix statui queat.

Thesis 2[8]

The circular motion of fire and air does not come about from its own intelligence, but rather from the movement of heaven's rotation and its impact. And it is also not a uniform, but rather a composite motion, the former quite rapid and the latter rather slower.

Appendix 1. And it is neither a violent motion, nor necessarily a natural one: but [on the contrary], against nature, and it is everlasting from its constant, eternal causal force: that is, from the turning movement of the heavens.

2. The view of Plotinus[9] (who maintains that circular motion is natural to both fire and heaven due to three underlying causes: divine providence, nature and necessity) resembles the picture painted by the Platonists, which contains more surface beauty than background truth.

Thesis 3[10]

Our vision, subject to and processed through a bodily instrument, has acquired a function that has been defined within certain established quasi boundaries of qualities and limited by nature. It is neither able to go above and beyond them, nor rightly perform its own duty.

Appendix 1. In many ways it is inevitable that [vision] deviates from reason, whether from the disordered condition of the medium, or from the position or quality of an object, and the imperfection of [vision's] other qualities.

2. Hence the diversity of paralaxes and refractions, and hence the different views of so many astronomers in disagreement about the observed size and movement of the stars. So, unless their views are subjected to the measurements of geometric proofs with a particularly agile attentiveness of the mind, then scarcely anything certain can be stated about the stars.

Thesis IV[11]

Utrumque sidus Veneris et Mercurii in periodica eccentrici revolutione est Solis ἰσόδρομον, σύνδρομον, ὁμόδρομον, et eadem omnium trium est medii motus linea.[12]

App. 1. Neutrum unquam a Sole ultra epicicli sui magnitudinem digreditur, Venus 28[13] gradibus, Mercurius 29. ac nunc orientales dum mane Solem antecedunt, nunc occidentales vesperi Solem sequuntur.

2. Errant qui Venerem alternis annis Solem anteire et subsequi volunt.[14]

3. Licet tam Mercurius quam Venus Solis πρόδομος et ἐπόμενος subinde sit, haec tamen sola Luciferi et Hesperi nomina obtinuit: quia magnitudine extra omnia alia sidera est, et tantae claritatis ut unius huius stellae radiis umbrae reddantur.[15]

Thesis 4[11]

Both the star of Venus and of Mercury is in the cyclical, eccentric orbit of the Sun, keeping pace, running alongside and on the same path; and the line of mean motion of all three is the same.[12]

Appendix 1. Neither [star] ever passes from the Sun beyond the extent of their own epicycle. Venus at 28 degrees[13] and Mercury at 29 degrees, at one time from the east they precede the sun in the morning, at another time they follow the sun in the evening in the west.

2. Those who are willing to propose that Venus precedes and follows the Sun in alternating years are wrong.[14]

3. Although Mercury at one time runs ahead of the Sun and at another behind in the same way as Venus, nevertheless only the latter has obtained the names of both Evening and Morning Star. This is due to the fact that, in magnitude, it stands apart from all of the other stars, and its brightness is such that shadows are cast from the rays of this one star alone.[15]

Thesis V[16]

Sidera quaelibet in omni caeli plaga, ut aequali semper a terris radio absunt, ita aequalia videntur.

App. 1. Discrimen illud variatae distantiae et magnitudinis, in eccentricis et epicyclis, non nisi exactorum organorum usu et ope sensuum innotescit.

2. Sol reliquaque sidera in ortu et occasu videntur maiora, non ex distantiae inaequalitate, quae insensilis est: sed crassiorum vaporum interiectu, qui frequentius iuxta Horizontem quam Meridianum exsurgunt, et exceptos Astrorum radios maiori sub angulo refractos ad visum transmittunt.[17]

3. Interiectus vapor ad intuentis visum non continuatur. Sed duplici superficie hinc inde terminatur, una intuenti, altera sideribus obversa: ita ut horum[18] radii e Caelo rariore transmissi, primum in aerem crassiorem, tum in vaporem aere constipatiorem, denique in aerem vapore tenuiorem, et visui proximum incurrant.

