

Verhandelingen der Koninklijke Nederlandse Akademie van
Wetenschappen, Afd. Letterkunde, Nieuwe Reeks, Deel 124

G.J. RHETICUS' TREATISE ON
HOLY SCRIPTURE
AND THE MOTION OF THE EARTH

with translation, annotations, commentary and additional
chapters on Ramus-Rheticus and the development of the
problem before 1650

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North-Holland Publishing Company, Amsterdam, Oxford, New York, 1984

ISBN 0-448-5601-3

AANGEBODEN IN DE VERGADERING VAN 13 JUNI 1983

To my wife

ILONA

this work is affectionately dedicated

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Foreword

This book deals with the hitherto unknown or unidentified treatise in which Copernicus' only direct pupil, George Joachim Rheticus, defended his master's theory against the imputation that it would conflict with the authority of Holy Scripture.

It seemed important to publish it, because now for the first time for more than 400 years we may know precisely the ideas of Copernicus and his circle on this question.

In the following pages we describe first the relation of Rheticus to Copernicus and Giese. In the second chapter are given the reasons why I ascribe this anonymous treatise to Rheticus, arguments I put before the Royal Netherlands Academy of Sciences in a session on March 10th 1975, i.e. more than two years after I had identified the text¹.

The third chapter first depicts the religious attitude of Giese, Copernicus and Dantiscus, and deals with the various positions that could be taken in biblical interpretation; whereas, thirdly, it analyses the different conceptions of astronomical hypotheses.

Next, follow the text of Rheticus' treatise and its translation into English. It is rather risky to make a translation from one foreign language into another; but fortunately I received valuable advice from several old friends.

Professor H. Boelaars C_{SS}R (Pontifical University, Rome) helped to establish the correct text. His decease on April 22th 1983 is much deplored by those who knew him as a scholar and a friend.

Professor G.J. de Vries (Amsterdam, V.U.), who was my colleague during many years, critically examined the translation from latin.

Professor A. Regan C_{SS}R (Pontifical University, Rome) kindly undertook the delicate task of transforming my too literal translation of many passages of Rheticus' treatise into a more current English.

A debt of gratitude is owed to professor D.M. MacKay (Univ. of Keele, England), who kindly gave much time in reading and correcting the English of the other chapters.

1. R. Hooykaas, *De oudste verhandeling over het Copernicanisme en de Heilige Schrift* [The oldest tract on Copernicanism and Holy Scripture]. Voordracht gehouden in de Koninklijke Nederlandse Academie van Wetenschappen te Amsterdam op 10 maart 1975.

I thankfully acknowledge their valuable advice, but it should be stressed that the responsibility for the final text is mine.

Rheticus' text has been provided with an extensive apparatus of notes and references, mainly passages from the Bible and from the works of St Augustine by which he supported his theses. The tracking down of his numerous quotations was not always easy, not least because of his habit of leaving references incomplete or even unmentioned.

Parallel citations from Copernicus' work and from Rheticus' other writings corroborate the claim that the anonymous tract is from his hand.

A separate chapter contains some more elaborate commentaries.

In the first additional chapter Rheticus' attitude towards so-called Egyptian «astronomy without hypotheses» is discussed, in particular with relation to his correspondence with Peter Ramus. The final chapter deals with the reasons why Rheticus' work, when published anonymously a hundred years later, was completely ignored.

Zeist, June 1983

R. Hooykaas

I. THE INTRODUCTORY PART

Rheticus, Copernicus and Giese

In May 1539 Nicholas Copernicus (1473–1543) received a remarkable visitor, a young professor of mathematics and astronomy of the university of Wittenberg, Georg Joachim Rheticus (1514–1574). His stay in Frauenburg (Frombork)² lasted till the end of September 1541, that is $2\frac{1}{2}$ years instead of the two semesters originally planned. Evidently, the Lutheran layman and the canon of the semi-independent bishopric of Ermland(Warmia) got on very well.

During his sojourn in Prussia the young scholar became Copernicus' devoted disciple. He wrote a *First Account* of Copernicus' work in the form of a letter (October 1539) addressed to the Nuremberg astronomer Johannes Schöner (1477–1547). It appeared in Dantzig as *Narratio Prima de libris revolutionum... Nicolai Copernici*. The title-page modestly announced that it had been written "by a certain young man who studies mathematics"³, but the heading of the text: "G. Joachim Rheticus to the famous D. Johannes Schöner, whom he honours as his father"⁴ reveals his name.

2. Copernicus wrote in Latin or in German; it seemed, therefore, expedient to use the German names of places. The 16th century Polish historiographer Martin Cromer, who was bishop of Ermland, tells us that in this region German is the language usually spoken whereas most names of villages, towns and strongholds are German: ...Germanica sunt pleraque omnia pagorum oppidorum et arcium nomina [of Ermland.] (Quoted by Prowe II, 489).

Allenstein (Allensteinum) = Olsztyn, (castle of the bishop of Ermland).

Braunsberg (Brunsberga) = Braniewo.

Dantzig (Gedanum) = Gdansk.

Elbing (Elbinga) = Elbląg.

Ermland (Varmia) = Warmia.

Frauenburg (Frauenburgum) = Frombork, residence of the Ermland chapter.

Heilsberg (Heilsberga) = Lidzbark, residence of the bishop of Ermland.

Kulm (Culma) = Chelmino.

Löbau (Lubavia) = Lubawa, residence of the bishop of Kulm.

Marienburg = Malbork.

Thorn (Torunna) = Torun, birthplace of Copernicus.

3. Ad Clarissimum virum D. Ioannem Schonerum, de libris revolutionum eruditissimi viri et Mathematici excellentissimi, Reverendi D. Doctoris Nicolai Copernici Torunnaei, Canonici Varmiensis .per quendam Iuvenum Mathematicae studiosum Narratio Prima.

4. Clarissimo viro, D. Ioanni Schoneri, ut parenti suo colendo, G. Ioachimus Rheticus S.D.

A second edition appeared soon afterwards (1541) in Basel by Rheticus' friend Achilles Pirmin Gasser, town physician of his birthplace Feldkirch. An English translation in: E. Rosen, *Three Copernican Treatises*, 2^d ed. New York 1959, pp. 107-196.

Before going to Frauenburg Rheticus had visited Schöner in Nuremberg (October 1538), and on that occasion they had already talked with the learned printer Johannes Petreius (1497–1559) about the possibility of publishing Copernicus' astronomical work⁵.

Rheticus' *Narratio Prima* contains an exposition of Copernicus' theory, and its author not only tries to convince the fatherly friend of its excellence, but also to reassure him that Copernicus had the highest respect for the Ancients and that his doctrine was not directed against Ptolemy but rather aimed at an improvement of the latter's astronomy. Rheticus begins his account by telling that some months after his arrival in Frauenburg (1539), he went – on the invitation of Tiedemann Giese, bishop of Kulm (Chelmno) – with his teacher to the episcopal residence in Löbau (Lubawa), where, during a long stay, he rested from his studies⁶. Evidently, Copernicus had shown so much satisfaction about his enthusiastic disciple, that Giese wanted him to accompany his friend during his visit.

Giese was Copernicus' best and lifelong friend and his former colleague in the cathedral chapter of Frauenburg. He took great interest in Copernicus' studies and he encouraged Rheticus' efforts to propagate the new system by printed works.

After Rheticus had left Poland at the end of September 1541, he sent the trigonometrical part of Copernicus' work to the press in Wittenberg⁷.

In the beginning of May 1542 Rheticus brought the manuscript of Copernicus' great work to Nuremberg, where Petreius immediately started printing it. In September, however, his academic duties forced him to return to Saxony and to transfer the supervision of the printing to Andreas Osiander (1498–1552), the main theologian of the town.

When Giese had received some printed copies of *De revolutionibus*, he wrote a letter to Rheticus (July 26th, 1543), in which he expressed the wish that in the copies not yet put on the market should be inserted the little treatise “by which you have skilfully vindicated that the motion of the earth is not contrary to the Holy Scriptures”⁸. This letter was published in 1615 by Jan Brozek, who

5. In 1540 Petreius printed an astrological treatise of Antonius de Montalma, which he dedicated to Rheticus (Aug. 1st, 1540). Cf Leopold Prowe, *Nicolaus Copernicus*, vol. I, Berlin 1883, p. 516; K.H. Burmeister, *Georg Joachim Rheticus 1514–1574, Eine Bio-Bibliographie*, vol. I, Wiesbaden 1967, p. 19. (Vols II and III appeared in 1968). The work of Prowe will be cited as Prowe I (1883), Prowe I² (1883), Prowe II (1884).

6. ... à Reverendissimo D. Domino Tiedemann Gysio, Episcopi Culmensi vocatus, una cum D. Praeceptorio meo Lobaviam profectus aliquot septimanis à studijs quievi. G.J. Rheticus, *Narratio prima*, fol. A IIr.

7. N. Copernicus, *De lateribus et angulis triangulorum*. Wittenberg 1542.

8. Quia optem etiam praemitti vitam auctoris quem a te eleganter scriptam olim legi... Vellem adnecti quoque opusculum tuum, quo a sacrarum scripturarum dissidentia aptissime vindicasti telluris motum. (Giese from Löbau to Rheticus in Leipzig, July 16th, 1543). Prowe, *o.c.*, I, 2, 537–539; II, 419–421. Burmeister, *o.c.*, III, 54–55.

inserted it in a small work, which remained practically unknown⁹. The oblivion continued until the letter was published again in the Warsaw edition of Copernicus' Works (1854).

To scholars of Copernicus this was indeed a tantalizing piece of information, for Rheticus' tract had completely disappeared and not the slightest additional information about its contents had been added since Giese had referred to it. Consequently, not only were we left in the dark about Rheticus' opinions on this issue, but also Copernicus' view thus remained hidden. For Giese's approval guarantees that Rheticus' treatise was as conformable to Copernicus' opinions on the Bible as the *Narratio prima* was conformable to Copernicus' ideas on the system of the universe.

Giese and Copernicus held the same opinions on astronomical as well as on theological matters. Moreover, the close relations between master and pupil make it highly probable that Rheticus had discussed the problem with Copernicus himself. Unfortunately, Giese's own vindication of Copernicus (his *Shield-bearer*) has disappeared¹⁰, and one can but hope that some good fortune may bring it to light in the future.

The loss of Rheticus' treatise was the more deplorable, as on this topic we have from Copernicus himself only his short remarks (in his Dedication to the pope) expressing his fear that many people will reject his theory because of its novelty, its philosophical absurdity, and its alleged contradiction to Scripture¹¹. In the then following lines Copernicus reveals only what kind of interpretation of Scripture he *rejects*, but not how he would reconcile his astronomical system with the authority of Scripture.

It is, therefore, understandable that since 1854 (when it became generally known that Rheticus had written a defence of Copernicus' orthodoxy) the loss of this treatise was much deplored by Copernicus-scholars. Prowe (1883) remarked that, apart from Broscius (1615), nobody, neither a contemporary, nor one of the next generation, has mentioned its existence, and that it appears to be "lost for us"¹². Burmeister (1968) deplored that "alas, we know nothing about the contents of Rheticus' tract", and he had but a very slight hope that it might be discovered some time. But a more recent author, having heard by rumour that it had been discovered indeed, wrote in an article on "Recent research on attitudes to Copernicus' astronomical theory" (1977), in anticipation, that "probably the most interesting results will be those from the discussion

9. Joannes Broscius, *Epistolae ad naturam ordinarum figurarum plenius intelligendarum pertinentes*. Cracoviae 1615. Prowe, *o.c.*, I, 2, 536.

10. Prowe, *o.c.*, I, 2, 444; I, 1, 91.

11. See below note 55.

12. Prowe, *o.c.*, I, 2, 494 (cf I, 1, 98). Burmeister deplores the loss of so many of Rheticus' manuscripts, but he admits the possibility that "by an extraordinary piece of luck" one of them might be brought to light ("Und doch bleibt es nicht völlig ausgeschlossen, dass durch einen besonderen Glücksfall eine dieser Handschriften wieder ans Licht kommen könnte". Burmeister, *o.c.*, II, 5). "Ueber den Inhalt der Schrift von Rhetikus wissen wir leider nichts", *o.c.*, I, 73.

opened by Hooykaas' publication of a newly discovered dissertation by G.J. Rheticus..."^{12b}. We hope that this expectation may be fulfilled: the elaborate analysis and commentaries we present together with Rheticus' text mark the beginning of such a discussion.

12b. Zófia Wardeska, "Recent Research on Attitudes to Copernicus' Astronomical Theory". *Studia Copernicana*, XVII, Wrocław 1977, p. 177.

Identification of the treatise

Shortly before the Copernicus Commemoration of 1973, when I was collecting materials for a work on “The Reception of Copernicanism in the Netherlands”¹³, I came across a certain *anonymous* pamphlet to which, at first, I paid little attention. It seemed to be just one of the multitude of polemical writings that appeared after the Galileo trials in which the debate raged about the compatibility of the motion of the earth with the teaching of Holy Scripture. It was bound together with early 17th century tracts; apparently there had not been the slightest suspicion that it was much older.

As we will see in chapter VIII, the arguments advanced in it had indeed quite independently been put forward also by early 17th century advocates of the Copernican system.

A closer inspection convinced me, however, that the tract on the motion of the earth must have been written much earlier and, finally that the anonymous author could not have been anybody else than Rheticus. This then was no other than the seemingly lost and hitherto unknown writing on the compatibility of the Copernican system with Holy Scripture. Consequently, we know henceforth precisely what Copernicus thought when he spoke scathingly about “mataiologoi”, who distort the Bible for their own (anti-Copernican!) ends.

The arguments which led me to this conclusion are the following:

1. *The tract has been written in the first half of the 16th century*

The work shows a certain theological vagueness characteristic of those who at that time still hoped that some compromise between “Lutherans” and “papalists” would be possible, and who, therefore, tried to avoid offending either party. It stresses the authority of St. Augustine, who was beloved by the Reformers but had also great authority with their opponents.

In general, Biblical quotations are taken from the Vulgate, but this was quite usual in Latin works as long as no new translations from Hebrew and Greek into Latin were available. But its humanistic predilection for the original lan-

13. Not yet published. Some of the data collected for it have been used in: R. Hooykaas, The Reception of Copernicanism in England and the Netherlands. In: *The Anglo-Dutch Contribution to the Civilization of Early Modern Society*. An Anglo-Netherlands Symposium, London, 27th and 28th June 1974 under the auspices of the British Academy and the Royal Society in association with the Royal Netherlands Academy of Arts and Sciences. London 1976, pp. 33-44.

guage is evident from its reference to the new translation (directly from the Hebrew text) of the Psalms by Johannes Campensis and also from its use of the Bible commentaries of Nicholas of Lyra (and their Additions by Paul of Burgos), which often went back to the Hebrew text of the Old Testament.

For these reasons it seems probable that the author belonged to those moderates who, before the Council of Trent (1545–'47; 1551–'52; 1562–'63) made the rift between Rome and the Reformation definitive, had some reason to hope for a reconciliation on the basis of patristic theology and the Apostles' Creed.

Accordingly, in an Erasmian spirit, the author emphasized the "catholicity" of his standpoint.

2. *More precisely, the work must have been written after 1532*

Apart from the many quotations from the Vulgate and the works of St. Augustine, there are references to Nicholas of Lyra (1270–1349), Nicholas Cusanus (1401–1464), Pico Della Mirandola's *Heptaplus* (written in 1493), Nicholas Perottus' *Cornucopia* (privilege of 1531; ed. Basileae 1532) and Johannes Campensis' *Enchiridion Psalmorum* (first ed. Nuremberg 1532)

3. *The work must stem from the circle of Copernicus' friends*

The anonymous author is quite familiar with Copernicus' thoughts as they had developed since in his *Commentariolus* (ca 1514) Copernicus had laid down a first outline of his theory. He must have had the possibility to read the manuscript of Copernicus' main work, *De revolutionibus*, (he never mentions this title, but Copernicus' manuscript does not do so either). Unlike most 16th century admirers of Copernicus' system, the author is wholly convinced that it does not only give a mathematically satisfactory account of the motions of the planets, but that it is also conformable to nature. He follows Copernicus' *physical* arguments for the motion of the earth and, like Copernicus, he combines Aristotelian and Platonic cosmological ideas. If he had known the Copernican system only by some manuscript of the *Commentariolus*, he could not have known these physical arguments, as they are not propounded in that first outline of Copernicus' theory.

4. *The author must be Rheticus*

As we know that both Giese and Rheticus wrote about the compatibility of his theory with Holy Scripture, it is probable that one of these two was the author of the treatise.

Many parallel passages of Rheticus' *Narratio prima* and our treatise make it already probable that the author of the two works was one and the same person.

Moreover, the anonymous author says that he does not enter into astronomical details because he has done so in another work. This statement fits in with Rheticus, not with Giese.

During his stay in Frauenburg Rheticus occupied himself also with geography. A passage of the anonymous tract, referring to the land discovered on the Southern hemisphere which Ptolemy had supposed to be wholly covered by

water, closely resembles a passage in a letter which Rheticus wrote to the duke Albrecht of Prussia during his sojourn in Frauenburg (see below p. 125).

But the decisive argument for Rheticus' authorship of the anonymous treatise is, that it never mentions the name of Copernicus but always speaks of "my teacher" (*praeceptor meus*). The *Narratio prima* mentions Copernicus' name in the title, saying "the books on the revolutions... of doctor Nicholas Copernicus", but in the text Copernicus is always indicated as "my teacher". Rheticus, and nobody else, could say that, for he was Copernicus' only direct pupil. Giese was no "mathematician"; he was an adherent but not a pupil of Copernicus; their relation was that of close friends, belonging to the same generation. In a letter to Rheticus Giese speaks about Copernicus as "*your teacher*" (*praeceptor tuus*)¹⁴.

The conclusion that Rheticus was the author of the tract found additional support in its style and composition. The writer shows now and again such waverings, that a first reading already gave the impression of an unbalanced character (see below p. 24).

14. Ita... compensabis id quoque incommodi, quo in praefatione operis praeceptor tuus tui mentionem omisit. Giese in Löbau to Rheticus in Leipzig, 26. July 1543. Prowe II, 420; Burmeister, *o.c.*, III, 55.

The spiritual climate in Copernicus' circle

1. *Erasmianism*

In the early 16th century a christian humanism was flourishing. Humanists in general advocated a return to the culture of the Ancients, to the purity of classical Greek and Latin literature and learning over against the accretions and corruptions in language and philosophy which, in their opinion, had been introduced by medieval scholasticism. "Christian humanism", in particular, wanted a return to the practices of the New Testament church and to the doctrine of Christ himself, and of St. Paul and the early Fathers.

The outstanding figure in this movement was Erasmus (1466–1536). He deemed a more correct knowledge of the Bible a necessary condition for a reform of the Church: instead of the Vulgate edition new translations should be made directly from the original languages, Hebrew and Greek. The theology of the Fathers, in particular St. Jerome and St. Augustine, should take the place of scholastic theology. He emphasized an inner religion instead of ceremonies and rites, and he was reluctant to consider as heretics people who dissented from Roman-Catholic doctrine on minor points. Obligatory dogmatic statements should be reduced to the minimum: in one of his dialogues a Lutheran is examined about the Apostles' Creed, and, when it turns out that he agrees with all its articles, the orthodox interrogator wonders why then there is a rupture between them¹⁵.

Like the Reformers, Erasmus openly criticized abuses that were in downright conflict with a sound religious practice, but unlike the Reformers he would not openly criticize points of doctrine which he deemed superfluous or unjustified. Erasmus would only emphasize the christocentric message of the Gospel and St. Paul. At all costs he wanted to maintain the unity of the church, and thus disappointed his Protestant sympathizers (Bucer, Oecolampadius, Melancthon) by what they considered his hesitations. On the other hand, the scholastic theologians and the conservative hierarchy accused him of heresy and showed little understanding of his efforts not to cut himself off from Rome.

15. Cf Erasmus' colloquia *Inquisitio de Fide* (1524), *Convivium religiosum* (1522), *Ichthyophagia*, etc.

See also R. Hooykaas, *The Erasmian Influence on D. João de Castro*, Lisboa 1979 (also in: *Revista da Universidade de Coimbra* XXVII (1979), pp. 1–29).

Those who advocated religious tolerance emphasized the inner unity of all christians; they wanted to reconcile the two camps into which the western church was falling apart, and they had a right to do so as long as the anathemas of the Council of Trent had not yet made reunion impossible. Before that time there were many Roman-Catholics who would not wholly condemn Luther and who, like the cardinal Jacopo Sadoletto (1477–1547), tried to negotiate a compromise with reformers like Melanchthon¹⁶.

In particular during the pontificate of Paul III attempts to reunite the church were frequent (1534–1541), and it is understandable that those who tried to find a common basis for Evangelicals and Roman-Catholics tended to blur the differences between the two. There were not yet two churches: the Reformers claimed that they tried only to restore the church to its pristine purity and to keep to the “catholic” Creed (what had been believed always, by all people, and at all places). They, too, considered themselves “catholics”, though no longer *Roman catholics*.

2. *Dantiscus and Copernicus*

Erasmian ideas were widely spread in 16th century Poland and this was one of the reasons of the relatively great tolerance before the counter-reformation. But Erasmianism and humanism in general did not form an organized party and, consequently, there were widely divergent shades of it.

In 1523 the Prussian humanist Johannes Dantiscus (Johann Flachsbander, of Dantzig. 1485–1548) visited Wittenberg where he had a cordial encounter with the Reformers, in particular with Melanchthon. Dantiscus was an envoy of the Polish king to the emperor Charles V, and as such he stayed for a long time in the Netherlands, where he underwent Erasmian influence. Being a great protector of humanistic language studies, he took an outstanding scholar, Johannes van Kampen (Campensis), professor of Hebrew at Louvain university, into his “familia”. In spite of the resistance of the conservatives, Campensis’ translation of the Psalms from Hebrew into Latin was printed in 1532, at Dantiscus’ costs¹⁷, by the learned Nuremberg printer Johannes Petrejus (who, afterwards, printed Copernicus’ work also). In the preface Campensis points out that in the Vulgate many places that are rather obscure in themselves have been translated by even more obscure phrases¹⁸.

Campensis accompanied Dantiscus to Dantzig, and for some time he taught Hebrew at the university of Cracow (1533–’34), where also a new edition of his *Enchiridion psalmodum* was published. When Campensis was in Rome in

16. As an intermediary between the irenic cardinal Sadoletto and Melanchthon functioned in 1537 Damião de Gois, a friend of Erasmus. Gois had established excellent relations with the Reformers, when he paid a visit to Wittenberg in 1531. But in 1538 already he felt that a wind of change was blowing and he advised Sadoletto to stop the correspondence.

17. H. de Vocht, *John Dantiscus and his Netherlandish friends as revealed by their correspondence 1522–1546*. Louvain 1961, p. 93.

18. Joannes Campensis, *Enchiridion Psalmorum*. Eorundem ex veritate Hebraica versionem, ac Ioannis Campensis à regione paraphrasim sic ut versus versus respondent, complectens. Lugduni 1534; Basileae 1548, etc. etc. The preface was written in Nuremberg 1532.

1537, he wrote to Dantiscus (April 6th, 1537) that he had no doubt that Melanchthon, if approached in a friendly way, would recognize his errors. Characteristic of the Netherlander's position is his remark that, whereas Our Lord and St. Paul had taken off the veil from Moses and the Prophets, this had been laid on again by the "sophists" (i.e. the scholastic theologians), and that this caused Luther and the Evangelicals to remove it again, though in the wrong way¹⁹.

In the same year (June 1st, 1537) Campensis wrote scathingly about the cardinal Hieronymus Aleander (1480–1542) (the great enemy of Luther and Erasmus)²⁰ whom he found as emptyheaded as Dantiscus had depicted him²¹. It is repeated that "Philippus" (Melanchthon) seems to be very "tractable" and that there also might be found a way to call back "Martinus" (Luther), "but indeed by means of other people than I see here in Rome, where there is such an ignorance about Holy Writ and the heritage of the Ancients, as never existed anywhere".

Though Dantiscus was a layman with a far from morally blameless past, he was appointed bishop of Kulm (1530), and, some years later (1536–'37), bishop of the much more lucrative semi-independent Ermland ("Warmia, quadruplo pinguior").

At first Dantiscus was tolerant towards dissidents, but after some time he took severe measures against them. Nevertheless he continued correspondence with Melanchthon, whom he had cordially entertained when they met in Augsburg in 1530²². After he had become bishop of Ermland he maintained literary relations with protestant humanists who were friends of Melanchthon (e.g. Eobanus Hessus)²³. But in Dantiscus, the prelate and the humanist had opposite interests and his attitude gradually hardened, in particular through the influence of Stanislaus Hosius, who had become a canon of the Ermland chapter in 1538²⁴. In 1539 Dantiscus enunciated a mandate "against heresy" and in 1540 this was followed by an even more severe one, forbidding reading and possessing Lutheran books²⁵. At the same time (April 12th) he sent warning to the canons of the cathedral chapter to denounce to him any of their countrymen who went to places tainted with heresy (Wittenberg!) or had in their home books full of the Lutheran pest²⁶. When the Wittenberg professor Rheticus arrived in Frauenburg the first decree had just been issued (March 21, 1539)²⁷, whereas during his stay with Copernicus, – one of the bishop's own

19. H. de Vocht, *o.c.*, 289–290.

20. Campensis from Venice, 4 Febr. 1535, to Dantiscus. H. de Vocht, *o.c.*, p. 232.

21. H. de Vocht, *o.c.*, p. 293.

22. Prowe, *o.c.*, I, 2, pp. 163 and 334.

23. Prowe, *o.c.*, I, 2, p. 353.

24. Hosius was Dantiscus' successor as bishop of Ermland in 1549. He played an important role in the Counter-Reformation in Poland. Cf Prowe, *o.c.*, I, 2, p. 259.

25. Mandatum wider die Ketzerey (Prowe, *o.c.*, II, 540–543). Mandatum der Lutherei halben (Prowe, *o.c.*, II, 544–545).

26. Prowe, *o.c.*, I, 2, 389.

27. Prowe, *o.c.*, I, 2, 393, 343.

officials, – the second decree (Apr. 15, 1540) banished those subjects who continued their sojourn in Lutheran places.

Perhaps even more awkward was that at the same time Copernicus had serious personal difficulties with the bishop. Dantiscus asked him to sever all relations with his friend and fellowcanon Sculteti (to whom in particular Hosius was very hostile) and to send away his housekeeper (Dec. 1538)²⁸. And when Copernicus and Rheticus were at Löbau with bishop Giese, the astronomer received there a second disagreeable letter on the issue of the housekeeper, while Giese was urged to exert pressure on his friend in order to make him obey on both issues²⁹. Copernicus complied with Dantiscus' wishes, and in 1541 the humanist in the bishop again came to the fore when he sent to Copernicus an amiable letter with an epigram meant to figure on the title-page of the great work³⁰. Perhaps the ambiguity of Dantiscus' attitude may be attributed to a genuine change of mind as well as a growing ambition (he was even nominated for a cardinalcy), and at the same time an unextinguishable love of "letters" in the humanistic sense. He admired in Copernicus the great astronomer, and there is no indication of hostility towards the new theory.

Ambiguity, though of a different kind, was also to be found in Melanchthon. He was a staunch opponent of the theory of the mobility of the earth, which he wanted to be censured (1541)³¹. At the same time, however, he had no objection against Rheticus' visit to Frauenburg and wanted him back on the chair of mathematics and astronomy in Wittenberg after his return³². Yet it was generally known, e.g. through the publication of the *Narratio prima*, that Rheticus was an enthusiastic supporter of Copernicus' theory. In spite of this, Melanchthon sent letters of recommendation to Nuremberg, when Rheticus in May 1542 went there in order to have Copernicus' work printed³³. His personal sympathy for his young protégé was stronger than his dislike of his "enthusiastic" ideas³⁴.

Rheticus was not a man to cause trouble about religious matters. Born in a

28. Prowe, *o.c.*, I, 2, 361, 363.

29. Prowe, *o.c.*, I, 2, 361, 365, 394.

30. Prowe, *o.c.*, I, 2, 368, 369.

31. *Profecto sapientes gubernatores deberent ingeniorum petulantiam cohercere*. Melanchthon to B. Mithob, autumn 1541. *Corp. Ref.* IV, 679. Cf Prowe, *o.c.*, I, 2, 233 and note 33 below.

32. Prowe, *o.c.*, I, 2, 390-391; 392. Rheticus then became dean of the faculty of arts.

33. Prowe, *o.c.*, I, 2, 517. H. Bornkamm ("Kopernikus im Urteil der Reformation", *Arch. f. Reformationsgeschichte* 40 (1943), 171-197) comes to the conclusion that "the facts do not at all confirm Zinner's opinion that the new doctrine was combated 'by the leaders of the Protestant church'" (p. 181). In a well-balanced evaluation of Melanchthon's attitude R.S. Westman ("The Melanchthon Circle, Rheticus, and the Wittenberg Interpretation of the Copernican Theory" *Isis* 66 (1975), 165-193) arrives at the same conclusion: "The customary dichotomy of 'pro' and 'anti' Copernican, then, becomes less than adequate as a description of Melanchthon's views and those of his disciples" (l.c. p. 173). In 1550 Rheticus (then a Leipzig professor) was invited by Melanchthon to come to Wittenberg to attend the wedding of his daughter with Kaspar Peucer; evidently, they remained on good terms in spite of their difference of opinion.

34. Melanchthon to Veit Dietrich, 2 May 1542; Prowe, *o.c.*, I, 2, 518.

family that remained Roman-Catholic, he was sent to Zwinglian Zürich to study there; and afterwards, in Wittenberg, he became a Lutheran and remained so for the rest of his life. It seems, however, that as such he was very moderate: at any rate, in the spirit of Melanchthon, he avoided giving offense³⁵. Prudence over against the hierarchical party and genuine affinity of spirit with the highly admired Copernicus and Giese determined the character of his treatise.

3. *Tiedemann Giese*

More affinity with the religious aspect of Erasmian thought showed Danticus' successor on the see of Kulm³⁶ (and, afterwards, of Ermland), Tiedemann Giese. A former canon of the Ermland chapter in Frauenburg, he had been for many years a colleague of Copernicus, and he remained his best friend until Copernicus' decease.

Giese's opinions on the dissensions in the church are known from his *Antilogikon* (1525), which was an answer to a tract on "faith and works" by Georg von Polentz, bishop of Samland, who had chosen the side of Luther on this issue³⁷. Giese's reaction was written in a conciliatory tone: "I dislike any kind of strife". He said that much of what he wrote seemed to support the opponent's standpoint rather than his own: "I often seem to follow rather than oppose him"³⁸. He wished that for one moment the Lutherans in their imagination would become Romish, and the Romish Lutherans, and that each would yield to the other just a little in a christian spirit, "then, surely, there would not be this tragedy in the churches"³⁹.

Wholly in the Erasmian spirit, Giese recognized that outward ceremonies are unimportant in themselves and that religion takes its root in the heart of man; yet, for the sake of the weak they have been instituted by the church. The differences of opinion in the church should be solved in a spirit of love, as the church of Christ is not served by quarrels but by peace, kindness and tolerance⁴⁰. He fully recognized that there are many abuses and superstitions in the

35. During his professorship at Leipzig university his religious life was at a low ebb, but during a mental crisis in 1547 it mounted high (cf Burm., *o.c.*, III, 73 ff. Letter from Kaspar Brusch in Lindau to Johannes Camerarius in Leipzig, Nov. 1547). Afterwards, his special loyalty to Lutheranism became evident in letters to a very close friend, Paul Eber, pastor and prof. theol. in Wittenberg (cf Burm., *o.c.*, III, 165, 166, 172, 173). Perhaps his tendency to please the person with whom he corresponded played a role.

36. Giese was bishop of Kulm 1538–1548, and of Ermland 1548–1549.

37. In his *Centum et decem assertiones s. flosculi de homine exteriori et interiore fide et operibus* (1523). The title of Giese's answer (*Flosculorum Lutheranorum de fide et operibus Anthèlogikon* (Cracow 1525)) plays with the words "anthèlogikon" (anthology = flower-collection) and "antilogikon" (refutation), a refutation namely of the "flosculi" (blossoms, flowers). So it really means an anti-anthology. Cf Prowe, *o.c.*, I, 2, 171–173.

38. Ego omniversum pugnam detrecto... Quapropter phrasin ita temperavi... ut... sequi magis quam insectari ipsum. Tidemannus Giso, *Flosculorum Lutheranorum de fide et operibus Anthèlogikon*, p. 3. In: F. Hipler, *Spicilegium Copernicanum*, Braunsberg 1873.

39. Giese, *o.c.*, p. 6.

40. Giese, *o.c.*, p. 88.

church, but he would like his opponents to show more kindness and patience and to work for a reform from within.

When a canon, Giese acted as he spoke and often intervened on behalf of Lutherans, trying to temper the severity of his bishop⁴¹. After he had become a bishop himself, he persevered in this tolerant attitude. In 1536 he wrote a work, *De regno Christi*, in which, though keeping to the Roman-Catholic doctrine, he gave in to the Reformers on minor points. He sent copies to Erasmus and Melanchthon, asking for their judgment, but the former died soon afterwards and the latter seems to have given an evasive reply (1533)⁴².

One might wonder why I expatiate on Giese's standpoint in theology. This is because the ties between Copernicus and Giese were so close, and their spiritual affinity so great, that it may be safely assumed that by knowing Giese's theological opinions we know those of Copernicus, and by knowing Copernicus' astronomical opinions we know those of Giese.

For example, Copernicus encouraged Giese when he hesitated to publish his *Antilogikon*, a theological work that he could not expect to be received with applause by the conservatives. In the dedicatory letter to Felix Reich, – a fellow-canon who was a friend of Copernicus, too, – Giese expressed the hope that Reich would not let his judgment be influenced by his sympathy for the author, “as I deem to have happened to Nicholas Copernicus – otherwise a man of acute judgment –, who persuaded me to publish in print these trifles of mine”⁴³.

On the other hand, Giese, who followed with interest the development of Copernicus' thought, encouraged his friend to go on. This is acknowledged by Copernicus in the prefatory letter of *De revolutionibus*, when he says that his most beloved Tiedemann Giese urged him to overcome his hesitation and to publish the work⁴⁴.

Giese went even further in his support of the Copernican cause. He wrote a (now lost) defence («Shieldbearer»), as is apparent from a remark made by Broscius in a copy of *De revolutionibus* in the margin beside the passage on the “mataiologoi” (which is the only place in which Copernicus perfunctorily alluded to the theological opposition he expected from a certain quarter.) Giese's *Hyperaspisticon* (or *Hyperaspistes*), therefore, must have been a vin-

41. Bishop Maurice Ferber. Cf Prowe, *o.c.*, I, 2, 170.

42. *De regno Christi* never was printed. Prowe, *o.c.*, I, 2, 183-184.

43. Verum ita, ne propensitate amoris in me tui patiaris iudicij puritatem falli, quod Nicolao Copphernico alioqui acuti iudicij viro evenisse existimo, qui illas meas nugas typis excusas vulgari suadebat. T. Giese, ex arce Allenstein, 8 Apr. 1524, to Felix Reich in Heilsberg (dedicatory letter of Giese's *Flosculorum Lutheranorum*..., p. 4. In: F. Hipler, *o.c.*, p. 6.

44. Proximus ille vir mei amantissimus Tiedemannus Gisius, episcopus Culmensis, sacrarum ut est, et omnium bonarum literarum studiosissimus. Is etenim saepenumero me adhortatus est, et convitijs interdum additis efflagitavit, ut librum hunc aederem, et in lucem tandem prodire sinerem, qui apud me pressus non in nonum annum solum, sed iam a quartum novennium, latitasset. Nicolaus Copernicus. *De revolutionibus orbium coelestium libri VI*. Norimbergae apud Ioh. Petreium, 1543. Praefatio ad Paulum III, fol. IIIr.

dication of Copernicus' orthodoxy with respect to the Bible similar to that of Rheticus. Nothing is known about its precise contents, except that, according to Broscius, – who had seen the manuscript –, Giese mentioned in it Erasmus' "very mild judgment about Copernicus"⁴⁵.

The Council of Trent not only condemned the Protestants but it also blocked the way to Erasmian humanism. In March 1546 the Tridentine fathers discussed the problem whether laymen might be allowed to give instruction in the interpretation of the Bible⁴⁶. The result was a decree which – in spite of some resistance from the humanistic side (cardinal Pole)⁴⁷ – prescribed the Vulgate as the obligatory and authentic text of Holy Scripture, and which allowed only interpretation conformable to the Church and the unanimous opinion of the Fathers⁴⁸. Though several members advocated a total prohibition of exegetical activities by laymen, this was not inserted in the decree.

It is evident that, henceforth, it was illicit to put the Hebrew text and its translations above the Vulgate, as had been done on some occasions by Nicholas of Lyra and, more recently, by Johannes Campensis. Erasmus' edition of the Greek New Testament, too, was no longer regarded as preferable to the Vulgate, let alone translations of it by Protestant scholars.

The relations between Roman-Catholics and Evangelicals became even more strained than before; the Inquisition more severe towards dissenters; the Index of prohibited books was very extensive and Erasmus' works were either wholly forbidden or admitted only after a thorough expurgation.

Consequently, there remained little room for "Erasmianism". Its adherents remained silent or conformed openly to the official standpoint. Shortly before his death, bishop Giese wrote (Aug. 12, 1550) to Stanislaus Hosius who was to become his successor in the diocese of Kulm and the most prominent zealot of the Counterreformation in Poland), that his so much criticized *De regno Christi* would be sent to him and that he had the right to delete from it what he deemed unfit. Giese recognized that he did not agree any longer with many thoughts laid down in it and that he never had considered them unshakeable dogmas. To the same expurgation should be submitted all his writings which he had not yet made conformable to the doctrine of the Church, and nothing

45. Broscius wrote: Vide Hyperaspisten Tidemanni Gysii Episcopi Culmensis ad Nicolaum Copernicum nondum typis excusum, ubi etiam sententiam Erasmi Roterodami de Copernico ipse Tidemannus refert valde mansuetam. Hipler, *o.c.*, p. 286; Prowe I, 2, 494; I, 1, 48. Mme E. Hilfstein (in: *Studia Copernicana XXI*, Wroclaw 1980), points out that "Hyperaspistes" is a misreading of "Hyperaspisticon". Her supposition that possibly Broscius had Rheticus' text before him and misattributed it to Giese, is contradicted by the fact that Rheticus' work does *not* mention Erasmus. The *Hyperaspisticon*, then, is not Rheticus' work, but a lost treatise by Giese.

46. *Consilium Tridentinum. Diariorum, Actionum, Epistularum, Tractatum Nova Collectio*. ed. Societas Goerresiana, T.V., Friburgi Brisgoviae 1911.

47. *Conc. Trid.*, p. 65.

48. *Conc. Trid.*, pp. 91-92.

should be published without approval of good catholic people; but – so Giese added prudently – nothing should be *added* either.