4. Triplex hic fit radiorum refractio, una in extima aeris supremi, altera in extima vaporum, tertia in extima proximi aeris superficie: quarum duae priores stellarum species et magnitudines contrahunt, tertia diffundit.[19]

5. Quin et sudo Caelo maiorum siderum diametri, distantiae et altitudines, versus Horizontem augentur propter obliquiorem radiorum in aere iuxta Horizontem refractionem, et quod maiore sub angulo incurrant.

Thesis 5[16]

Each and every star in every region of heaven, as they are always distant from the earth by an equal radius, so they appear equal.

Appendix 1. That difference of distance and size as it changes in eccentrics and epicycles is not apparent unless by means of accurate instruments and through the assistance of the senses.

2. The Sun and the other stars appear larger at rising and settings, not through variance in distance, which is imperceptible, but through the interposition of very dense vapours, which arise in greater quantity near the horizon than near the meridian and which transmit to our sight the rays of the stars captured by them and refracted below a greater angle.[17]

3. The interposing vapour does not extend to the sight of the observer. Rather, it is bound on one side and the other by a double-sided surface, one facing the observer, the other the stars. [It happens] in such a manner that the rays of the stars,[18] transmitted from heaven's rarefied atmosphere, first run through denser air, then through the vapour, which is denser [still] than air, and finally through the air that is thinner than the vapour and is closest to our view.

4. Here the refraction of the rays is threefold: one at the outermost surface of the upper air, another at the outermost surface of the vapours, and the third at the outermost surface of the lower air. Of these, the two former contract the appearance and extent of these stars, the third expands them.[19]

5. Indeed, even in a clear sky the diameters, distances and altitudes of the greater stars increase at the horizon due to the intensity of the refraction of their rays in the air near the horizon and also on the grounds that they occur below 90 degrees.

Thesis VI[20]

Causae effectrices tot motuum caelestium, tanta periodi, polorum, axium, et inaequalis conversionis varietate differentium, adeoque dissimilium effectuum in singulis ex motu et lumine, eiusdem rationis ac similis naturae esse non possunt.

App. 1. Diversi orbes eorumque sidera inter se specie differunt, ac sua cuique orbium forma est, quae dat esse et moveri, sive insit, sive adsit.

2. Cumque contigui, non continui sint orbes caelestes, non erunt partes eiusdem homogenei.

3. Diversorum orbium et siderum inter se ratio et natura eadem est genere, non Physico, sed Metaphysico et transnaturali.

4. Caelo nihilominus est suus actus et potentia, non transmutationis ad esse, et non esse,[21] quae est soboles privationis contradictoriae, sed receptivitatis ad sustinendam formam, ex quibus quae fit compositio, sufficit ad generis Categorici constitutionem.

5. Universum caelum est quintum corpus simplex non specie, sed genere unum.

Thesis 6[20]

The causes that effect so many celestial motions, differing greatly in the variety of their extent, poles, axes, and uneven orbital periods, and such dissimilar effects of motion and light individually, cannot be of the same kind and similar nature.

Appendix 1. The various orbital planes and their stars differ amongst themselves in their apparent outline, and each has a particular orbital shape, which allows it to exist and be moved, whether inside it or near it.

2. Since the celestial orbits are contiguous and not continuous, they will not form part of the same unified body.

3. The same rationale and nature of the various orbits and their stars exists not in physical type, but rather metaphysical and transnatural.

4. No less does heaven have its own impulse and power, not of changing to being and not being,[21] which is the offshoot of a contradictory loss, but rather of a receptivity for maintaining form, the realised union of which suffices for the definition of a categorical type.

5. All heaven is one quintessentially uncompounded body not in appearance, but in type.

Thesis VII[22]

Cometam a.d. 1577 tribus fere mensibus conspicuam, ex uniformi eius motu tardiore Lunari, ex ductu maximi circuli quem motu proprio designavit, ex Parallaxi minore Lunari, et interdum vix sensili: plerique magni nominis astronomi[23] in aetheris regione Luna superiori constitisse evidenti[24] et firma demonstratione collegerunt.[25]

App. 1. Non solum sacrae literae, quae testantur Solem pugnante Iosua tribus horis constitisse,[26] ad optionem Ezechiae 15 gradibus regressum esse,[27] stellam novam praeter naturae ordinem Magis apparuisse: sed etiam novorum siderum et Cometarum procreatio, inordinatae in caelo mutationes eius mutabilitatem arguunt.