Hosius deemed the book unworthy of publication: many years later (1569) he wrote that a first reading of it was pleasant enough, but, when reading it again, you will find “horrible heresies” in it⁴⁹.

49. Prowe, *o.c.*, I, 2, 183.

Modes of interpretation of the Bible

As the aim of Rheticus' treatise was to reconcile a scientific or "philosophical" theory with Holy Scripture, it seems useful to place this topic in its historical context.

It should be realized that to all Christians at that time the Bible was the Word of God, written by human authors under divine inspiration. If some statement was taken as apodictical by some people, and as allegorical or merely descriptive by others, this did not imply that the latter were closer to what is now called a liberal theology. But, according to Christian doctrine God had written *two* books: the Book of Creation (Nature) and the Book of Holy Scripture. In the Book of Nature God revealed tokens of His wisdom, power and goodness, and this revelation could be read by all people, pagans as well as christians. There could be no contradiction between Nature and Scripture, but there could be contradiction between the human *interpretation* of Nature (natural philosophy, *scientia naturalis*) and the *interpretation* of Scripture (exegesis and dogmatics), and it is here that controversies could arise.

The Fathers of the Church had recognized that the text of Scripture, when taken at face value, often conflicted with the then current cosmology of Aristotle but the christian philosophers and theologians had learned to "reconcile" the highly sophisticated Greek world picture with the more naive world picture of the Bible. In general the Fathers were prone to read Holy Scripture (when speaking about natural phenomena) through the spectacles of Platonic or Aristotelian philosophy and to overlook the apparent discrepancies between the Mosaic record and Greek cosmology.

Nevertheless, Greek cosmology was closer to a naive world picture than the Copernican system in that the central position and the immobility of the earth belonged to its fundamental tenets. Consequently, it was inevitable that the problems which ancient and medieval theologians seemed to have satisfactorily solved, had to be considered again when the Copernican system was propounded, and that the various modes of interpretation that had been advanced in the past, were applied again. Which were these exegetical standpoints?

1. *Literalism*

According to the literalistic conception, the passages in which the Bible speaks about nature should be taken in the literal sense and, moreover, the fun-

damentals of cosmology should be borrowed from Scripture. This implied, e.g., that there are “waters above the expanse”, in contradiction to the Aristotelian tenet that the natural place of water is below the spheres of air, fire, and the heavenly bodies. In case of conflict, however, the sacred text should prevail over the “heathenish” philosophy of Aristotle.

In particular the Syrian Fathers wanted cosmology to be free from «pagan» taints. They put up a Biblical cosmology in opposition to the Greek world picture. In their wake the 6th century author Kosmas Indikopleustes went to the extreme of holding that the earth is flat, and that, because the Bible speaks of “the ends of the world” (Job 38:13; Revelation 7:1), the earth must have an (oblong) foursided shape⁵⁰.

Kosmas, however, was quite exceptional and he had hardly any influence, for practically all medieval philosophers and astronomers accepted the spherical shape of the earth as a demonstrated philosophical truth, and this may be said of the theologians, too⁵¹. From Pythagoras on, all Greek philosophers, (with the exception of the Materialists), and all astronomers had accepted the sphericity of the universe, the heavenly bodies and the earth, and the christian theologians, who borrowed most of their natural philosophy from Plato or Aristotle, followed them.

Consequently, the opinion of the ancient theologian Lactantius (ca 310), who denied that the earth has a spherical shape, was not taken seriously by the vast majority of christian philosophers in the Middle Ages⁵². He had also ridiculed the idea that antipodes could exist: people would walk with their heads downwards, etc.⁵³.

50. Cf J.W. McCrindle, *The Christian Topography of Cosmas*. London 1847 (Hakluyt Soc. 98, Eng. transl.). W. Wolska, *La topographie chrétienne de Cosmas Indicopleustes: Théologie et Science au VIe siècle*. Paris 1962, pp. 13-14, 246-248. “Aussi... demeura-t-il résolument ennemi de tout compromis entre le chrétien et le païen” (o.c., p. 150; cf pp. 167-183). Wolska regards this work as directed against Joannes Philoponus, who had reconciled the indications of Moses with those of Greek cosmology (o.c., p. 161).

51. R. Hooykaas, Science and Theology in the Middle Ages. *Free Univ. Qu.* 3 (1954), p. 147.

52. Except in Russia (Wolska, o.c., pp. 183, 273).

53. Lactantius (c. 250-c. 325) was not the first to ridicule the notions of a spherical earth and the existence of antipodes, as the enlightened pagan writer Plutarch (c. 50-c. 125) also scoffed at these ideas (*De facie in orbe lunae*, c. 7). Lactantius wrote: Quid illi, qui esse contrarios vestigiis nostris Antipodas putant, num aliquid loquuntur? aut est quisquam tam ineptus, qui credat esse homines, quorum vestigia sint superiora, quam capita? aut ibi, quae apud nos jacent, inversa pendere? fruges et arbores deorsum versus crescere? pluvias, et nives, et grandinem sursum versus cadere in terram? Et miratur aliquis, hortos pensiles inter septem mira narrari, cum philosophi et agros, et maria, et urbes, et montes pensiles faciant?... Quod si ita esset, etiam ipsam terram globo similem; neque enim fieri posset, ut non esset rotundum, quod rotundo conclusum esset... Quod si esset, etiam sequebatur illud extremum, ut nulla sit pars terrae, quae non ab hominibus caeterisque animalibus incolatur. Sic pendules istos Antipodas coeli rotunditas adinvenit... (Next, he combats those philosophers who hold that heavy bodies, following Nature, strive after the middle of the spherical universe, and light bodies, on the contrary, try to get away from it as far as possible)... vanis vana defendunt; nisi quod eos interdum puto, aut joci causa philosophari... Lactantius, *Divinarum institutionum libri VII*, 1. III, c. 24; in: F. Migne, *Patrologia latina*, T. VI, Parisii 1844; 425 B -426 A; 427 A-B.

After the circumnavigation of the earth by Magelhães and the discovery of antipodes on the southern hemisphere by the Portuguese, Lactantius' reputation as a philosopher sank still lower⁵⁴. He was an easy target for all those who were harassed by literalistic opponents, (who, since the voyages of discovery could not defend him). In the Copernican disputes his name appears again and again. On the only occasion that Copernicus referred to the expected theological opposition, this usually mild man spoke of "mataiologoi" (idle talkers), people without knowledge of mathematics who, on the ground of some passage from Scripture, "which they evilly distort for their own end, dare to attack my doctrine". Rather contemptuously, he added that these people worried him so little that he scorned their judgment as foolhardy⁵⁵.

Lactantius then, was the scapegoat: in him all other literalists might see to what absurdity their approach might lead; Lactantius, "otherwise a distinguished author but hardly a mathematician", speaks "in an utterly childish way" about the shape of the earth and ridicules those who affirm that it has the form of a globe⁵⁶ (Copernicus).

If, however, it is certain that Copernicus here repudiated the literalistic interpretation of Scriptural passages concerning natural philosophy, this gives us no positive information about the way in which he himself would conceive Biblical statements about the motion of the sun or the immobility of the earth. On the basis of this verdict a decisive answer cannot be given, for after the rejection of the literalistic interpretation, more than one way remained open.

In particular many Renaissance scholars tried to extricate from the plain text of Scripture the philosophical tenets they held already beforehand. These ideas might be those of Greek philosophers, but also – often in opposition to them – those of allegedly "Egyptian" sages. It was said that Moses, being instructed in all the wisdom of the Egyptians, laid down much of this ancient wisdom in the Book of Genesis.

In fact, it depended on the preconceptions of the interpreter whether "Mosaic philosophy" would turn out to be more or less Aristotelian or, on the contrary, violently anti-Aristotelian. But all protagonists of a «Mosaic philosophy» claimed that the Holy Spirit guided the hand of the biblical writers, so that they wrote down scientific truth for all times.

A typical example in the later 16th century is the Paracelsist physician Joseph du Chesne (Quercetanus, 1546–1609). He held that all chemical compounds are formed from the three prin-

54. D. João de Castro, *Tratado da Esfera* (1538). In: ed. A. Cortesão and L. de Albuquerque, *Obras Completas de D. João de Castro*, vol. I, Coimbra 1968, p. 57.

55. Si fortasse erunt mataiologoi qui... propter aliquem locum Scripturae, male ad suum propositum detortum, ausi fuerint meum hoc institutum reprehendere ac insectari: illos nihil moror, adeo ut etiam illorum iudicium tanquam temerarium contemnam. N. Copernicus, *De revol.*; praefatio ad Paulum III, fol. IV vs.

56. Non enim obscurum est Lactantium, celebrem alioqui scriptorem, sed mathematicum parum, admodum pueriliter de forma terrae loqui, cum deridet eos qui terram globi formam habere prodiderunt. Copernicus, *De revol.*, praefatio, fol. IV vs.

ciples put forward by Paracelsus, (viz. mercury, sulphur and sal), and two of the elements of Aristotle, (viz. earth and water). Why not all four elements? Paracelsus had given the definition: "What brings forth is an element"⁵⁷. And as Moses mentions only earth and water as "bringing forth" plants (Gen. 1:11-12 and 24-25) and animals (Gen. 1:20-21), it must be concluded that air and fire should not be considered as such: "for we prefer to follow the divine Seer rather than the heathen philosopher"⁵⁸.

In principle such a procedure remains within the literalistic tradition.

In particular the "waters above the earth" (Gen. 1:6-7) were hard to reconcile with Greek cosmology. William of Conches (2d half 12th Cent.) therefore made no effort to interpret them in the literalist way and adapted them to Aristotelianism: water, which is a heavy thing, ought to be directly *on* the earth and it cannot remain in the vicinity of the sphere of fire. Consequently, there are no waters above the expanse; the firmament is the air, and "the waters above it" are suspended as vapours in the clouds⁵⁹.

2. *The allegorical interpretation*

Another way of evading conflicts between philosophical beliefs and the letter of the Bible was to resort to an allegorical interpretation of passages which seemed at first sight to be incompatible with natural philosophy. In this way Origenes explained away the concreteness of the "waters above the expanse" by saying that the angels were meant by this term.

More important, however is that an allegorical exegesis was sometimes used in a *positive* way, when it was claimed that the letter of Scripture had a second meaning, hidden to the vulgar, and that this referred to concrete cosmological truths. Consequently, not only the literalists (who took the plain letter of the Bible for authoritative scientific information), but also this kind of allegorizing interpreters, believed that there was (natural) science to be found in the Bible. They differed from the literalists in that they held that this scientific information is not given in such a direct way. It was found either in hindsight, after it had already been discovered by reason and experience, or in advance of such discoveries, when, by divine enlightenment, some people intuitively claimed to see the hidden sense of biblical passages and thus to obtain a scientific knowledge more profound than the current one. In particular the theosophically inclined Hermeticists and alchemists of late Antiquity and the Renaissance went to great lengths in the construction of such a "Mosaic philosophy" or "physica Mosayca".

In fact, most allegorizing interpreters took first some philosophical (scienti-

57. R. Hooykaas, *Die Elementenlehre des Paracelsus*. *Janus* 39 (1935), pp. 175-187.

58. R. Hooykaas, *Het Begrip Element in zijn historisch-wijsgeerige ontwikkeling*. Utrecht 1933, cap. VIII, 2, "Quercetanus", pp. 121-129; also: R. Hooykaas, *Die Elementenlehre der Iatrochemiker*. *Janus* 41 (1937), pp. 1-28; "Quercetanus", pp. 7-15.

59. *Posuit firmamentum in medio aquarum, quamvis hoc plus allegorice quam ad litteram dictum credimus*. Gul. Conches, *Philosophia*, lib. II, c. 3. Quoted from Migne *PL* 172 (Parisiis 1895), where it goes under the name of Honorius Augustodinensis ("De philosophia mundi"). See R. Hooykaas, *Free Univ. Qu.* 3, pp. 180-181. Cf Rheticus's treatise p. 44.

fic) tenet for granted and then found it back in Scripture, where it was said to be stated in a veiled way.

A typical example of this procedure is the *Heptaplus on the sevenfold narrations of the six days of Genesis* of the Italian philosopher Johannes Pico della Mirandola (1463–1494)⁶⁰. He goes very far in distorting the plain sense of the history of creation told in the first chapter of Genesis. In his opinion, Moses, like the other Ancients, wrote figuratively of great things divine and physical. Since his audience, because of their ignorance, could not stand the splendour of his teaching, he had to speak “with a veiled face”, lest they be blinded by too much light. The data Moses gives symbolize the secrets of “all the worlds” and the whole of nature. The tenth sphere of the universe (which emits light) corresponds with what Moses in particular calls “heaven”, whereas the eight lower spheres are called “earth”⁶¹. In a certain sense this “earth” contains the “four elements”: the lowest (the moon), is as it were the element “earth”, the planet Mercury is “water”, Venus is “air”, the Sun is “fire”, whereas in an inverse order Mars is “fire”, Jupiter is “air”, Saturn is “water”, and the 8th sphere is “earth”⁶².

In Pico’s opinion what was enclosed between these two “earths”, Moses correctly called also “earth”, and this was “without form and void” (Gen. 1:2) before light was sent into it from the highest heaven.

Between the 8th sphere and the empyreum is what Moses symbolically calls “the waters”, the 9th sphere, the “crystalline heaven”. Above that sphere the Spirit “brooded” (Gen. 1:2), i.e. imparted the life-giving light to the lower spheres. The terms “water” and “earth” in the first chapter of Genesis denote the 9th sphere and the other spheres of the astronomers.

Moses teaches that the sphere of the fixed stars (which *we* call “firmament”) is situated between two bodies of water, for the 9th sphere as well as that of Saturn are called “water”. Consequently, God placed the firmament in the midst of the waters (Gen. 1:6); the waters under the “heaven” (as Moses calls the firmament) were “gathered together in one place”, so that “dry land”, i.e. earth, appeared (Gen. 1:9–10). That “the waters gathered in one place” means that all virtues of the planets are collected in the Sun, which Moses here calls “sea” (Gen. 1:10). The “earth” that then appeared is the Moon, which generates the grass and the trees (Gen. 1:11). In this way Moses shows us the nature of the sun and the moon “in a figurative way”.

But why is Moses silent about the four other planets, when he has mentioned the 10th, the 9th, and the 8th sphere, and also Saturn, the Sun and the Moon?, Pico asks. And then he rejects the subterfuge that Venus, Mercury, Jupiter and Mars were omitted because Moses wrote for an uneducated people, which knew only about the sun and the moon. Such an opinion “I cannot without blushing betake myself to it, since I asserted that Moses omitted nothing that might contribute to a perfect understanding of all the worlds”⁶³.

60. Ioannes Picus Mirandula, *Heptaplus, de septiformi sex dierum Geneseos enarratione* [1489]. In: *Opera omnia* Pici, Mirandulae Concordiaequae comitis, Basiliae 1557. Cf note 5 to p. 33 of Rheticus’ treatise.

61. Picus, *o.c.*, lib. II, c. 2.

62. *ibid.*

63. Cur inquam cum de decima, nona, octavaque sphaera, de Saturno, item Sole et Luna fecerit mentionem, de quatuor qui supersunt Venere et Mercurio, Iove idem et Marte ne verbum quidem. Dixeris forsitan ideo factum quia rudis populus Solem tantum novit et Lunam. Sed hoc per fugium ipse mihimet ademi, nec possum non erubescens isthuc divertere qui supra sum attestatus nihil propterea obmissum à Mose faceret. Picus, *o.c.*, lib. II, c. 3, p. 19.

Pico rejects “accommodation” to simple people with no less vigour than the literalists did. He resorts to the tenet of all theosophists of the Renaissance when expressing his belief that here, in Scripture, lies hidden the mystery of the ancient wisdom of the Hebrews, among whose dogmas on the heavens it is important that Jupiter and Mars are included with the sun, and Venus and Mercury with the moon. If we reflect on the nature of these planets, so Pico goes on, the reason for this belief is not obscure, although the Hebrews themselves offer no reason for this doctrine⁶⁴. For, Jupiter and Mars are “hot” and the Sun, too, is “hot”; the heat of Mars is “violent”, that of Jupiter “beneficent”, and in the Sun both qualities are tempered to an intermediate nature. And then Pico concludes that Moses had spoken sufficiently about the empyrean heaven, the 9th sphere, the firmament, the planet Saturn, and about “the sun and the moon, which represent the rest, suggesting to us their inclusion by his very silence”⁶⁵.

Evidently, some allegorical exegetes did not shrink back from the most tortuous reasonings and the most gratuitous assumptions in order to reach their goal.

3. *Accommodation*

A third way of interpreting those biblical texts that seemed to be at odds with the philosophical world picture was to point out that the Bible does not at all intend to give any scientific or cosmological information, as God has left these things to man to find out for himself as far as possible. Only for some topics which lie beyond the scope of “philosophical” investigation – e.g. whether the world has a beginning or not – has one to resort to the special divine revelation in Holy Scripture in order to get an authoritative answer. Scripture, so it was said, has been given only for religious and ethical and not for scientific instruction. Therefore, when the Bible speaks about purely “natural” things, it accommodates itself to the conceptions (naïve or traditional) of the common people. In this way St. Augustine had little difficulty in recognizing the spherical shape of the earth and the planetary spheres of Aristotelian cosmology, though he did not find them expressly taught in the Bible.

It goes without saying that “accommodation” was inevitable when human language is used about the Infinite and Eternal himself. St. Augustine emphasizes that the Bible speaks in an anthropomorphic way about God’s hands and eyes, and Nicole Oresme (14th century) points out that also when Scripture says that God repented Himself or that He was angry (Gen. 6:6; Isaiah 47:6; Ps 60 (59):1), this should not be taken in the literal sense. And Paul of Burgos says in his “addition” to Lyra’s commentary on Genesis I, that anything regarding the nature of God is expressed “as it were in a stammering way”⁶⁶.

64. *Altius credo latere mysterium veteris Hebraeorum disciplinae, inter cuius de coelo dogmata, hoc est praecipuum concludi à Sole Iovem et Martem, à Luna vero Venerem et Mercurium.* Pico, *o.c.*, p. 19.

65. *De coelo igitur empyreo, de nono orbe, de firmamento, de sydere Saturni, deque Sole ac Luna, qui reliqua complectuntur ipso silentio huius complexus nos admonens sufficienter hactenus dixit.* Pico, *o.c.*, p. 20.

66. ...aliquod pertinens ad naturam divinam ... quasi balbuciendo exprimitur.

Biblical statements about the rising and the motion of the sun, could not cause any difficulty, as in this respect the naive and the Aristotelian conceptions coincided. The more the Aristotelian world picture became part and parcel of the familiar semi-popular world view, the more the discrepancy between the Mosaic record and Greek cosmology was overlooked. But when Scripture says that God covers the heaven with clouds (Ps 147 (146):46), Nicole Oresme (1377) remarks that it often accommodates itself to the common way of human speech, as in this case, where in reality it is heaven that covers the clouds. In the same way it could be said that heaven only seemingly performs a daily rotation with the earth standing still, whereas in truth the opposite is the case, so that in Joshua's time (Joshua 10:12-14) the *earth* stood still⁶⁷. Oresme does not say that in reality the earth stood still, but he clearly indicated that the principle of accommodation might lead to acceptance of this theory, without weakening the authority of Scripture.

A great influence on biblical interpretation was exerted by the commentaries of Nicholas of Lyra (c. 1270–1349) with the “Additiones” of Paul of Burgos (c. 1351–1435). In the “additio” to the commentary on the first chapter of Genesis Paul of Burgos points out that the story of creation has been written for “the rude” (= uneducated) people and that the words have been chosen so, that they condescend to the “ignorance of uneducated or simple listeners”⁶⁸. Again he points out that these simple people were “incapable to understand spiritual things”⁶⁹. In his opinion, when the creation of «heaven» is told in Genesis, this means all orbs or spheres and also the empyreum⁷⁰.

In Lyra's commentary on Job 38, however, there is an awkward effort to reconcile the “Mosaic” text with the Aristotelian theory of the four elements. He says then that the earth, water and air are mentioned, but that the sphere of fire is omitted, as it is comprised in the sphere of air⁷¹.

It should be emphasized again that the application of the exegetical principle of accommodation to the cultural situation of the readers and hearers, may be closer to modern standards of interpretation, but that in itself it has nothing to do with theological liberalism, for no dogma is at stake. The difference of

67. Nicole Oresme, *Traité du ciel et du monde*, l. II, 14ld. Nevertheless Oresme, referring to Ps 93:1, chose for the immobility of the earth.

68. *Moyses rudi populo loquebatur... ut imbecillitate rudium seu simplicium audientium condescenderet. Postilla fratris Nicolai de Lyra de ordine minimorum super Genesis... cum additionibus Pauli episcopi Burgensis.* In: *Biblia Latina cum postillis Nic. de Lyra*, Nuremberg, Ant. Koberger 1493.

69. ...quantumcunque populus ille rudis fuisset et incapax spiritualium... nihilominus necesse erat ut eis praeponerentur primo et supponerentur quaedam penitus invisibilia, sicut deum esse, quia sine hoc in vanum instruerentur.

70. *O.c.*, d IIIr.

71. De elemento autem ignis mentionem non facit quia non videtur speram propriam distinctam a sphaera aeris. *O.c.*

mode of interpretation does not imply a difference in the belief that Holy Scripture is an authoritative divine revelation. All 16th century Christians believed that the Holy Spirit intends to teach us apodictically the truth about God and man and their mutual relations, and it is only on religiously and ethically indifferent matters that, according to the advocates of the principle of accommodation, the Spirit adapts Himself to the naive conceptions of the common people.

Moreover, it should be noticed that these various modes of interpretation are just “types” and that each of them was occasionally applied by the same person. St. Augustine, e.g., applied the principle of accommodation in many cases, but he made also a free use of the allegorical method. In many cases the same passage was interpreted “according to the letter” as well as allegorically. (See n. 3 to p. 37 of the treatise)

4. *The astronomers’ evasion of the exegetical problem*

Discussion of the question whether the astronomical hypothesis of the mobility of the earth is acceptable from a biblical point of view, could easily be dodged by astronomers. Most of them held that astronomy is but a mathematical *art* and not a part of physics or philosophy of nature. Its traditional task was to observe and measure the motions of the heavenly bodies and to construe, on the basis of the numerical data, a coherent system that would enable the mathematician (as the astronomer or astrologer was often called) to calculate the places of the stars in the past and the future. It was recognized that this could be done by more than one mathematical device (i.e. by different combinations of circular motions). As long as the interests of chronology, geography, navigation, medicine, and politics were served well, it was not so important which of those hypotheses was most conformable to reality.

On the other side, however, there were scholars who held that in order to yield reliable results, calculations must be based on the real structure of the universe and the real motion of the heavenly bodies, and that, consequently, astronomy must be more than an “art”: that it should be a *science* which deals with some mathematical aspects of physical reality, and even that it should establish the “nature” (physis), the essence, of the heavens. To them astronomy was a part of physics.

Some tenets of Aristotelian *physics* — namely the central position and the immobility of the earth, and also the idea that heavenly bodies perform only circular and uniform motions — were accepted as rules in the several “mathematical” astronomical systems, too. The fact that Ptolemy, in Copernicus’ opinion, violated this latter rule by introducing the “equants”, was for the Polish astronomer a reason to break away from Ptolemaic astronomy.

Ptolemy in his *Almagest* and the medieval astronomers realized that, “mathematically” speaking, and for practical purposes, it does not matter whether the heavens perform a rotation in 24 hours and the earth stands still, or the earth rotates and the heavens stand still. From such a standpoint one could admit also other physical “absurdities” and, e.g. let the earth and the sun exchange their

positions. This explains why several astronomers who remained faithful to Aristotelian physics, recognized Copernicus' theory as a mathematical device that could easily compete with that of Ptolemy, and even surpassed it.

It is, however, certain that Copernicus considered his system as physically true and not only mathematically convenient. That is why he had to introduce physical theses that did not agree with Aristotle's physics⁷².

Therefore, as is evident already from the dedicatory letter to the pope, (the "praefatio auctoris"), Copernicus expected violent opposition to his theory, because of its many philosophical "absurdities" from the Aristotelian standpoint and because of its incongruity with the Bible, from the standpoint of literalistic theologians⁷³.

Rheticus and Giese shared Copernicus' firm belief that his system represented physical reality. In his *Narratio prima* (1539) Rheticus had unambiguously declared this, and the Nuremberg theologian Andreas Osiander (1498–1552), to whom the supervision of the publication of Copernicus' *De revolutionibus* had been transferred by him, knew this perfectly well. To Copernicus' request for information about the possible opposition of scholastic philosophers and theologians, Osiander answered (April 20th, 1541) that in his opinion astronomical hypotheses are no articles of faith, but only the bases for calculation, so that it does not matter whether they are true or false, provided the phenomena can be accurately determined by means of them. Therefore, it would be expedient to say something of this kind in the preface; in this way you would pacify the Aristotelians and the theologians, whose future opposition you fear⁷⁴.

On the same day Osiander wrote to Rheticus (who was at that time with Copernicus in Frauenburg) a letter with the same advice: "The peripatetics and theologians will easily be placated, if they hear that various hypotheses are possible for explaining the same apparent motion..."⁷⁵. And he added that in this way they would be persuaded to stop their severe critique and to investigate the

72. See below, the commentary to p. 45 of the treatise (p. 134).

73. ...contemptus qui mihi propter novitatem et absurditatem opinionis metuendus erat propemodum impulerat me, ut institutum opus prorsus intermitterem. N. Copernicus, *De revol.*, praefatio, fol. IIIr.

74. This correspondence is known through J. Kepler's *Apologia Tychonis contra Ursum*.

De hypothesis ego sic sensi semper, non esse articulos fidei, sed fundamenta calculi, ita ut, etiamsi falsae sint, modo motuum phaenomena exacte exhibeant, nihil referat... Quare plausibile fore videretur, si hac de re in praefatione nonnihil attingeres. Sic enim placidiores redderes peripateticos et theologos, quos contradicturos metuis. Andreas Osiander in Nuremberg to Copernicus in Frauenburg, 20 Apr. 1541. Prowe, *o.c.*, I, 2, 522.

Kepler's *Apologia Tychonis contra Ursum* (1601), cap. I (publ. in: Joannis Kepleri astronomi Opera Omnia, ed. Ch. Frisch, vol. I, Frankfurt and Erlangen 1858), contains a full exposition of his ideas about hypotheses. Cf R. Hooykaas, Het hypothesebegrip van Kepler. *Orgaan* chr. vereen. natuur- en genesk. in Nederland 1939, pp. 38–60.

75. Prowe, *o.c.*, I, 2, 523.

problem, and thus become more reasonable; and, finally, having sought in vain for something better, would accept the opinion of our author⁷⁶.

After the supervision of the printing of Copernicus' work had been transferred to him, Osiander – without the author's consent – inserted the notorious statement "To the Reader, about the hypotheses of this work", in which he reassured the readers that hypotheses need not be true or even probable: it is enough if they lead to calculations conformable to observations. Astronomy does not claim that things really are as the hypotheses propound. The philosopher may perhaps want a greater probability, but neither the philosopher (= physicist), nor the mathematician (= astronomer) ever arrives at certainty, "unless it has been unveiled to him by divine revelation". Nobody should expect astronomy to give certainty about hypotheses⁷⁷.

Though Osiander did not deliberately *deceive* the reader of Copernicus' work – his anonymously made statement is clearly distinguished from the "Preface of the Author" in which Copernicus addresses the Pope, and refers to the author of the book in the first person, whereas the anonymous statement speaks about him in the third person – yet it was an effort to "placate" the opponents, and it was inserted without consent of Copernicus (and Rheticus). It is known that Giese was very angry about this high-handed act⁷⁸. Both, Giese and Rheticus, however, must have felt some relief that the statement was not undersigned⁷⁹.

76. ...ita a vindicandi severitate ad exquirendi illecebras avocati ac provocati primum aequiores, tum frustra quaerentes pedibus in auctoris sententiam ibunt. Osiander to Rheticus, 20 Apr. 1541, Prowe, *o.c.*, I, 2, 523.

77. Neque enim necesse est, eas hypotheses esse veras, imo ne verisimiles quidem, sed sufficit hoc unum, si calculum observationibus congruentem exhibeant... nequaquam tamen in hoc excogitat, ut ita esse cuiquam persuadent, sed tantum, ut calculum recte instituant... Philosophus fortasse, veri similitudinem magis requiret, neuter tamen quicquam certi comprehendet, aut tradet, nisi divinitus illi revelatum fuerit... Neque quisquam, quod ad hypotheses attinet, quicquam certi ab Astronomia expectet, cum ipsa nihil tale praestare queat... [Andr. Osiander], Ad lectorem de hypothesis huius operis. (In: N. Copernicus, *De revolutionibus orbium caelestium, libri VI*, Norimbergae 1543, fol. I vs -IIr.

78. T. Giese in Löbau to G.J. Rheticus in Leipzig, 26. July 1543. Prowe, *o.c.*, I, 2, 537-539; II, 414-421. Burmeister, *o.c.*, III, 54.55.

79. Giese did not level against Osiander the accusation of having given the impression that Copernicus was the author of the statement to the reader, nor did he blame him for remaining anonymous. But he criticized him for having inserted it without Copernicus' assent, the more so as it did not at all represent Copernicus' opinions. It was, however, a boon, that Osiander had not revealed his name, for he was a notorious theological controversialist: "to place it on such a work,... would have almost guaranteed closer scrutiny of it by the church and increased the chances of adverse theological reaction. Moreover, it would have cast suspicion on Copernicus himself, who had quite enough trouble with his own bishop at that moment" (B. Wrightsman, "Andreas Osiander's Contribution to the Copernican Achievement". In: *The Copernican Achievement*, Univ. Calif. Press, Los Angeles, 1975, p. 233).

In his letter to Rheticus (see previous note, n. 78) Giese wondered why Copernicus in his dedicatory letter to the Pope (cf quotation in n. 44 above) had not mentioned Rheticus' support. His explanation was that Copernicus paid little attention to non-scientific matters and, in particular,

←
that he was already very ill, for he certainly had been aware of what he owed to Rheticus' help ("...incomodi, quo in praefatione operis praeceptor tuus tui mentionem omisit. Quod ego non tui neglectu, sed lentitudine et incuria quaedam (ut erat ad omnia quae philosophica non essent, minus attentus), praesertim iam languescenti evenisse interpretor, non ignarus, quanti facere solitus fuerit tuam in se adiuvando operam et facilitatem." Giese to Rheticus in Leipzig, 26 July 1543; Prowe, *o.c.*, II, 420.

But Copernicus did *not* forget to mention *Giese's* own share and, therefore, one wonders whether it was more than a kind excuse he offered for Copernicus' embarrassing omission. It could be that Copernicus found it unwise openly to praise a Wittenberg professor in a letter intended to obtain the Pope's favour. This is also Dr Wrightsman's opinion: "...Copernicus shrewdly declined to name his Lutheran disciple, Rheticus, in his letter of dedication to the Pope, as one of those whose assistance and encouragement persuaded him to have the work published. What other possible reason could there be for such a significant omission?" (Wrightsman, *l. c.*, p. 234).

II. THE ANONYMOUS TREATISE
ON [HOLY SCRIPTURE AND]
THE MOTION OF THE EARTH

Text¹, translation and notes

[A. FOREWORD TO TEXT AND TRANSLATION]

The text as delivered to us contained simple abbreviations; in the transcription these words have been written in full.

The many wrong interpunctuations, the misspellings and several errors have been corrected in the transcription, but the original version has been indicated at the bottom of each page. Only in the few cases where it seemed that the error could not be attributed to a copyist or printer, it has been left in the text, and the *correction* is given in the footnote.

The margin of the text often gave references to the source from which the author quoted, but these were usually incomplete and sometimes not wholly correct. Moreover, there are in the text many quotations from the Bible and from Augustine without indication of the place from which they have been borrowed. In these cases the reference has been completed or located, which may be seen in the notes indicated in the text.

Biblical quotations in the text are (with few exceptions) from the Vulgate; in the Notes the corresponding “authorized” version is sometimes added (in the case of the Psalms not only the text but the numbering, too, often differs).

The *Translation* is as literal as possible, even if this lessens the readability. Additional words by the translator have been put within square brackets.

After some preliminary pages we find the original text divided into three parts (without headings); the last one is by far the largest. I have introduced into the *translation* subdivisions and headings (these latter being put between square brackets).

In the *Notes* to the text (which are all the editor’s) the quotations from the Bible and St Augustine and other writers are given in full.

The *explanation* of the text, however, should be sought mainly in the *Commentary* and the Notes pertaining thereto.

The title page of the available text gives as title: *Epistola de Terrae Motu*. On the top of the pages, running from the left page to the right one, however, there is the heading *Dissertatio de Hypoth. Astron. Copernicanae*. As both titles do not cover the contents sufficiently, it is improbable that they stem from the author himself. The contents are covered rather by a title like *De Terrae Motu et Scriptura Sacra* (Holy Scripture and the Motion of the Earth), or perhaps,

with regard to Giese's letter (see note 8 to the Introductory Part.): *Opusculum quo a Sacrarum Scripturarum dissidentia Telluris Motus vindicatur*.

The treatise is annexed to Gorlaeus' booklet mentioned below (p. 167, n. 5), a photocopy of which was kindly supplied (ca 1970) by the University Library of Greifswald.

[B. THE LATIN TEXT]

1.

Mathematicè demonstratur, ad perpetuam rationem τῶν φαινομένων | corporum coelestium obtinendam, terrae mobilitatem assumendam. Quid autem hac de re secundum Sacram Scripturam statuendum est?

Divus Aurelius Augustinus¹ librum qui imperfectus extat in Genesin ad literam², gravi hac sententia orditur. De obscuris naturalium rerum, quae omnipotenti DEO artifice facta sentimus, non affirmando, sed quaerendo tractandum est, in libris maximè quos nobis commendavit autoritas, in quibus temeritas asserendae incertae dubiaeque opinionis difficile sacrilegii crimen evitat³; ea tamen quaerendi dubitatio Catholicae fidei metas non debet

a. ,

2.

excedere¹. Voluisse autem Divum Augustinum locos Sacrae Scripturae de rebus naturalibus, eo modo quemadmodum hic proponit, tractari, satis ex ejus scriptis, cum tales loci incidunt, apparet. Sed dixerit fortasse quispiam, Augustini sententiam nequaquam admittendam. In Sacris enim literis non quaerendo, sed affirmando procedendum esse², neque correctionem, quam postea D. Augustinus subjicit, piis animis satisfacere, cum ex sacris literis vera notitia omnium eorum quae in iis continentur, sit petenda, et non aliundè aut ex ratione, aut ex Philosophiâ et prophanis artibus accersenda³. Nam scriptum est, neque ad dextram neque ad sinistram à verbo Domini discedendum esse⁴, et ipsum verbum demonstrationis vim habet, quia nobis à DEO

Deut: c. 5 et
17. et 28.
Iosuae. 1.

3.

traditum est. Quare et si quaedam sensibus et intellectui nostro videbuntur repugnare, tamen non ideò dubitandum et Academicorum more ἐπέχειν, sed captivandum intellectum nostrum et simpliciter verbo standum esse atque

acquiescendum. Haec quaestio posset imperitioribus nebulas obfundere, ideò antequam ad alia^a procedamus: eam pro nostri ingenii et doctrinae tenuitate explanabimus.

I

Matth. 18. Cum post lapsum Adae notitia DEI in mentibus nostris indies extingueretur, ac ut inquit Christus, Non sit voluntas patris ut ullus pereat¹, dedit nobis DEUS verbum suum, ut de sua erga nos voluntate certi essemus, et perpetuò ob oculos haberemus, quid nos facere vellet, et quomodo per semen promissum iram suam su-

a. alia,

4.

per nos remissurus esset, nosque in gratiam recepturus. Hoc est illud quod Spiritus Sanctus per verbum revelare voluit, et hic est finis sacrae Scripturae. Proindè omnes, quibus quidem verbum Domini est lucerna pedum suorum¹, tenemur ut articulis fidei, quos propter dictum finem nobis Spiritus Sanctus proponit, firmiter assentiamur, neque eos ullâ ratione nobis patiamur eripi. Huc etiam pertinent, quae his cohaerent; aut ex eis bona consequentiâ deducuntur². Et neque ad dextram vel sinistram declinandum est ab his, quae constat Spiritum Sanctum ex instituto voluisse tradere, quâ in re idem tamen est servandus modus, quem teneri voluit. Porrò cum in Sacris literis rerum naturalium sit^a mentio, ap-

a. fit,

5.

Deut. 4^a paret Spiritum Sanctum non velle Philosophorum more de his loqui, sed alio, et ad jam dictum principalem Scripturae finem, respicere: ut, *Cum Moses orditur Genesin, judicavit necessarium, ut principio huic populo diligenter inculcaret, mundum, et totam hanc naturam à DEO, quem Patres ipsorum coluerunt, ex nihilo conditam esse.* Cum enim hic populus natura esset superstitiosus, et circum circa habitarent Idololatras, duxit ei hac ratione cavendum, ne derelicto fabricatore mundi, naturaeque conditore, se ad Solem, stellas, aut aliquam aliam creaturam converteret et loco DEI coleret: Sicut testatur Moses¹. Et in hunc usum articulus creationis saepius quoque alias in Scripturâ repetitur. Deindè cum DEUS per naturam inter gentes voluerit innotescere, ut

a. Deut. 14

6.