2. Cur non profiteri licebit Caelum caelestiaque corpora, nec eius perfectionis esse, quin mutari, nec eius divinitatis, quin sicut vestimentum veterascere possunt,[28] quanquam nec eo modo, nec tam brevi periodo, qua caduca et sublunaria.

Thesis 7[22]

Through clear and compelling proof, many astronomers of great reputation[23] have concluded that the comet, which was visible for almost three months in the year 1577, remained consistently above[24] the Moon in the region of ether, as evidenced by its motion being slower than lunar motion, by the line from the greatest circle, which it traced with its own motion,[25] and its lesser angular divergence from the Moon's, which was often scarcely perceptible.

Appendix 1. Both sacred literature, which attests that the Sun stood still for three hours while Joshua battled,[26] that it moved back fifteen degrees at Hezechiah's choosing,[27] that a new star appeared to the Magi beyond nature's correct order, and the creation of new stars and comets (the disordered changes in heaven) offer an argument for its mutability.

2. Why will it not be right to profess that heaven and the heavenly bodies are not [that type] of perfect state that cannot change, nor that type of divinity that cannot grow old just like clothing,[28] even though they cannot [do so] in such a manner and over such a short period as perishable and sublunar matter?

Thesis VIII[29]

Eruditissimi Astronomi profitentur sicut demonstravit Copernicus variari maximas Solis declinationes, et augeri ad 23. gradus 52. minuta, minui ad 23. gradus 28 minuta, ut accrementi et decrementi differentia sit 24 minutorum.[30]

App. 1. Statuendum Solem, aut non eandem semper Eclipticam describere, aut si una eademque dicatur, latitudinem quandam obtinere: sed quae tantula sit,[31] ut in sensum non incurrat; nec altitudinum aut umbrarum meridianarum, aut amplitudinis ortivae aut occiduae ullam sensilem mutationem pariat.

2. Quocirca pro simplici linea usurpari potest, a qua Sol secundum iudicium sensus non exorbitet.

Thesis IX[32]

Apud Caldaeos et Aegyptios, qui iudicia astrorum exercuerunt, invaluit ea fati opinio quae ex corporum caelestium influxu et efficientia inferiora haec omnia convexa quadam consequentium causarum serie sic necessario affici et peragi statuit, ut ne humanas quidem actiones huius fatalis necessitatis exortes esse voluerint.

App. 1. Hinc sublata omni e rebus sublunaribus contingentia[33], et consilii humani libertate, superstitio illa praedictionum Astrologicarum nimia credulitate hominum animos occupavit.

2. Damnamus[34] huiusmodi astrologos tanquam professione infames, legum constitutionibus damnatos, supplicio affici aequum est: nisi sobrie sapiant, et artis, quae solis coniecturis innixa est, iustis finibus sese contineant.

Thesis 8[29]

Very learned astronomers profess, just as Copernicus has demonstrated, that the highest declination of the Sun varies, that it has risen to 23°52' and decreased to 23°28', so that there exists a difference in its rise and decrease of 24'.[30]

Appendix 1. It should be set down that the sun either never defines the same ecliptic, or, if it is called one and the same [ecliptic], that it holds to a certain [bandwidth of] latitude; but that [width] is of such a small nature,[31] that it is never perceived, and does not produce any discernible change in height, in mid-day shadows, or in size at either sunrise and sunset.

2. It follows that, in place of a simple line, [this 'line'] can be used, from which the Sun does not deviate according to the judgement of the senses.

Thesis 9[32]

That opinion on fate, which prevailed among the Chaldaeans and Egyptians, who practised judicial astrology, stated that all these things on earth were so unavoidably affected and driven on by a particular chain of causes arising from the influence of celestial bodies and the power of heaven that indeed they did not accept that even human actions were free from this fated necessity.

Appendix 1. Hence, after every restraint[33] was removed from terrestrial affairs, and the freedom of human agency, that superstition of astrological predictions, with too much credulity, took hold of the minds of men.

2. We[34] condemn astrologers of this type, disreputable through their pseudo-occupation, [whom,] having been condemned by the statutes of the laws, it is justified to punish; unless they partake moderately and confine themselves within the limits prescribed for a technique which is supported by conjecture only.