Paulus testatur¹, voluit maxime in suo populo, hac ceu certissimâ nota deprehendi, et quemadmodum in verbo vocat se Deum Abraham, Deum Isaac, et Deum Iacob², et postea Deum, qui forti manu eduxerit populum de Aegypto³, de domo servitutis, tandem qui nobis secundum scripturas exhibuerit filium suum D.I. Christum⁴, ita^a non semel, sed saepè in Scripturâ nobis inculcat se eum esse Deum, qui coelum et terram creaverit etc, et praeter se non esse alium Deum⁵. Tertio etiam ideò saepè in scripturis creatio naturae describitur, ad ponendum nobis ob oculos potentiam DEI, et paternum ejus erga nos affectum, et ut animis nostris timor ac fiducia, quas^b à nobis requirit, inprimerentur. Quam ob causam etiam Scriptura plerumque, ubi breviter

a. . Ita

b. quae

7.

perstrinxit articulum creationis, enumerat interim beneficia quae DEUS huic populo peculiariter praestitit. Rectè igitur faciunt physici, quod non assentiunt Aristoteli disputanti de aeternitate mundi. Tametsi satis firma argumenta ex ratione sumpta adducat, quibus contra Platonem, mundum nunquam incepisse, nec interitum unquam asserit¹. Et quanquam Aristotelis argumenta non possent rite ac philosophicè solvi, ac pariter aliis adductis rationibus Platonis sententia² defendi, quam à patribus acceptam, ut multa alia, ex Aegypto in Graeciam invexerat, tamen quia sunt contra manifestam Scripturam, hoc est, repugnant articulo creationis et his, quae ipse complectitur, ab his disputationibus tanquam impiis et blasphemis ab-

8.

stinendum. Alia autem est ratio, cum Scriptura, ubi de rerum natura agit, tanquam descriptio naturae, ceu physica quaedam, consideratur. Hoc itaque loco D. Augustinus prudenter vidit, scripturam consulto exactam rerum naturae descriptionem praeteriisse¹, cum, ut ipse alibi testatur, Spiritus DEI noluerit docere homines nulli ad salutem profutura². Quis enim physices notitiam ad salutem necessariam dixerit? Deindè etiam perpendit, quemadmodum Scriptura genus sermonis, consuetudinem loquendi, et rationem docendi à populo et vulgo sumit³, *ita ut etiam se plane ad populi captum accommodaret, et non sapientiae hujus saeculi conformaret*. Proindè cum propter has causas Scripturae loca de rebus naturalibus varias interpretationes

9.

reciperent, utpote quae à Spiritu Sancto non ea cura sint tradita, ac in quibus Salus nostra consistit, eos qui ex talibus locis sibi de rebus naturalibus iudicium praesumunt, cohibendos censuit, ne per eorum imprudentiam aliquid auctoritati sacrae scripturae apud eruditos, et Sapientes hujus saeculi derogaretur, minusque sacrae Scripturae crederent, per quam tamen DEO lucrificandi erant¹. Nulla autem meliori ratione talium animos frangere, et temeritatem retundere potuit, quam quod Scripturae locis de rebus naturalibus, quatenus naturae quaeritur notitia, eam auctoritatem adimit, quam reliqua scriptura habet: et aperte docet in hujusmodi tractatione, non affirmandi, sed quaerendi via incedendum esse². Deinde cum fieri soleat in hujus-

10.

cap. 19.

modi obscurioribus locis, ut qua quisque ratione aut natura, aut doctrina institutus est, ita aliter atque aliter scripturae locos, qui varias interpretationes suscipiunt, interpretetur³. Ideo severe statuit eum sacrilegii crimen incurrere qui incertam opinionem pro certa assumit, et scripturae temere accommodat: cujus rei satis copiosas causas circa finem libri primi in Genesin ostendit. Vult etiam D. Augustinus, ut nunquam adeo nobis nostram opinionem sinamus placere, quam de rebus naturalibus ex sacris literis nos elicuisse credimus, ut cum veritate aliter edocti simus, pedem referre pudeat, et de nostra opinione tanquam de sacrae scripturae sententia dimicemus¹. Itaque pulchre docet, nobis à veritate convictis dicendum esse: Hoc

a. interpretetur;

11.

non habebat divina scriptura, sed senserat humana ignorantia. Haec facile satisfaciunt piis, ubi diligenter consideraverint causas, quae eum moverint ad talem methodum in obscuris scripturae locis de rebus naturalibus instituendam. Et correctio seu clausula, quam adjicit, si quid praecedentia incommodi haberent, per se tollit. Quid enim amplius desiderabitur, si quispiam in talium quaestionum tractatione Catholicae fidei metas non transilierit?¹ Hoc est, ut seipsum interpretari videtur, ne suspendat assensum in his quae à Spiritu Sancto à nobis requiruntur, aut ne dubitet de locis Scripturae, per se manifestis^a vel collatione aliarum scripturarum, aut perspicuis rationibus declaratis?^b Deinde ut in locis dubiis diligenter scripturae auctoritatem

a. Question mark cancelled.

b. Question mark inserted.

12.

custodiat. Vera notitia omnium eorum quae in sacris literis continentur, ex iisdem petenda est, et non aliunde¹. Fatemur et nos idem, sed ita ut ea ratione scriptura accipiatur, quemadmodum Spiritus Sanctus eam intelligi voluit, sic^a locos de rebus naturalibus non tanquam philosophicum librum intueamur, sed in quibus Spiritus Sanctus aliquid docere nos voluit^b ad salutem nostram necessarium, ut ostensum est. Quis neget si DEUS naturae conditor verbo suo rerum naturam nobis depingere voluisset, nihil nos in toto mundo latere potuisse: cujus naturam, causas et *δυνάμεις* non exactè teneremus? Quis enim melius descripsisset oculum, quam qui ipsum condidit DEUS². *Cum autem Sole clarius sit, Deum nostrae industriae non pauca reliquisse,*

a. voluit. Sic

b. comma cancelled

13.

ut excitaret artes et disciplinas in vitâ necessarias, et quae ad cultum et ingenii honestam exercitationem pertinent^{a1}, sequeremur vero in his naturae filium, quo nos prima principia, ratio, et quotidiana experientia ducunt. Et quia DEUS vult in natura illustrari, non est dubium quin ei hoc nostrum studium gratum sit. Ideoque et magnorum virorum animos ad inquisitionem naturae à se conditae exuscitat, et eorum studia provehit et gubernat. Haec nobis satisfaciant, et ex sacra Scriptura, tantum petamus principaliter, quae ad nostram salutem necessaria sunt. Philosophica autem à suis autoribus mutuemur, et quae in sacris literis de rebus naturalibus habentur, reverenter commodis interpretationibus receptis observemus.

a. . Sequeremur

14.

II

Hactenus exposuimus, quid sit sentiendum de locis scripturae, ubi agitur de rebus naturalibus et tradidimus rationem ex Augustini sententia, quomodo tales quaestiones sint tractandae. Transeamus nunc ad ipsam causam seu controversiam et cum debita reverentia diligenter consideremus, ipsos sacrae scripturae locos, qui ad eam facere videbuntur.

Satis alibi ostendimus, hypotheses de terrae motu adeò consentire *τῶν φαινομένων*, ut cum eis tanquam bona definitio cum definito converti possint¹. Neque enim ratio alias hypotheses veritati propinquiores, ut continua temporis successio edocuit, quantum quidem homini de divinis istis rebus scire licet, constituere potest, ut Mathematicè à D.

15.

praeceptore in suo opere copiosè ostenditur¹. Cum itaque pro comperta veritate terrae mobilitas habeatur; non est timendum, ut ab aequioribus et eruditioribus iudicibus nobis nota impietatis ascribatur, tametsi inquiramus, num indè etiam interpretationes quaedam locorum obscuriorum in sacris literis de rerum naturâ sumi possint.

Ecclesiastes inquit: *Cuncta fecit bona in tempore suo et mundum tradidit disputationi eorum, ut non inveniatur homo opus quod operatus est Deus ab initio usque ad finem*². Praeclaram hanc sententiam in conspectu habemus. Quare nemo nos insimulet quasi nostrae imbecillitatis immemores terrae mobilitatem ἀληθῶς asseramus. Quid enim magis humanum quam labi et decipi. Et contenti su-

16.

mus, ut homines de divinis operibus quantum permittitur quaerere, quemadmodum alibi Divus Augustinus admonet¹. Haec praemittenda seu praefanda duximus, ut quilibet vir bonus sentiat nos non temerè, aut sophisticae amore provinciam hanc accommodandi terrae mobilitatem ad sacram scripturam suscepisse. Et si quid etiam nobis imprudentibus exciderit, quod adversus sanctam Ecclesiam, Sanctam et catholicam fidem, et divini verbi autoritatem fuerit, hoc abolitum et indictum esto. Ideoque omnibus piis, doctis et peritis, iudicium de nostrâ hac Scripturae explicatione relinquimus, quorum sententiis libenter acquiescemus.

Divus Augustinus ait nonnullos fratres dubitare, an coelum moveatur, cum scriptura vocet firmamentum. Dicebant

17.

In Genesin.
lib. 2.
cap. 10.

enim, quomodo firmamentum esse possit si moveatur¹. Et hanc sententiam non improbat, cum rationem invenerit, quomodo coelo immobili apparentia contingere^{a2}. David, ut Campensis reddit *Psal.* 33. ait^b: E coelo prospexit Dominus, contemplatus est quicumque usquam est hominum. E tabernaculo quod ab omni inquietudine liberum, ipse inhabitat, consideravit universos habitatores terrae³. Cum igitur Scriptura vocet coelum, sedem DEI et terram scabellum pedum suorum⁴, poterimus coelum intelligere immobile, et nulli inquietudini subiectum, tanquam nobilissimam naturae conditae partem. Huc etiam referri poterunt loci, qui commodius videntur intelligi posse de coeli immobilitate, ut est locus^c *Esa.* 40^d: Qui extendit

Es: c. 66.

- a. ,
- b. .
- c. .
- d. .

18.

Psal. 103.

Esdr. 1. 4.
c. ult.Cap. 38^b

velut nihilum coelos et expandit eos sicut tabernaculum ad inhabitandum¹. David *Psal.* 103. extendens coelum sicut pellem: qui tegis aquis superiora ejus². *Esdr.* libr. 4. *cap. ult.* Qui extendit coelum quasi cameram, super aquas fundavit eam³. Similius enim vero contentum moveri quam continens, et locatum loco⁴. Assumpto igitur hoc, quod coelum sit immobile, ut satisfiat apparentibus motibus siderum, multiplices motus terrae sunt attribuendi. Quare et diversa centra, quae videtur velle notare Dominus ad Iob⁵ dicens: Ubi eras, quandò ponebam fundamenta terrae? Indica^c mihi si habes intelligentiam? Quis posuit mensuras ejus, si nosti, vel quis tetendit super eam lineam? Super quo bases illius solidatae sunt? Aut quis demisit^d lapidem angularem

- a. ,
- b. Cap. 8
- c. Iudica
- d. dimisit

19.

Esa. 37.

Psal. 23.

Esa: c. 40.

Psal. 81.^b

ejus cum me laudarent simul astra matutina et jubilarent omnes Filii DEI¹. Per terram scripturam saepè usitato genere sermonis accipere totum globum ex terrâ et aquâ, cum adjacentibus elementis, non est dubium, ut est apud *Esaia* *cap.* 37. Tu es DEUS solus omnium regnorum terrae. Tu fecisti coelum et terram². David *Psal.* 23. Domini est terra et plenitudo ejus etc³. Et terrae in hac significatione acceptae ait se DEUS posuisse non unum fundamentum, sed fundamenta, ut etiam in *Esaia* *cap.* 40. Numquid^a non intellexistis fundamenta terrae? Qui sedet super gyrum terrae, et habitatores ejus sunt quasi locustae⁴. Item *Psal.* 81^b. Movebuntur omnia fundamenta terrae⁵. Porro haud obscure significat se in collocazione fundamentorum

- a. Nunquam
- b. 80

20.

terrae peculiari artificio usum esse, et quod haud ab humanâ ratione perfectè deprehendi possit. Idem Sapientia apud Salomonem de se glorians, quando appendebat fundamenta terrae¹, cum eo eram, cuncta componens, ceu digito ostendit varium et mirabile artificio in connexionione fundamentorum terrae adhibitum esse². Et non video, quomodo in ullâ naturae parte, tam manifestè, incomprehensibili humanâ ratione, DEI sapientia et infinita potentia conspiciatur, quemadmodum fit in assumptione motus terrae, ubi apparet, Deum voluisse unum quoddam omnium apparentium vinculum constituere³, id quod Plato necessarium quiddam esse perspexit, et admonuit inquirendum, tametsi quodnam illud esset, non animadverteret⁴.

21.

Cap. 9.

Terram autem moveri Iob alibi testari videtur cum dicit: Qui commovet terram de loco suo, et columnae ejus concutiuntur¹. Hoc ita accipi potest, qui circumducis^a terram sub coelo de uno loco in alium, motu annuo, circa centrum orbis magni, sicut globum lunae menstruo motu, et columnae ejus concutiuntur, ut sit figuratè dictum, quasi dicas, fundamenta ejus seu centra quae ad ejus motum spectant², dum terra multas periodos facit de suis etiam positionibus removentur, idque quasi concuterentur propter fundamentorum commixtum motum. De motu vero diurno terrae, locus Esaiæ intelligendus fortasse erit, cum dicit Dominus, Levate in coelum oculos vestros et videte sub terra deorsum, quia coeli quasi fumus liquescent³. Cum

C. 51.

a. circumduis

22.

ponimus terram circa suos polos moveri motu diurno, facta dimidiâ revolutione, videmus partem coeli, quae nobis antea erat sub terrâ deorsum. Est satis clarus locus. Iubet enim coelum undiquaque intueri, et admonet se ista tam praeclara opera immutaturum esse. Nicolaus de Lyra¹ supra primum caput Genesis hoc, Et Spiritus DEI ferebatur super aquas², secundum Hebraicam veritatem interpretatur, Et Spiritus Dei, hoc est Spiritus Sanctus fovebat^a aquas³. Quoniam ipse sit vivificator omnium à principio, sicut est in Psalmo: Emitte Spiritum tuum et creabuntur, et renovabis faciem terrae⁴. Deindè cum vivificatio rectissimè primo ac diurno motui attribuat, colligit in primordio creationis rerum naturalium de hoc primo motu, tanquam de vitâ

Ps. 103.

a. forebat

23.

rerum naturalium fieri mentionem, attribuendo ipsum motum DEO in personâ Spiritus Sancti, cujus proprium est, ut mox dictum, vivificare¹. Cum autem haec Nicolai de Lyra sententia², qui praeclaram operam in Bibliis interpretandis praestitit, ut non repugnans scripturae assumetur, concinnius terrae mobilitati accommodabitur, atque Sphaerae stellarum, cui ipse diurnum motum inesse credidit. Nam si Spiritus Sanctus praeter officia quae ei in Evangelio tribuuntur, ut esse paraclitum³, vivificare piorum corda. etc.⁴ fovet, agitat, vivificat, naturam creat, et renovat faciem terrae, ut testatur Scriptura⁵, maximè Spiritui Sancto gubernatio in terra viventium tribuitur. Unde constituto quod terra moveatur in unicâ divina

24.

conservatione motuum ejus, totum quoque inferiorem mundum, ut Philosophorum more loquar administraverit, vicissitudines temporum conservat, et efficit ut omnium virtutum, quas DEUS Soli, Lunae, et omnibus stellis dedit, nos participes fiamus. Per motum annum ordine omnibus coeli sideribus subjicimur, per diurnum Sol omnisque coeli ornatus nobis oritur et occidit. Aristoteles dixit per motum in obliquo circulo consistere vitam animantium¹. Sic motu declinationis habemus ver, aestatem, autumnum et hyemem, et omnia creantur, et suo tempore renovatur facies terrae. Videtur motus declinationis et alibi in Psalmis testimonium habere^a. Inquit enim David post longam enumerationem operum DEI: Tu fecisti omnes

Ps. 73.

a. ,

25.

terminos terrae, aestatem et ver, tu plasmasti ea¹. Si enim per aestatem et ver appositione intelligas terrae terminos explicari, motus declinationis² prodibit. Nam hic motus est causa efficiens vicissitudinis temporum cujus per eundem ceu termini quidam in terrâ designantur. Huc fortasse non inepte referetur, quod est apud Esaiam. Nunquid nescis aut non audivisti? DEUS sempiternus Dominus, qui creavit terminos terrae, et non deficiet, neque laborabit, neque est investigatio sapientiae ejus³. Praedicat Propheta hoc opus inter praecipua DEI opera, et utitur ad hoc verbo creationis, quo videtur aliquod peculiare opus Dei significare voluisse, quale videlicet esset haec divina ordinatio, quod dum terra annuo motu à suâ intelligentiâ circumducitur, et terrae poli

26.

easdem coeli partes divinâ virtute observarent, terra ita sese ad Solem reflecteret, ut omnes vicissitudines temporum, sicut deprehenduntur, susciperet. Addit Propheta: et non deficiet, neque laborabit¹, q. d. non est ei labor pulcherrimam hanc suam ordinationem conservare. Et subjicit: Verum imbecillitas humani intellectus haec nunquam poterit perfectè deprehendere. Quasi Spiritus DEI, qui per os Prophetæ loquebatur longius progressus in re ad salutem non necessaria, quam humanus perciperet, orationem in viam revocaret.

Dominus apud Ieremiam ait: Si pactum meum inter diem et noctem, et Leges coeli et terrae non posui, Equidem et semen Iacob et David servi mei projiciam etc². Hic fatetur

27.

naturae conditor suam ordinationem esse Leges coeli et terrae. Cum itaque ra-

tio persuadeat terram habere suos motus, quemadmodum Luna suos motus habet, poterit intelligi Deum attribuisse terrae Leges eadem ratione, qua reliquis corporibus coelestibus, quae moveri constat, quod est ut certo et praefinito tempore praescriptas vicissitudines motuum conficiat, et conservationi animantium deserviat, nosque omnium beneficiorum naturae participes faciat. Legitur in libris Regum: Domini sunt cardines terrae, et posuit super eos orbem¹: Quod fortasse quis interpretetur, terram esse appensam suis polis, circa quos tanquam cardines vertatur. Hi sunt fere loci Scripturae, quibus si terra movetur, aliquid hac de re, sed obscurè in bibliis possemus dicere,

28.

contineri. D. Augustinus monet, non esse omnia scrupulose rimanda, ideo elegimus ea, quae sine figurâ quam simplicissimè nobis videbantur posita¹. Nihil tamen affirmo, quod cuilibet visum fuerit, sequatur. Sacra Scriptura testatur supra firmamentum esse aquas²: Haec quia sunt extra sensum posita, non possumus sensibus decipi, ut aliud statuamus, sed simpliciter Scripturae acquiescimus³. Quia autem sensus nostri judicant Solem et Coelum moveri, et terram immobilem manere, ideò alias Scripturae interpretationes quaerimus: Sicut Nicolaus de Lyra tanquam Physicus interpretatur locum in Iob. Qui commovet terram⁴, non secundum se totam, cum sit centrum mundi, sed secundum aliquas ejus partes. Deinde imaginatur columnas

29.

terrae quasi radios in rotâ qui exteriora sustentant. Apparet autem concludendum ut quoque antea excussum est, nos ex sacris literis habere posse exactam notitiam omnium eorum, quae sunt necessaria ad salutem. Deinde de rerum natura et aliis rebus, à Philosophis tractatis, quantum DEUS concesserit humanae rationi¹. Et cum DEUS nos magis velit circa divina versari, quam corruptibilem naturam, (Socratis sequendum erit iudicium) nos homines de divinis istis rebus aut parum aut nihil scire², Mundum in pulcherrimo ordine conservari videmus, unde colligit ratio, unam esse primam causam ista omnia conservantem, nempè Deum. Quid autem sit DEUS, quomodo haec administret, quae sit ejus erga nos voluntas etc: nihil perspicimus, nisi quatenus ipse per suum verbum

30.

nos scire voluit. Sentimus Spiritus esse ex effectibus, sed quid sint, ignoramus. Quales sint, ostendit Scriptura. Videmus Solem, stellas, supra denique omnia certa ratione oriri, occidere, pristinosque cursus repetere³. Sentimus commoda infinita, quae DEUS per ea, tanquam sua instrumenta nobis suppeditat. Quid sit Sol etc. Alius facem accensam, quae nocte extingueretur, alius lapidem igni-

tum, aliqui credunt esse aquam lucentem; Aristoteles¹ ne omninò nihil diceret, appellat coelum et stellas quintam Essentiam. Dicere vero, non minus certum esse Solem non oriri quam oriri, omniaque pariter incerta esse, est hominum insanientium. An autem nobis oriatur Sol terrae cessione, an ipsi insit motus, illud quidem concludit

a. ,

31.

ratio, et Mathematica; hoc vero sensus. Pro hoc agenda sunt gratiae DEO, quod largitur nobis notitiam et usum effectuum naturae, à se propter hominem ut quam maxime conditae¹. Sic satis est, nos habere calculum *τῶς φαινόμενοις* exacte respondentem. Verum enimvero quam sit exigua causarum rerum naturalium notitia, etiam Physici in lenissimis quandoque rebus fateri coguntur, ut cum dicunt, haec herba non habet hanc vim propter calidi et humidi tale temperamentum², sed propter specificam naturam à DEO ei inditam etc. Ubi autem hanc corruptibilem naturam exuerimus et Christi regnum inchoabit, videbimus facie ad faciem³, sicut Scriptura testatur, et totam rerum naturam, coram et divinis oculis, non humanis intuebimur.

a. temperantum

32.

Proinde his quae scire possumus acquiescamus, laudantes DEUM interim, et ei gratias agentes pro omnibus suis beneficiis, cujus nomen sit benedictum. Amen.

III

Sperarem piis, liberali eruditione tinctis, posse ea, quae hactenus de hac quaestione diximus, satisfacere, eosque facile commodas interpretationes eorum locorum, qui his adversantur, inventuros. Et quanquam eis hanc lampada trado, simul petens, ut hanc causam utilem Reipub. literariae, adversus imperitorum judicia defendant, tamen propter importuniores, praecipuorum quorundam locorum quibus nobis obstrepere possint, interpretationem adjiciendam existimavimus. Qua in parte, sicut et in aliis omnibus, nos Ecclesiae iudicio subjicimus¹.

33.

Principio si quis valde contendat coelum firmamentum appellari, non propter immobilitatem, sed propter firmitatem et terminum, qui super Coelestem mundum discernat, à coelesti etc.¹, hunc^a ego nihil moror, cum Divus Augustinus nobis aliam quoque sententiam admittat², neque propterea limites

Euclides in
datis defini-
tione 6.

catholicae fidei excesserim³, tametsi coelum stellatum ponam immobile. An autem fundamenta terrae recte interpretemur centra, videndum est.^b In datis apud Geometras, circulus positione datur, cum ejus centrum datur⁴. Sic dato centro Sphaerae, ejus quoque positio habetur, ut cum dico: Centrum Lunae esse sub isto vel alio gradu Eclipticae, intelligitur totius globi Lunaris certa positio dari. Proinde aliquis recte centrum fundamentum Sphaerae dixerit,

a. . Hunc

b. ,

34.

Ps. 23.

utpote cui omnes partes Sphaerae innituntur, et eo posito tota simul Sphaera datur. Quare terrae mobilitate assumpta, ejus fundamenta seu bases erunt, centrum proprium, centrum orbis magni¹, centrum parvi circuli², et centrum Solis, ut numerus fundamentorum terrae³ sit quaternarius, quem Pythagorici perfectum vocant⁴, multisque aliis laudibus praedicant quemadmodum et sacrae quoque literae. Haec ut nobis sane concedantur, suborietur alia quaestio, et in speciem aliquanto difficilior. David inquit: Quia ipse super maria fundavit eum et super flumina praeparavit eum⁵. Item: Qui firmavit terram super aquas⁶, In 4. Esdr. 16. legitur:^a Qui conclusit mare in medio aquarum, et suspendit terras super aquas verbo suo⁷. Hic si quis τὸ ῥητὸν

a. .

35.

Genes. 1.

urgeat, dicet, Sacram Scripturam clare docere, aquas fundamenta esse terrae, et non aliunde accersendas interpretationes. Nam principio cum crearet DEUS coelum et terram, aquis eam totam immersam fuisse¹, deinde verbo divino aquis in unum locum collectis, unde facta maria etc. apparuisse arida². Non tamen innatare aquae, sicut de Delo vel Ortygiâ³ Insula dixerunt veteres, cum sit à DEO super aquas firmata. Haec splendide et copiose possent tractari, sicut Lactantius vir alias eruditissimus et eloquentissimus irridet eos qui profitentur, terram esse rotundam⁴. Nicolaus de Lyra se his breviter explicat, videt ut Philosophus in natura ordinata terram esse gravissimum Elementum⁵, neque causam esse, cur DEUS miraculose terram super

36.

aquas stabiliret hoc est, alveum super flumen, et grave super leve, cum eadem ordinatione, qua grave appetit centrum, terra fundetur super centrum, et inde ex diversis partibus assurgendo, super aquas emineat, interspersis undiquaque aquis ad animantium utilitatem¹. NB. *Quare omissis subtilioribus disputationibus,*

ait *Scripturam loqui secundum receptam vulgi consuetudinem*². Fundavit terram super aquas³ i.e. juxta aquas, ut terra Genuensis est super mare mediterraneum i.e. juxta etc. Porro de loco in Genesi, et ubi in Scriptura repetitur, sentit terram quidem aquis circumdatam fuisse, sed tantum naturaliter⁴, postea tertio die condensatam, qualem nunc in natura ordinata habemus certis limitibus inclusam, quos non egrediatur propter divinam talem

37.

In Genesim
1.2. c. 1.

ordinationem¹. Divus Augustinus se in hoc loco aliquantulum plus torquet: Primo interpretatur Davidis verba allegorice: *Qui fundavit terram super aquas*², hoc est, qui parvulos et simplices in fide confirmaverit per Baptismum³. Deinde ad literam intelligit in cavernis terrae aquas recipientibus, terram super eas firmatam esse quae non decidant⁴.

Quod autem tales sint cavernae, docent terrae motus, quos naturaliter diluvia seu inundationes sequuntur. Tali enim concussione, apertis meatibus aquae erumpunt⁵. Hujus Scripturae est fortasse, et haec sententia. Quemadmodum vulgus Cosmographorum⁶, in globis, aut mappis, totum terrarum orbem referentibus, maria pingunt, ubi nullam terram exploratam habent, sicut

38.

Ps. 103.

Ptolomaeus¹ credit ibi aquas esse ubi Portugalensium navigationibus deprehensum est, esse fertilissimas regiones², ita^a Psalmista ad vulgi opinionem et captum se accommodans, terras super aquas esse fundatas cecinit. Et abyssus sicut vestimentum amictus ejus etc.³ ut nempe totum Elementum terrae esset in una parte, tanquam pomum aquae innatans⁴, et ex altera aquae quae tanquam in utre congregatae essent⁵, terminumque eis DEUS posuisset, quae non transgredirentur, neque converterentur operire terram⁶, ut eodem loco^b haberetur. Ex eo, quod dicit, *converterentur*, apparet Davidem respicere ad Scripturam, quae testatur, terram totam immersam fuisse aquis⁷, deinde sequens sui temporis experientiam^c de terra cognita, putare reliquas aquas non irrumpentes undique in terras

a. . Ita

b. (see notes 5 and 6)

c. ,

39.

propter animantium conservationem¹, in unum locum collectas², super quas terra sit firmata ne demergeretur.³ Et sic Oceanus et Maria essent fundamenta terrae. Multi possent colligi scripturae loci, quibus ostenderetur, Scripturam se saepe accommodare ad vulgi captum, neque *το ἀκριβὲς* Philosophorum more

quaerere. Sic propter ruditatem populi, ut Nicolaus de Lyra author est, in principio Genesis nulla facta est mentio de aëre, multo minus de elemento ignis³; quia non incurreret rudioribus in oculos⁴. Manifestum est propter eandem causam, excepto Sole et Lunâ nihil de reliquis Planetis ibidem dici, utcunque Picus⁵ in suo Heptaplo eos conetur inde eruere⁶, ut et alia taceam, quae ibidem praetermittuntur; Quare quidam, ut Divus

a. ,

40.

Iob 26.

Augustinus, mundum in instanti conditum putant, et propter tradendi ordinem creationem in certa membra esse distincta¹. Ita certè vacuum in Iob non est intelligendum Aristotelico more², cum dicitur: Qui extendit Aquilonem super vacuum, et appendit terram super nihilum³; Sic in Novo Testamento: Nisi semen, quod in terram projicitur, mortuum fuerit etc.⁴, est^a oratio accommodata captui populi^b. Physici certe negabunt, semen mortuum, herbam protrudere, et fructum ferre. Non igitur laedetur Scripturae Sacrae autoritas, etsi^c concedamus Davidem⁵ in his ad vulgatam opinionem respexisse. Si Spiritus Sanctus iudicasset necessarium ad salutem tradere, terram tantum alveum esse aquae, quis melius eo nobis in

a. Est

b. ,

c. Etsi

41.

mappas retulisset, terram illis temporibus cognitam, nostro tempore investigatam, et post aliquot secula inveniendam, ut sic apertè nos^a convicisset, ubique infra aquas esse terras. Verum cum sese ad summa et longe^b alia respiciant verba scripturae, non erunt in Philosophorum censuram adducenda. Atqui respiciendum est ad ea, quae Scriptura à nobis vult observari, sicut in tractatione Thesis hujus disputationis dictum est.

D. Augustinus quanquam Scriptura videatur clare docere in opere quartae diei¹, quid sit intelligendum per firmamentum, tamen laudandum ducit eum, qui propter Sacrae Scripturae autoritatem de aquis supra firmamentum^c persuasibilem et sensibus subjectam Interpretationem invenerit, ut nubes, quae in aëre

a. eos

b. longa

c. fundamentum

42.

continherentur, dicerentur aquae, quemadmodum sunt in potentia, *et spatium inter nos et eas firmamentum, cum aër in scripturis saepe vocatur coelum*¹. Sic poterunt fortasse etiam aliter intelligi, quae sunt in Psalmis: Physici in Meteorologicis², ubi disputant de aquis promanantibus ex montibus aut cavernis terrae, ajunt propter circumstans frigus aërem cavernas subintranter in aquam resolvi, et quia ea gravitate sua decedente aër subinde ab extra succedit, fit ut fluvii sint perennes. *Aër itaque nihil aliud est, quam aqua in potentia*³. Quae aut à circumstante frigore, ut dictum, aut potentia divina in aquam dissolvitur, ut est factum in diluvio. Quare et Apostolus Iudas^a ait, in diluvio coelos quoque periisse⁴, loquens secundum communem

a. This should be "Petrus".

43.

loquendi formam, sicut est in Scriptura, volatilia coeli¹, Item: Faciem Coeli nostis dijudicare etc.² Quod si igitur admittatur, aërem hoc loco posse accipi pro aqua, *interpretabitur quis, suspendisti terram*³; *hoc est totum orbem terrae super aquas aërem*, qui DEO jubente in aquam comprimeretur, et totam terram operiret. Locus etiam Esdrae: Qui conclusit mare in medio aquarum⁴, videtur ponere aërem pro aqua. Constat enim mare primo ab aëre circumdari. Ita etiam Abacuc in illo, quia replebitur terra, ut cognoscant gloriam Domini quasi aquae operientes mare⁵: Intelligi potest aër circumdans, aut certe nubes, caligo, aut vapores sic ut Dominus testatur in Iob⁶. Item. *D. August. lib. 1. cap. 15. de Genesi contra Manichaeos probat, per aquam*

44.

*etiam aërem intelligendum*¹. *Quaecunque autem interpretatio recipietur, satis apparebit, per fundamenta terrae non intelligendas esse aquas, contra itaque ut ex praemissis sequitur. Recte igitur legitur in Iob terram esse suspensam super nihilum*². Quid enim aliud est centrum quam^a punctum, et quid punctum, quam quaedam relatio, ad quod confertur³.

Porro non deerunt, qui monstrosum esse vociferabuntur, terrae motus attribuere, et hic suam sapientiam ex Physicis proferent et ostentabunt⁴. Ridiculi, quasi potentia DEI ex nostris viribus ac nostro intellectu sit metienda. An putabimus DEO^b, qui ex nihilo totam rerum naturam verbo condidit, quicquam esse impossibile?⁵ An alligabimus Deum Peripateticis disputationibus, de gravi et levi, ut qui nullo loco

a. centrum. Quâ

b. DEI

45.

alligatus totum mundum complet, ubique praesens et potens est, quiue firmat Antipodem super terram. Atque ordinavit, ut coelum sit undique sursum, non possit terrae tribuere motus naturales ejus figurae convenientes² Nequaquam ut opinor. Quare neque nobis est necessarium Aristoteli assentiri cum docet, motus à medio³, ad medium, et circa medium esse à se invicem distinctos²? Recte enim statuere possumus, praesertim mathematicâ ratione cogente, totam terram moveri circulariter, ideoque omnibus ejus partibus hunc motum inesse. Deinde motus à medio et ad medium ex accidenti apparere in elementis³, ut cum aër aquae vel terrae inclusus tendit sursum et erumpit ad locum sibi à natura traditum,

a. à medio ad medium

46.

et terra in aërem ejaculata cadendi deorsum non finem faciat, donec in terra subsistat, aut centrum terrae occupet, ut suum locum sibi à naturâ concessum. Quare dixerimus ferri quodque in suum locum nihil aliud esse quam in suam formam ferri, et contra Aristotelem recte sensisse veteres simile in simile ferri. Quia haec est causa et divina ordinatio, quare Sol, Luna, stellae et terra Sphaerica sint, *et non est demonstratum gravia medium universi appetere, sed tantum medium sui globi*¹.

Verum enim vero si ad sacram Scripturam revocemur et aliquis primo quae de mobilitate terrae adduximus, aliter quomodocunque interpretetur; deinde vero alios Scripturae locos proferat, quibus terrae immobilitatem asserat, ac

47.

Soli à DEO attributos motus ostendat. Cum hoc ego quantum ad primum non diu velitabo, quanquam loci à nobis adducti satis aperti videntur, et ea quae ibi objici poterant, facile esset diluere. Neque enim ea proposuimus affirmandi animo, sed quaerendi studio, in hoc D. Augustini vestigia¹ pro nostra medio-critate sectantes, et habemus quoque in conspectu Spiritum Sanctum noluisse Physicam, sed vitae regulam conscribere, et quomodo Filii DEI reddamur docere.

Caeterum loci Scripturae, qui adversus terrae mobilitatem nobis, ut praecipui occurrerunt sunt ferè hi. Esaias cap. 42. Haec dicit Dominus DEUS creans caelos et extendens eos, firmans terram, et quae germinant ex eâ, dans flatum populo qui est super eam, et Spiritum

48.

stabiliens
fundans

calcantibus eam¹. Item. 44. Cap. Ego sum Dominus faciens omnia, extendens coelos, solus stabiliens terram et nullus mecum². Postea 48. cap. Manus quoque mea fundavit terram et dextra mea mensa est coelos³. David Ps. 92. Etenim firmavit orbem terrae, qui non commovebitur⁴.

Item. 101. Initio tu Domine terram fundasti, et opera manuum tuarum sunt coeli⁵.

Item. 103. Qui fundasti terram super stabilitatem suam, non inclinabitur in saeculum seculi⁶.

Item. 118. In generationem^a et generationem veritas tua, fundasti terram, et permanet⁷.

Zacharias cap. 12. dixit Dominus extendens coelos, et fundans terram, et fingens Spiritum hominis in eo⁸.

Veteres propter haec credebant

a. generatione

49.

terram immobilem factam, et sequentes Aristotelem¹, affirmabant in centrum universi, ubi sit locus quietis ejus collocatam. Nos autem dicemus non intelligendum, quod eam immobilem condiderit. Et hujus nostrae sententiae habemus pro nobis primo Mathematicam², deinde alios Scripturae locos. Quid magis in coelo vagum seu mobile, quam Luna, tamen si fundare esset immobilem reddere, et David eam cum reliquis stellis dixisset immobilem, cum inquit: Quoniam videbo coelos tuos, opera digitorum, lunam et stellas, quae tu fundasti³. Simili modo DEUS, neque firmando neque stabiliendo terram immobilem effecit, idem enim Scriptura coelo tribuit, ut David; Verbo Domini coeli firmati sunt, et Spiritu oris ejus

Psal. 8.

Ps 32.

50.

Proverb.
c. 3.

omnis virtus eorum¹. Salomon: Dominus sapientiâ fundavit terram, stabilivit coelos prudentiâ².

Omnem itaque hujus disputationis nodum nobis dissolvit locus, qui est adductus ex *Psalmo*, 103. Quemadmodum David terram fundatam dixit, quod est firmatam et stabilitam super stabilitatem suam, quam perpetuo sit observatura³, sic^a etiam recte intelligemus Lunam et quodlibet corpus coeleste mobile fundatum ac firmatum super suam stabilitatem, à qua nunquam inclinabitur. Clarum namque est, quodlibet horum corporum divina ordinatione in suo esse (ut dici solet) conservari.

Quanquam enim in terrâ fiunt corruptiones, generationes, et omnis generis alterationes, tamen ipsa in sua integritate,

a. . Sic

51.

ut est condita, permanet¹; ignis, aër, aqua, terra, quodlibet suum locum obtinet, et suo muneri, ad quod conditum est, satisfacit. Ut enim quicquid nomine terrae Scriptura intelligit, est fundatum super suam stabilitatem, ita quoque partes ejus testante Psalmista, cum ait: Tu confirmasti in virtute tuâ mare etc.² An autem in Luna et reliquis corporibus fiant alterationes nec ne, non video, quomodo constituamus. Si namque^a aliquis in Lunâ habitaret, non puto eum aliquid judicaturum de alterationibus terrae. Et Nicolaus de Cusa in doctâ ignorantia³ pluribus disputat, terram quoque luminosam esse, adeoque unam ex stellis⁴. Porro quia motus etiam ad esse terrae⁵ et reliquorum mobilium pertinet, *dicendum quodlibet super suam*

lib. 2.
c. 12.

a. Namque

52.

stabilitatem fundatum hoc est, ita conditum, ut suos statos cursus, ut Pliniano utar verbo, servet, et ad praescriptos numeros veniat. Et nisi ad talem stabilitatem motus certam et perpetuam Legem essent haec confirmata, nullam quoque haberemus certam rationem temporis, quod tamen voluit DEUS nos tenere, ut legitur in primo Genesis¹. Ex his patet non probari ex sacris literis, terram esse immobilem; Non igitur contra S. Scripturam facit, qui ad constituendam certam temporum et motuum rationem, ejus mobilitatem assumit; sed veniamus ad testimonia Scripturae de Solis mobilitate.

Solem motu suo sibi à DEO attributo autorem esse diei et noctis, et omnis vicissitudinis temporis, nec non ipsum ferri in obliquo circulo, secundum

53.

Ptolomei et veterum hypotheses his testimoniis videtur comprobari. *Gen. 1.* Fecitque DEUS duo luminaria magna, luminare majus, ut praeesset diei, et luminare minus, ut praeesset nocti; et stellas, et posuit eas DEUS in firmamento coeli, ut lucerent super terram et praeesent diei ac nocti, et dividerent lucem ac tenebras¹. *Gen. 19.* Sol egressus est super terram, et Lot ingressus est Segor².

Iosuae c. 10. v. 12. et seqq. Tunc locutus est Iosua Domino in die quâ tradidit Amoroheum in conspectu filiorum Israhel, dixitque coram eis: Sol contra Gabaon ne movearis, et Luna^a contra vallem Aialon. Steteruntque Sol et Luna donec ulcisceretur se gens de inimicis suis³, et addit postea: Stetit itaque Sol in medio coeli, et non festinavit occumbere spatio

a. moveare, et Lunae

54.

unius diei: Non fuit antea et postea tam longa dies, obediente Domino voci hominis et pugnante pro Israhel¹.

*Regum 4. cap. 20*². Et *Esaias c. 38.* ad Hezechiam aegrotantem: Ecce ego reverti faciam umbram linearum, per quas descenderat in Horologio Achaz in Sole retrorsum decem lineis. Et reversus est Sol decem lineis per gradus quos descenderat:³

Ecclesiasticus eundem locum repetit *c. 48.* loquens de Hezechia. In diebus ipsius retro rediit Sol, et addidit Regi vitam⁴.

David *Psal. 103.* Fecit Lunam in tempora. Sol cognovit occasum suum⁵. Locus qui et ex Genesi adscriptus est, repetitur *Psal. 135*⁶. et à *Ieremia cap. 31*^{a,7}

Baruch. cap. 6. Sol quidem et

a. cap. 37.