Commentary

Thesis 1

1 As indicated in the Introduction, each proposition (*thesis*) is introduced by the regent, then the series of *appendices* in response are recited by the various students allocated to each topic. Thesis 1 and its appendices are taken verbatim from: Dk.7.29: f. 6r, 6v, 7r. The final clause of app. 2 (*unica moles . . .*) is taken from Dk.7.29: f. 9v. Full text of app. 7 is taken from f. 7r. Full text of app. 8 is taken from f. 37r. Lemma in Dk.7.29: Buchanan, *De Sphaera* 1.78–82.

2 '62½' in the Dk.7.29 text. This thesis is a general orientation to practical astronomy. Firstly, longitudinal differences across the globes are introduced: 15 degrees movement longitudinally results in an hour lag or jump (depending on east/west movement) of one hour in rising and setting (15 x 24 = 360). Secondly, students are informed of the equivalence of sixty-two and a half miles to one celestial/terrestrial degree (latitude). This is derived from Ptolemy's calculation of the circumference of the earth to 22,500 miles (360 x 62.5 = 22,500) from book one of his *Geographia*, but perhaps from the Jesuit mathematician Christoph Clavius' 1581 edition of *In Sphaeram de Sacrobosco* (p. 211 – see n. 7 for King's reference to the same section from Clavius). The Buchanan lemma simply states that the earth is a globe. King uses this statement to articulate its size, highlight the uniformity of proportional celestial rising and settings across the globe and provide a metrical framework for students to follow.

3 The Commandinus citation is taken from the margin in Dk.7.29. This and the previous (3) appendix are taken from the same section in Dk. 7.29, where King is dealing with the centre of gravity of water and earth. King here introduces students to the anti-Aristotelian concept of the terraqueous earth; that is, that water and earth share the same centre of gravity. See Grant 1996: 630–7, for the adoption of the idea by Copernicus and Clavius. King instructs the readers at this point in Dk.7.29 to consult Clavius' *In Sacroboscum* for a fuller account.

4 King says (f. 6v) that this is the opinion (far less water than earth) of the following series of writers: Piccolomini (*Lib. de terrae et aquae magnitudine*), Scaliger (*Exercit. 38.*), Cardano (*Lib. 2. de Subt.*) and Nonius Marcellus Saia (*De terrae et aquae magnitudine*).

5 King explicitly states the writer of the opinion: Bodinus (Jean Bodin), *Theatri Naturae* 2.

6 'to them' refers to the continents and islands (*varias continentes et insulas*) that are the point of reference in the Dk.7.29 passage, but which have been edited out in the *Theses*, with reference to the singular mass of land. Hence the grammatical disconnect between the singular *terra/terram* in the *Theses* and the plural *his*, which refers back to it.

7 This passage is taken from King's discussion (f. 37r; Buchanan lemma: 1.672) of the potential surface area of the earth's land mass, which references Christoph Clavius' commentary on Sacrobosco (1581 edition, p. 211) and its discussion of Ptolemy's calculations. King revises Clavius' calculations with data from recent European expeditions to America.

Thesis 2

8 All text in Thesis 2 is taken from Dk.7.29: f. 19r. Buchanan lemma: 1.290–2. The thesis and appendices are introductions by King to contemporary debates on impetus to motion in a post-Aristotelian context. This introductory discussion is elaborated at greater length at Dk.7.29, f. 39r, where the views of Julius Caesar Scaliger on intellection and motive intelligences are explored and the views of Andrea Cesalpino on Aristotelian concepts of violent and natural motion. On intellection and its context, see K. Sakamoto, *Julius Caesar Scaliger, Renaissance Reformer of Aristotelianism*, Leiden 2016: 94–9. This larger discussion is also found verbatim in the Edinburgh *Theses Philosophicae* – esp. *Theses Physicae* XIV (Edinburgh 1628), but *passim*. See D. McOmish, 'Andrea Cesalpino and the rejection of the celestial spheres in 17th century British Education' in F. Baldassarri and C. Martin (eds), *Andrea Cesalpino: An Aristotelian Natural Philosopher in the Renaissance* (forthcoming).

9 Citation in Dk.7.29: *Ennead. 2. lib. 2. cap. 1.* The specific diction of King's characterization of Plotinus' view (*Caelo motum circularem natura insitum esse*) is taken from Sebastian Fox Morcillo's presentation of Plotinus' views in his commentary to Plato, *Timaeus* (1554 edition, p. 108). King quotes and cites Morcillo's commentary throughout this section of his work (Dk.7.29: f. 17r).

Thesis 3

10 All of Thesis 3 is taken from Dk.7.29: f. 38v. Buchanan lemma: 2.21. King uses Buchanan's pessimistic evaluation of the inability of human senses to perceive heavenly truth to articulate his own optimistic view of the positive role mathematics can play in discerning external reality (geometric proofs).

Thesis 4

11 Main thesis and appendix 1 are taken from Dk.7.29: f. 42v; appendices 2 and 3 are taken from f. 43r. Buchanan lemma: 2.91–2.

12 Cf. Plato, *Timaeus* 38D. Eccentric motion alludes to the apparent differential rates of the speed of and the space covered by bodies passing along the ecliptic. Ptolemy was the standard predictive model for these bodies moving in perfect circles (see Grant 1996: 275–89), but with offset centres (hence eccentric) and various corrective epicycles. In the *Astronomia Nova* of 1609 Johannes Kepler proposed elliptical orbits that dispensed with a circle-focused eccentric model. This was more fully elaborated in 1619, when he published his third law in his *Harmonice Mundi*. Adam King cites and quotes liberally from Kepler's *Astronomia Nova* throughout the commentary.

13 *Venus ad 48 gradum* Dk.7.29: f. 42v.

14 Jean Bodin (see n. 5).

15 This second clause is a quotation from Pliny, *Nat. Hist.* 2.6. Cited in Dk. 7.29 as *Plinius, lib. 2. cap. 8.*

Thesis 5

16 Thesis 5 and appendices 1–4 are found at Dk.7.29: f. 49v. Appendix 5 is taken from f. 50r. Buchanan lemma: 2.264–6. The following Thesis and appendices are redacted extracts from Adam King's development of Buchanan's simple statement on the existence of atmospheric refraction. In the original in Dk.7.29 King presents an overview of the latest development in optics from Alhazen's and Witelo's exposition of Aristotle to Kepler's development of those views. King's main point of reference throughout this section is: Johannes Kepler, *In Paralipomenis ad Vitellionem*, cap. 4. prop. 11.

17 Adam King presents the incipient refraction point at under 90 degrees, which is implied by his use of *Meridianum* and *maiori sub angulo*; he then proceeds to delineate how refraction increases markedly under 10 degrees by highlighting the intensity of stellar refraction just above the horizon point (0 degrees).

18 Replacing *illorum* of Dk.7.29: f. 49v. Change is necessitated by the differing placements in the Thesis and in Dk.7.29 of *intuenti* and *sideribus* in the previous clause.

19 All of the text found in appendices 4 and 5 is taken from the introduction and conclusion to Adam King's extended discussion of Kepler's views on optics.

Thesis 6

20 Text taken from Dk.7.29: f. 59r. Buchanan lemma: 2.542.

21 *ad esse, et non esse*: with the lack of a gerund form of *esse*, this is King's approximation of the Greek articular infinitives τὸ εἶναι ἢ μὴ εἶναι, found in Aristotle, *Physics* 5.1, but also *Metaphysics* 9.10. See also Aristotle, *Metaphysics* 12.6, for the diction and the idea of changing (*transmutatio*) from being to non-being as an attribute of perishable matter. For the broader philosophical case for celestial immutability within this Aristotelian context of being and non-being: Aristotle, *De Caelo* 1.11–12.

Thesis 7

22 The main Thesis is taken from Dk.7.29: f. 39–40r. Buchanan lemma: 2.29. Appendices 1 and 2 are taken from f. 61r. Buchanan lemma: 2.599.