55.

Luna ac Sydera cum sint splendida et emissa ad utilitates, obaudiunt¹.

Ecclesiastes cap. 1. Oritur Sol et Occidit et ad locum suum revertitur, ibique renascens gyrat per meridiem, et flectitur ad aquilonem, Lustrans universa in circuitu pergit Spiritus et in circulos suos revertitur².

Item David. *Psal. 18.* In Sole posuit tabernaculum suum, et ipse tanquam sponsus procedens de thalamo suo^a: Exultavit ut gigas ad currendam viam à summo coelo egressio ejus. Et occursum ejus usque ad summum ejus^b: nec est, qui se abscondat à calore ejus³. Ad haec testimonia Scripturae de Solis motu, non est difficilis responsio. Nos fatemur Solem autorem esse lucis in natura, atque DEI in natura

a. suo Exultavit

b. ejus nec

56.

administratorem, quemadmodum inquit Psalmista: In Sole posuit tabernaculum suum, unde totam naturam conditam illuminet, et emittit lumen, et vadit; et vocavit illud, et obedit ei in tremore¹: Ut est in *Baruch. cap. 3.*

Praeterea non negamus manifestam experientiam, quod Solis beneficio habeamus diem, ver, aestatem, et reliqua anni tempora etc. Quod autem dicimus, haec nos à Sole accipere, sicut Luna suum lumen pro diversa ejus ad Solem habitudine, facimus ut eruditus innotescat Uraniae imperio² cui ut cedat veritatis amator, necesse est.

Porro neque nos manifesta scripturae verba negamus, quod Soli non tribuit motum diurnum et annum, ac si placet etiam praecessionis^a cum ab eo,

a. processionis

57.

tanquam termino numerentur tempora, dies et anni. Verum quales isti motus sint, considerandum est. Omne quod videtur moveri, aut est propter motum ipsius rei, aut propter motum visus, aut propter motum et rei et centri visus. Communis autem sermo ut plurimum sequitur sensuum iudicium. Ideo hae differentiae motus in eo non distinguuntur ab invicem; haec etiamsi aliud statuatur ratio, et in veritate rem aliter se habere sciamus, quemadmodum saepius in quotidiano sermone et authoribus est observare, ut cum sequentes sensuum iudicia dum à portu solvimus terram et urbes à nobis decedere¹, et navigantes montes et terras ex mari attolli², Solemque et stellas in mare demergi dicimus, neque sermone veritatem

58.

ab apparentia discernimus.

Cum autem ut veritatem inquirentes de rebus cogitabimus, animo distinguemus apparentia à veritate, et ut dici solet, sentiemus ut pauci, loquemur autem ut multi. Ita cum recta ratio concludat, Solem esse immobilem, oculi vero eum moveri iudicent, non discedemus à recepta consuetudine loquendi. Solem oriri, occidere, suo motu diem et annum conficere, etiamsi teneamus haec de apparenti motu esse vera, cum ratio ponat eum immobilem¹, idque non aliter atque progredientibus nobis ad septentrionem, dicimus polum elevari, quia ita apparet nobis, cum tamen ratio sciat, eum fixum suum locum tenere, et tantum propter nostrum progressum sic ad

a. mobilem

59.

visum elevari. Sed sacram Scripturam uti usitatis et receptis loquendi formulis et figuris sermonis, notius est, quam ut longiori probatione indigeat. Proinde clarum est quanquam constituamus in descriptionibus motus Solis ex Scriptura adductis, de apparenti ejus motu ea intelligenda, tamen nos nihil limites à D. Augustino praescriptos excedere¹, aut quicquam inducere, ex quo aliquid sequatur incommodi. Testimonia itaque de Solis motu quae adversus nos pugnare videbantur diligentius inspectae recentis instaurationis Astronomiae non adversabuntur².

Non posse autem in his locis τὸ ῥητὸν teneri, et vocabula ac literam in propria significatione accipi, haud obscurum est. Iosua mandat Soli ne moveatur

60.

contra Gabaon et Lunae contra vallem Aialon¹. Si Iosua fuisset in civitate aut

alio latere sui exercitus, certum est luminaria eum in aliis locis per respectum ad terrae loca visurum fuisse. Quare apparet eum non ut Mathematicum² loqui neque scripturam à sermone consueto discedere. Ita etiam Nicolaus Perottus³ vir doctissimus in sua Cornucopia loquens de Cometa, qui visus fuit anno Domini 1471. non animadvertens ad haec, scribit eum conspectum supra aedes Bessarionis⁴, et signum mortis ejus fuisse⁵. Ex suâ domo ita fortasse videbatur, sed ex Bessarionis certè in alio loco conspexisset eum. In explicatione miraculi de prolongatione diei temporibus Iosuae et Hezechiae à DEO factae, interpretes volunt, in ordinatione

61.

seu decursu temporum nihil mutatum esse, et id alius aliter conatur ostendere, positâ autem mobilitate terrae hoc est demonstratu facillimum. Nam quemadmodum in transitu Israël, per Iordanem, superius^a descendentes aquae tam diu in molem crescebant, donec suum cursum concedente DEO repeterent, aquae^b autem inferiores defluebant, neque ab indita suae naturae proprietate impediabantur¹, sic^c etsi quiescente terra motu diurno, illis quibus Sol fuit supra Horizontem continuus dies erat donec DEUS eum in naturalem cursum redire permittebat, tamen Lunam suos motus per terram seu solem in apparentiâ reliquos retinuisse dicimus, et propterea neque in anno, neque in mense, aut celebratione Paschae quicquam mutatum.

- a. Iordanem superius
- b. repeterent. Aquae
- c. . Sic

62.

Habacuc cap. 3. ubi in Spiritu praevidet vastationem Babylonis per Medos et Persas alludit ad historiam Iosuae, ait: Sol et Luna steterunt in habitaculo suo etc.¹ Hic interpretantur, sicut auxilio fuit divina potentia Iosuae, ita etiam suppetias tulit Medis et Persis ad occupandam Babylona. Simili modo Psalmista poterit videri ad eandem historiam alluisse, cum in *Psalm. 75.* praedicit in Spiritu cladem infligendam ab Angelo Assyriis, inquiens: De coelo auditum fecisti iudicium DEUS terra tremuit et quievit, cum exurgeret in iudicium DEUS, ut salvos faceret omnes mansuetos terrae². Cum in historiâ nulla fiat mentio terrae motus, si accipiatur ad literam, poterit intelligi, sicut temporibus Iosuae terra obediens in tremore voluntati divinae,

63.

quievit à motu diurno, cum Dominus pugnaret pro Israël¹, ita^a Assyrii cum auferes Spiritum eorum deficient², et in pulverem convertentur, et pro hac tua

liberatione à suis hostibus, reliquae tibi gratias agent etc.³ Verum per me quispiam hunc locum poterit figurate dictum intelligere aut quomodocunque⁴. Quod doctis ac piis in tota hac disputatione visum fuerit convenientissimum ad assumendum, nos quoque sequemur. Cum autem quilibet in suâ vocatione aliquid cum suo talento Ecclesiae Catholicae Christi debeat lucrifacere, probanda est opera Domini praeceptoris mei⁵, quam Reip: Literariae praestat et nobis Mathematica duce certam rationem, et omnibus seculis consentientem temporum, annorum et dierum communicat.

a. Ita

64.

Deinde quoque emendatum calculum omnium apparentium coelestium tradit, unde exemplo monstrante viam, assequamur (quantum nobis à DEO conceditur) notitiam quomodo haec pulcherrima mundi corpora nobis Dominus insignia quoque esse voluerit¹. Philosophi dicunt, quaedam naturae esse nota, nobis autem incognita. Ad hoc genus referamus sane et de hypothesis disputationes. Recte enim apparet Dominum dixisse ad Iob: Nunquid nosti ordinem coeli, et pones rationem ejus in terra².

FINIS

[C. TRANSLATION OF THE TRACT]

I.

[Introduction]

It is mathematically certain that to obtain a consistent explanation of the phenomena of the heavenly bodies, the mobility of the earth should be assumed. What, however, should be laid concerning this matter according to Holy Scripture?

Saint Aurelius Augustinus¹ begins his unfinished book on “Genesis ad litteram”², with this important principle: The obscurities of nature, which we sense as the work of God, the almighty Architect, should be dealt with, not by making assertions, but by research; – [and this] especially in those books which authority has recommended to us –, in which boldness in asserting as certain an uncertain and questionable opinion hardly avoids the crime of sacrilege; this doubting in investigation, however, must not exceed the limits of the Catholic faith¹.

1. Aurelius Augustinus (354–430), bishop of Hippo (395) in North–Africa. As a young man he was for some time under the influence of Manichaeism, and then of Neoplatonism. Cf E. Gilson, *La philosophie au moyen âge*. 2me éd. Paris 1947, p. 88.

Augustine was baptized in 387. His christian metaphysics always kept a neoplatonic tinge.

2. Augustine wrote *De genesi ad litteram imperfectus liber* about 393. It was the precursor of his great commentary on Genesis.

2.

That, however, St. Augustine wished to treat passages in Holy Scripture referring to the things of nature in the way which he here suggests, is sufficiently evident from those of his writings in which such passages occur. But someone might possibly argue that Augustine’s statement is quite inadmissible. For in the sacred writings one should not proceed by inquiry, but by affirmation², nor will the correction which St. Augustine added later satisfy pious minds, since the true understanding of everything contained in Scripture is to be sought in Scripture, not elsewhere, either in reason, or in philosophy and the secular arts³. For it is written that one shall not diverge from the words of the Lord, either

to the right or to the left⁴, and that the Word itself has the force of demonstration, since it has been given to us by God.

1. De obscuris naturalium rerum, quae omnipotente Deo artifice facta sentimus, non affirmando, sed quaerendo tractandum est; in Libris maxime quos nobis divina commendat auctoritas, in quibus temeritas asserendae incertae dubiaeque opinionis, difficile sacrilegii crimen evitat: ea tamen quaerendi dubitatio catholicae fidei metas non debet excedere... Augustinus, *De genesi ad litteram imperfectus liber*, (I), n.1. In: Sancti Aurelii Augustini... *Opera Omnia*... studio Monachorum Ordinis Sancti Benedicti e congregatione S. Mauri. Editio Parisiana altera, emendata et aucta. Parisiis 1836–1839. T. III, col. 157A. All quotations of St Augustine we have taken from this edition.

For similar passages in Rheticus' treatise, see pp. 11, 16, 33, 47.

2. Cf above n. 1; n. 2 to p. 9 and n. 1 to p. 47 of the treatise. References mentioning only the number of the page and not the title of the work, indicate pages of Rheticus' treatise.

3. Similar statements on p. 11 (... collatione aliarum scripturarum, aut perspicuis rationibus declaratis) and p. 12 (Vera notitia omnium eorum quae in sacris literis continentur, ex iisdem petenda est). According to Augustine, too, Holy Scripture has its divine authority in itself, and obscure passages should therefore be explained with the help of more perspicuous ones: Ubi autem aperius ponuntur, ibi discendum est quomodo in locis intelligantur obscuris. Augustinus, *De doctrina christiana*, lib. III, n. 37 [XXV]; Opera III, 97 C.

Quando autem ex eisdem Scripturae verbis, non unum aliquid, sed duo vel plura sentiuntur, etiam si latet quid senserit ille qui scripsit, nihil periculi est, si quodlibet eorum congruere veritati ex aliis locis sanctarum Scripturarum doceri potest... Augustinus, *o.c.*, 1. III, n. 38 [XXVII]; Opera III, 98 A.

When interpreting the Bible, a comparison of various passages of Scripture is better than to trust Reason. Augustinus, *o.c.* 1. III, n. 39 [XXVII]; Opera T. III, 98 BC.

4. Deuteronomy 5:32; 17:11; 28:14. Joshua 1:7. When quoting texts from the Bible the author of the tract follows (with a few exceptions) the *Biblia Sacra Vulgatae Editionis*.

3.

Therefore, even if some things seem repugnant to our senses and our intellects, they are not, on that account, to be doubted and suspected in the manner of the Academics. Rather our mind must be surrendered, simply keeping to the Word and acquiescing in it. This question is one which can easily confuse the unskilled; therefore, before we proceed to other matters, we shall explain it in so far as the poverty of our mind and learning will allow.

I

[2. *No scientific statements in Holy Scripture.*]

Since, after the fall of Adam, the knowledge of God was progressively being extinguished in our minds, and since, as Christ says, it is not the will of the Father that anyone should perish¹, God gave us His Word, that we might be sure concerning His will with regard to us, and might have always before our eyes what He wishes us to do, and how through the promised Seed He was to put away His wrath against us

1. Matth. 18:14.

4.

and receive us into His grace. This is what the Holy Spirit desired to reveal through the Word, and this is the purpose of Holy Scripture. Therefore all for whom the word of the Lord is a lamp to their feet¹, are bound to assent firmly to the articles of the faith which the Holy Spirit, in order to attain the aforesaid end, proposes to us, and in no way let them be taken from us. This is true also of all things connected with them, or which may be correctly deduced from them². And no-one may turn to the right or to the left from the things which it is certain that the Holy Spirit has desired to hand down to us according to His plan. In which matter, indeed, that method [of interpretation] is to be kept which He has wished to be observed. Furthermore, when there is mention in the sacred writings of the things of nature,

1. Ps 118:105: *Lucerna pedibus meis verbum tuum, et lumen semitis meis.* Ps 119:5 (Authorized Version): Thy word is a lamp unto my feet, and a light unto my path.

2. This latter addition (*aut ex eis bona consequentiâ deducuntur*) is similar to the statement on p. 11 [note 2] (*aut perspicuis rationibus declaratis*). It played an important role in scholastic theology. It was already advanced by Origen, whose methodical principles are, according to M. Grabmann, in many respects found again in the fundamental ideas of scholastic method. (M. Grabmann, *Die Geschichte der scholastischen Methode*, Bd I, Freiburg i. Br. 1909, pp. 80-83.

5.

it is clear that the Holy Spirit does not want to speak of them in the manner of Philosophers, but in another way, and that He keeps in view the main purpose of Scripture which we have already mentioned; e.g. *when Moses begins Genesis he judged it necessary at the outset to impress on this people that the world and all nature were created from nothing by the God whom their ancestors had worshipped.* For since these people were by nature superstitious, and idolaters dwelt all around them, he thought it necessary to provide in this way, that they should not depart from the Maker of the world and Creator of nature, and turn to worship the sun, the stars, or some other created thing, instead of God, as Moses testifies¹. And the doctrine of creation is frequently repeated elsewhere in Scripture, for the same purpose. Further, whereas God wished to become known among the nations through nature, as

1. Not Deut. 14 but Deut 4:19: And lest thou lift up thine eyes unto heaven, and when thou seest the sun, and the moon, and the stars, even all the host of heaven, shouldest be driven to worship them, and serve them, which the Lord thy God hath divided unto all nations under the whole heaven. (A.V.).

Also Deut. 17:3 (A.V.):... and hath gone and served other gods, and worshipped them, either the sun, or moon, or any of the host of heaven, which I have not commanded:...

6.

Paul testifies¹, above all He willed to be known among His own people by, so to say, the clearest signs; and in the same way as in the Word, calling Himself,

the God of Abraham, the God of Isaac and the God of Jacob², and later, the God Who with a strong hand led His people out of Egypt³, out of the house of bondage, and Who finally revealed to us His Son, the Lord Jesus Christ⁴, according to the Scriptures, so He, not just once, but many times in Scripture, teaches us that He is that God, Who made heaven and earth, etc., and that there is no other God beside Him⁵. Thirdly then, the creation of nature is often described in Scripture in order also to set before our eyes the power of God, and His fatherly care for us, so that the awe and trust, which He requires of us, might be impressed upon our souls. For this very reason Scripture, where it briefly touches upon the doctrine of creation,

1. Rom. 1:20.
2. Exod. 2:24; Deut. 9:27; 2 Paralipomenon (= II Chronicles in A.V.) 30:6, etc.
3. Exod. 32:11; Deut. 9:26, 29.
4. Hebr. 1:1.
5. Isaiah 44:6; Is. 45:18, etc.

7.

often lists at the same time the benefits, which God has bestowed in a special way on His people. The physicists therefore are right in disagreeing with Aristotle, when he argues about the eternal existence of the world, though he adduces valid enough arguments, drawn from reason, by which he asserts against Plato, that the world never began and will never come to an end¹. And although Aristotle's arguments cannot be refuted after the rules and in a philosophical way, – and likewise Plato's teaching², which like much else, he had got from the ancestors, and brought into Greece from Egypt, might be defended by adducing other reasons –, yet because they are against the clear teaching of Scripture, that is because they are contrary to the doctrine of creation, and what it implies, one must abstain from these tenets, regarding them as impious and sacrilegious.

1. Aristoteles, *Physica* VIII, 1, 251 b 18.
2. Plato, *Timaios* 38 B.

8.

However, it is a different matter when Scripture, where it deals with natural things is regarded as a description of nature or a kind of physics. In the same place, therefore, St. Augustine has the prudent insight that Scripture has deliberately forgone an exact description of the nature of things¹ since, as he says elsewhere, the Spirit of God did not wish to teach men things which would not be an aid to anybody's salvation². For who would maintain that knowledge of physics is necessary for salvation? Further he takes also into account how Scripture borrows a style of discourse, and idiom of speech or a method of teaching from popular usage³, so that it may also fully accommodate itself to the people's un-

derstanding, and not conform to the wisdom of this world. Therefore as, for these reasons, texts of Scripture dealing with natural things receive different interpretations,

1. Cf p. 28 n. 3.

2. Quæri etiam solet quæ forma et figura coeli esse credenda sit secundum Scripturas nostras. Multi enim multum disputant de iis rebus, quas majore prudentia nostri auctores omiserunt, ad beatam vitam non profuturas discentibus. Augustinus, *De genesi ad litteram*, lib. II (IX), n. 20; Opera III, 233 B. This final version of Augustine's commentary on Genesis was written ca 410–414.

3. ...breviter dicendum est de figura coeli hoc scisse auctores nostros quod veritas habet; sed Spiritum Dei, qui per ipsos loquebatur noluisse ista docere homines nulli salutis profutura. Augustinus, *De gen. ad litt.*, II (IX), n. 20; Opera III, 233 C.

9.

inasmuch as they have not been handed down by the Holy Spirit with the same care as those on which our salvation depends, he has thought good that those who presume to make judgments on natural things on the basis of such texts should be restrained, lest by their foolishness they detract from the authority of Holy Scripture among the learned and wise of this world, who would then have less faith in Holy Scripture, whereas by means of it they were meant to be won for God¹. For in no better way the spirits of such men could be curbed, and their temerity restrained, than by denying to the passages of Scripture which deal with things of nature in so far as knowledge of nature is sought for, that authority which the rest of Scripture has; and by clearly teaching that in matters of this kind one must proceed, not by the way of affirmation, but by the way of inquiry².

Furthermore, since it usually happens in

1. Et non tam molestum est, quod errans homo deridetur, sed quod auctores nostri ab eis qui foris sunt, talia sensisse creduntur, et cum magno eorum exitio de quorum salute satagimus, tanquam indocti reprehenduntur atque respuuntur. Cum enim quemquam de numero Christianorum in ea re quam optime norunt, errare deprehenderint, et vanam sententiam suam de nostris Libris adserere; quo pacto illis Libris credituri sunt, de resurrectione mortuorum, et de spe vitæ æternæ, regnoque coelorum, quando de his rebus quas jam experiri, vel indubitatè numeris percipere potuerunt, fallaciter putaverint esse conscriptos? Quid enim molestiæ tristitiæque ingerant prudentibus fratribus temerarii præsumptores, satis dici non potest, cum, si quando de prava et falsa opinione sua reprehendi, et convinci coeperint ab eis, qui nostrorum Librorum auctoritate non tenentur, ad defendendum id quod levissima temeritate et apertissima falsitate dixerunt, eosdem Libros Sanctos, unde id probent, proferre conantur... multa inde pronuntiant verba, "non intelligentes neque quæ loquuntur, neque de quibus affirmant" (I Tim. 1:7). *De gen. ad litt.*, lib. I (XIX) n. 39; Opera III, 220 A–B.