23 King provides a list of scholars who witnessed either the 1572 supernova or the 1577 comet (or both) and agreed on their/its superlunary nature: *Cardanus, Maurolicus, Pridanus, Clavius, Hagerius, Maestlinus, Cornelius Gemma, Tychon Braheus, Kepler ... demonstratione collegerunt.* Dk.7.29: f. 39v. In this section, King quotes directly from the work of Brahe, Cardano, Kepler and Clavius. Additionally, at the end of this passage, King approvingly quotes a large section from Christoph Rothman's 1585 attack upon Scaliger's 'mathematically-ignorant' anti-superlunary argument.

24 Text corrupt. Original text from Dk.7.29: *in aetheris regione luna superiorem* [i.e., *cometam*] *constituisse evidente satis et ...* .

25 The demonstration (*demonstratione*) refers back to the charting of the comet's path *ex ductu maximi circuli* (i.e. from the ecliptic). More practical astronomical information from Adam King, as he informs students how a body's celestial co-ordinates may be charted (via Tycho Brahe's astronomical co-ordinate system).

26 Joshua 10:13.

27 Isaiah 38:8. In the biblical passage, it moves back 10 degrees. So too in Dk.7.29, where the text reads *decem gradibus*. The religious content of this appendix and the next are taken from the end of an extended passage in Dk.7.29 highlighting expert philosophical and astronomical opinions from antiquity to the present age (Arab, Latin, Greek) arguing for the corruptibility of the heavens. It is noteworthy that the biblical passages are used for justification in the public disputations and not, e.g., Hipparchus and Brahe, who are quoted and cited immediately before these passages. This is one of many such instances of the regents' heavy-handed manipulaton of the content of Dk.7.29 in a religious context. For more examples and a discussion

of the significance of the public setting upon the editing process, see McOmish (forthcoming).

28 Adam King cites *regius propheta* (i.e., David) as the author of this quote. The textual point of reference is Psalm 101.

Thesis 8

29 Thesis 8 and appendices are taken from Dk.7.29: f. 79v. Buchanan lemma: 3.278. Buchanan states that the sun never deviates on its apparent path along the ecliptic. King cites Copernicus to counter this view.

30 Degree (*gradus*) is rendered as ° and minute (*minuta*) as ' in the following sections, reflecting Adam King's notation. King cites and quotes *De Revolutionibus* 3.10, where Copernicus discusses the variance over time of the earth's equatorial plane in relation to its orbital plane (its axial tilt or obliquity). Copernicus cites the ancient astronomers whose computations he used as a point of reference as Timocharis and Ptolemy, who King in turn states in DK.7.29 are the very learned astronomers.

31 i.e., only .24 degrees according to Copernicus.

Thesis 9

32 Thesis 9 and appendices are taken from Dk.7.29: f. 113v–114r. Buchanan lemma: 5.51–9. In this section King softens Buchanan's outright condemnation of astrology by stating that it does no harm (*nec iniuria*) if practitioners should acknowledge astrology as conjecture. He encourages the students to read Ptolemy's *Apotelesmatum*, book 1, chapter 2. In the Dk.7.29 passage immediately following the text found at appendix 2 of the published theses King quotes Ficino, *In Plotinum* 2.3.7, who states that stars simply contribute to the production of effects and are not the determinators of fate: *Ficinus vere colligit, stellas neque omnia facere, neque ubi agunt, omnia peragere: multa etiam significare, quae ipsae non agant:* . . . (Dk.7.29: f. 114r; 'Ficino rightly reckons that "stars do not do everything, nor where they have a role, do they completely condition all. Also, they indicate much in which they themselves play no role.: . . ."').

33 *contingentia*: this first declension noun has a long and involved post-classical history. Boethius uses the familiar (classical) participial forms of *contingens, contingentis*, but also liberally uses the noun form (*De Interpretatione*, book 5 especially). For the word's use and its complex meaning in early modern philosophical discourse, with specific relevance for the subject matter of this

thesis and appendices, see H. D. Rutkin, *Sapientia Astrologica: Astrology, Magic and Natural Knowledge*, New York 2019: 191–5.

34 Another interesting editorial change from Dk.7.29 to Thesis, perhaps again influenced by public setting (see n. 27). Adam King has Christian theologians condemning astrology, not 'we'. On King James I and VI and his view that judicial astrology was 'uttelrie unlawful', see *Daemonologie*, Edinburgh 1597 / London, 1603: 12–14.