2. Cf pp. 2 and 47.

10.

rather obscure passages of this kind that, according to each one's way of thinking, or nature, or education, he interprets differently those passages of Scrip-

ture which admit of various interpretations; he [Augustine] therefore says, severely, that whosoever assumes an uncertain opinion as being certain, and boldly accommodates it to Scripture, is guilty of the crime of sacrilege, and he gives plenty of examples of this, near the end of his first book on Genesis. For St. Augustine desires that we should never let ourselves be so happy with our own opinion on nature, which we believe to have extracted from the sacred writings, that, when truth has taught us otherwise, we are ashamed to retract, and fight for our own view, as if it were the teaching of Scripture¹. Therefore he finely teaches that we, who have been convinced by the truth, must say: this

1. Et in rebus obscuris atque a nostris oculis remotissimis, si qua inde scripta etiam divina legerimus, quae possint salva fide, qua imbuimur, alias atque alias parere sententias, in nullam earum nos praecipiti affirmatione ita projiciamus, ut, si forte diligentius discussa veritas eam recte labefactaverit, corruamus: non pro sententia divinarum Scripturarum, sed pro nostra ita dimicantes, ut eam velimus Scripturarum esse, quae nostra est; cum potius eam, quae Scripturarum est, nostram esse velle debeamus. *De gen. ad litt.* lib I (XVIII), n. 37; Opera III, 219 A.

Plerumque enim accidit, ut aliquid de terra, de coelo, de caeteris mundi hujus elementis, de motu et conversione vel etiam magnitudine et intervalli siderum, de certis defectibus solis ac lunae, de circuitibus annorum et temporum, de naturis animalium, fructicum, lapidum atque hujusmodi caeteris etiam non christianus ita noverit, ut certissima ratione vel experientia teneat. Turpe est autem nimis et perniciosum ac maxime cavendum, ut christianum, de his rebus quasi secundum christianas litteras loquentem, ita delirare quilibet infidelis audiat, ut, quemadmodum dicitur, toto coelo errare conspiciens, risum tenere vix possit. Et non tam molestum est... (see further note 1 to p. 9). *De gen. ad litt.* I (XIX), n. 39; Opera III, 219 D-220 A.

11.

was not [contained] in Holy Scripture, but that it was felt by human ignorance. This will readily satisfy believers, when they consider closely the reasons which led him [St. Augustine] to adopt this method, when interpreting obscure passages of Scripture dealing with nature. And the correction or parenthetical clause removes of itself difficulties which could be found in the foregoing passage. For what more could be desired, than that a man does not transgress the bounds of the Catholic faith in the discussion of such matters?¹ That means, as he seems to interpret his own words, that he must not suspend assent to those things which are required of us by the Holy Spirit nor cast doubt on those passages of Scripture which are self-evident, or evident by comparison with other parts of Scripture, or explained by clear arguments². Furthermore, that he carefully maintains the authority of Scripture in [the interpretation of] unclear passages.

1. Cf pp. 1, 16, 32, 33.

2. Cf note 2 to p. 4.

12.

True understanding of everything contained in the sacred writings is to be sought from them, and not elsewhere¹. We, too, acknowledge the same, but so that Scripture should be received in the way in which the Holy Spirit wished

it to be understood, so we do not study the passages about nature as if Scripture were a philosophical textbook, but rather as books in which the Holy Spirit desired to teach us something necessary for our salvation, as has been pointed out [already]. For who would deny that if God, the creator of nature, had desired to describe the nature of things for us by His Word, nothing in the whole world could have remained hidden to us, of which we now would not know exactly the nature, causes and powers? For who could better describe the eye than God, Who made it?² *But as it is clearer than the day that God has left a good deal to our own efforts,*

1. See also p. 11 and p. 2 (note 3).
2. But not only in anatomy, – in geography, too, God could have revealed all things (see pp. 40–41).

13.

so as to stimulate the arts and sciences necessary for life, and the things that pertain to education and the honest use of our mind¹, we should really follow in these things the thread of nature, by which first principles, reason and daily experience lead us. And, since God desires to be glorified in nature, there is no doubt that our study will be pleasing to Him. Therefore He prompts the minds of great men to inquire into the nature which He created, and He furthers and conducts their studies. These things must be enough to us, and from Holy Scripture we should seek in the first place only those things which are necessary to salvation. Let us borrow the philosophical matters from their authors and let us respectfully regard, according to the appropriate and received interpretations, what is said in Holy Scripture about nature.

1. Sed quia artes vitae utiles praecipua Dei dona sunt, res ipsa ostendit, non humana ope, sed quodam singulari Dei beneficio, utcunque eas conservari et interdum rursus ceu flammam excitari, ne funditis intereant. Rheticus to George Hartmann in his edition of N. Copernicus' *De lateribus et angulis triangulorum*, Wittenberg 1542. Publ. by L. Prowe, *Nicolaus Copernicus*, Bd II, Berlin 1884, p. 379. Cf Bd I², Berlin 1883, pp. 480 ff.

Augustine had praised useful arts in similar terms: Sed haec tota pars humanorum institutorum, quae ad usum vitae necessarium proficiunt, nequaquam est fugienda christiano... Augustinus, *De doctrina christiana*, lib. II, (XXV), n. 4C; Opera III, 65 D.

Philosophi autem qui vocantur, si qua forte vera et fidei nostrae accommodata dixerunt, maxime Platonici, non solum formidanda non sunt, sed ab eis etiam tanquam injustis possessoribus in usum nostrum vindicanda... sed etiam liberales disciplinas usui veritatis aptiores... continent. Augustinus, *op. cit.*, (XL), n. 60; Opera III, 75 C.

The christian young people should study what is necessary for the maintenance of life: Illa vero instituta hominum, quae ad societatem conviventium valent, pro ipsa hujus vitae necessitate non negligant. *Op. cit.*, (XXXIX), n. 58; Opera III, 74 C.

[3. *Scientific data in the Bible?*]

Hitherto we have explained how the passages of Scripture which deal with natural things are to be understood, and have taken over from Augustine the explanation of how such matters should be dealt with. Let us now proceed to the dispute or controversy itself, and let us carefully consider, with due reverence, those passages of Holy Scripture which appear to give rise to it.

We have sufficiently explained elsewhere how the hypotheses concerning the earth's motion agree so strongly with observed facts that they may be identified with them as a good definition with what it defines¹. For reason cannot produce any other hypotheses nearer the truth, (as continuous progression of time has taught us), in so far as it is given to man to know about these divine things, as is amply demonstrated mathematically

1. This statement occurs in almost the same words in Rheticus' *Narratio prima*. We underline the words it has in common with p. 14 of the treatise: ... *ita D. praeceptoris mei hypotheses tois phainomenois consentire videbis, ut etiam inter se, tanquam bona definitio cum definito converti possint.* (*Narratio prima*, Gedani 1540, fol. H Iir). The work was written "Ex Musaeo nostro Varmiae in Calend. Octobris, anno Domini M.D. XXXIX, (fol. J iiir).

The same sentence is borrowed by Kepler in his *Apologia Tychonis contra Ursum* (*Kepleri Opera*, ed. Frisch, vol. I); it is almost identical with a much earlier statement by the French philosopher Jean Buridan (c. 1300-c. 1358): *Item bona diffinitio debet esse convertibilis cum definito* (Joh. Buridanus, *Questiones super octo phisicorum libros Aristotelis*, II, qu. 4; ed. Parisiis 1509, fol. XXXI vs, col. 1).

The sentence seems to be inspired by a statement made by Aristotle: "if the term and the description do not signify the same thing, it is obvious that the description assigned cannot be a definition". Aristotle, *Topica* VII, 2, 152 b 40; cf *Topica* VII, 5, 154 b 1.

15.

by my venerated master in his work¹. Since, therefore, the motion of the earth may be considered as demonstrated truth, we need not fear that more balanced and learned judges will ascribe the marks of impiety to us, though we inquire further whether thence also certain interpretations of rather obscure passages of Holy Writ which refer to nature can be accepted.

[*The mobility of the earth in the Bible*]

Ecclesiastes says: "*He made everything good in its season and gave the world over to their disputing, so that man cannot discover the work which God has worked from the beginning even unto the end*"². We keep this excellent statement before our eyes. Wherefore let no one charge us of asserting as a truth that the earth moves as if we are heedless of our weakness. For what is more human than to stumble and be deceived? And we are content

1. In the *Narratio prima*, too, Rheticus always speaks of “my teacher”, or “my lord praeceptor” instead of using Copernicus’ name; “in suo opere” (“in his work”) refers to Copernicus’ *De revolutionibus* of which Rheticus had seen the manuscript. Cf p. 63 where the same indirect indications are given.

2. Ecclesiastes (Preacher) 3:11.

16.

as men to inquire into the works of God, as far as is permitted; just as St. Augustine elsewhere warns¹. We have considered that all this should be said first or by way of a preface, so that no sensible man should think that we have taken on the task of harmonizing the earth’s motion to Holy Scripture rashly, or from a love of sophistry. And if, maybe through our imprudence, anything which will be contrary to the Holy Church, to the Holy and Catholic faith and the authority of God’s Word has escaped our notice, let it be annulled and condemned. Therefore we leave the final decision on this our interpretation of Scripture to all devout, learned and skilful men, to whose opinions we shall readily defer.

St. Augustine says that some brethren doubt whether the heaven moves, because Scripture calls it the firmament. For they said:

1. Eligat quis quod potest: tantum ne aliquid temere atque incognitum pro cognito asserat; meminertique se hominem in divinis operibus quantum permittitur quaerere. *De genesi imperfectus liber*, (IX), n. 30; Opera Augustini, vol. III, 137 C. See also this (Rheticus’) tract p. 29 (and n. 1 to p. 29) and p. 64 (and n. 1 to p. 64).

Copernicus makes a similar remark: Et quamvis sciam, hominis philosophi cogitationes esse remotas à iudicio vulgi, propterea quod illius studium sit veritatem omnibus in rebus, quatenus id à Deo rationi humanae permissum est, inquirere, tamen alienas prorsus à rectitudine opiniones fugiendas censeo. Copernicus, *De revol.*, Norimbergae 1543, Praef. ad Paulum III, fol. II vs.

17.

How can it be a *firmament* if it moves¹? Nor does he reject this opinion, since he found an explanation how the phenomena fit in with an immobile heaven². David (according to Campensis’ rendering of Psalm 33) says: “God looked down from heaven and considered the doings of man. And from the tabernacle which is free of all disquiet, in which He dwells, He contemplated all the inhabitants of earth”³. Therefore, since Scripture calls the heaven God’s seat, and the earth His footstool⁴, we may conceive the heaven as being immobile and subject to no disquiet, as the noblest part of created nature. On this point could also be cited passages which seem even more aptly understandable as [referring to] the immobility of the heaven, like the text Isa. 40: – “Who spreads out

1. De motu etiam coeli nonnulli fratres quaestionem movent, utrum stet, an moveatur. Quia si movetur, inquirunt, quomodo firmamentum est? Si autem stat, quomodo sidera quae in illo fixa creduntur, ab oriente usque ad occidentem circumeunt...? Augustinus, *De genesi ad litteram*, lib. II, (X), n. 23; Opera III, 234 D.

2. Quibus respondeo... nec nomen firmamenti cogere ut stare coelum putemus (firmamentum

enim non propter stationem, sed propter firmitatem, aut propter intransgressibilem terminum superiorum et inferiorum aquarum, vocatum intelligere licet); nec, si veritas coelum stare persuaserit, impediri nos circuitu siderum ne hoc intelligere possimus. *De gen. ad litt.* II, (X), n. 23; Opera 234 D–235 A. See also n. 1–2 to p. 33 of this tract.

3. Johannes van Campen, born in Kampen in the Netherlands' province Overijssel in 1490; died in 1538 in Freiburg im Breisgau.

Campensis gives the translation:

vs 13. Dominus coelo prospicit ad considerandum omnes filios hominum.

vs 14. De firmo solio suo contemplatur omnes habitatores orbis.

But Rheticus quotes its paraphrase which Campensis added to it:

vs 13. E coelo prospexit Dominus, contemplatus est quicquid usquam est hominum.

vs 14. E tabernaculo, quod ab omni inquietudine liberum ipse inhabitat, consideravit universos habitatores terrae. (*Enchiridion Psalmorum*. Eorundem ex veritate Hebraica versionem, ac Ioannis Campensis è regione paraphrasim, sic ut versus versui respondent, complectens... Lugd. 1534. The "Epistola nuncupatoria", Nuremberg 1532, is addressed to Joannes Dantiscus.)

In the Vulgate the text runs as follows: Ps 32:

vs 13. De coelo respexit Dominus: vidit omnes filios hominum.

vs 14. De praeparato habitaculo suo respexit super omnes, qui habitant terram.

The A.V. simply says: "From the place of his habitation...", and the Netherlands' Statenvertaling: "Van zijn vaste woonplaats..." ("From his fixed dwelling-place...").

4. Isaiah 66: 1. Haec dicit Dominus: Coelum sedes mea, terra autem scabellum pedum meorum.

18.

the heavens as nothing, and expands them like a tent to dwell in"¹. David, Psalm 103: "...spreading out the heaven like a garment", and "Thou coverest its mountains with waters"². *IV Esdras, last chapter*: "Who spread out the heaven like a vault, and founded it upon the waters"³. For it is more probable that something that is contained should move than something that contains, and that which is in place than the [particular] place itself.⁴

Assuming therefore that the heaven is immobile, numerous movements must be attributed to the earth in order to account for the apparent motions of the stars. And therefore also various centres [must be attributed], as the Lord seems to want to tell Job⁵, saying: "Where wast thou when I laid the foundations of the earth? Show me, if thou hast understanding. Who has laid its measures, if thou knowest, or who has stretched the line upon it? Whereupon are its foundations fastened? Or who laid its cornerstone

1. Isaiah 40:22.

2. Ps 103:2-3 (Ps 104:2-3, A.V.).

3. IV Esdra 16:60. In the Vulgate, too, the books III Esdra and IV Esdra are added as *apocrypha* to the canonical books of the Bible.

4. Cf N. Copernicus, *De revolutionibus*, Nuremberg 1543. lib I, cap. 5; fol. a III vs: Cumque coelum sit quod continet et caelat omnia, communis universorum locus, non statim apparet, cur non magis contento quam continenti, locato quam locanti motus attribuat.

5. Job 38:4-7.

19.

when the morning stars praised me together, and all the sons of God rejoiced

ced?”¹. There is no doubt that by “earth”, Scripture often, according to the common way of speech, understands the whole globe of earth and water with its adjacent elements, as for instance, in Isaiah 37: “Thou alone art God of all the kingdoms of the earth. Thou hast made heaven and earth”². David, Psalm 23: “The earth is the Lord’s and the fulness thereof” etc.³. And, understanding “earth” in this sense, God says that He has laid not *one* foundation but foundations, as also in Isaiah 40: “Have you not understood the foundations of the earth? He, Who sits above the orbit of the earth, and its inhabitants are like grasshoppers”⁴. Likewise Psalm 80: “All the foundations of the earth shall move”⁵. Moreover, He clearly means that He employed a unique device when laying the foundations of the earth,

1. Job 38:4-7.
2. Isaiah 37:16.
3. Ps 23 (24):1.
4. Isaiah 40:21-22. Numquid non intellexistis, . . . etc. (The treatise has: “Nunquam . .”).
5. Ps 81 (82):5.

20.

which can by no means be understood perfectly by the human mind. Likewise, Wisdom, proclaiming her own glory in the writings of Solomon, says: “when He weighed out the foundations of the earth¹ I was by Him, putting everything together”, as it were with the finger showing what a varied and wonderful skill was applied in the linking up of the foundations of the earth². And I do not see how the wisdom and infinite power of God may so clearly be grasped by the uncomprehending human mind in any [other] part of nature, than it is in accepting the motion of the earth, where it appears that God desired to establish one particular bond of all visible things³, something which Plato saw was necessary and urged men to investigate, even though he did not perceive what it really was⁴.

1. Proverbs 8:27, 29, 30. Quando [Dominus] praeparabat coelos, aderam (v.27); . . . quando appendebat fundamenta terrae (v.29), . . . Cum eo eram cuncta componens. (v.30).

Proverbs 1:1 says that the proverbs stem from king Solomon: “Parabola Salomonis, filii David, regis Israel”.

2. On Rheticus’ opinion about “foundations of the earth”, see also p. 34 of the treatise.

3. For the interpretation of this difficult passage of the treatise we refer to the (also for Rheticus) no less difficult passages from “*Timaios*”, where life, soul, order and harmonious proportion are closely connected as cause and purpose. We quote from Marsilio Ficino’s Latin translation of “*Timaios*”, which had been edited with emendations by Rheticus’ contemporary Simon Grynaeus (*Platonis Opera*, transl. Marsilii Ficini, emend. . . Simonis Grynaei. . . Basileae 1532 fols 709-713). This translation uses the same terminology as Rheticus: Quocirca sicut ratio nobis haec probabilis persuadet, dicendum est, hunc mundum animal esse, idque intelligens, revera divina providentia constitutum. *Timaios* 30 B.

Vinculorum vero id est aptissimum atque pulcherrimum, quod ex se et ex ijs quae astringit, quam maxime unum efficit. Hoc maxime proportio ratioque alternae comparationis assequitur. (*Tim.* 31 C).

. . . corporaque *nexibus* compacta vitalibus animalia evaserunt, praescriptum tenorem et institutum ordinem tenuerunt. (*Tim.* 38 E).

In “Timaios” the sun’s orbit is the measure of the other planetary motions: ...ut autem esset quaedam velocitatis illorum tarditatisque mensura certissima, omniumque octo motuum prodire in lucem chorea, accendit lucem clarissimam deus in secundo a terra circulo, quam modo Solem vocamus. Cuius splendore coelum omne illustraretur et animantes omnes quaecumque natura numeri capaces sunt, ipsius particeps efficerentur, usum numerandi discentes ab illo eiusdem similisque naturae circuitu. (*Tim.* 39 B).

...Nam voluntas mea maius praestantiusque vobis est *vinculum* ad vitae custodiam, quam nex ille, quibus estis tunc cum gignebamini colligati. (*Tim.* 41 B). (The italics are mine. R.H.).

In Rheticus’ opinion the earth’s orbit (orbis magnus) forms the link (*vinculum, nexus*. Cf pp. 20 and 34) between the celestial phenomena, as is evident from the *Narratio prima*: Cum enim orbis magnus terram deferens, ad quinque planetarum orbis perceptibilem rationem habeat, unde videlicet omnem apparentiarum diversitatem in his planetis, per eorum ad Solem habitudines provenire demonstratur. (*Narr. prima*, D IIr).

Porro, quamquam admiranda est et haud indigna tum opifice Deo, tum quoque divinis his corporibus motuum et orbium symmetria ac *nexus*, quae praedictis hypothesis assumptis conservatur, animo citius concipi (propter affinitatem quam cum coelo habet) quam ulla voce humana eloqui posse affirmaverim, quemadmodum in demonstrationibus non tam verbis, quam perfectis et absolutis, ut ita dicam, Ideis harum suavissimarum rerum nostris animis imprimi solent. Tamen et in generali hypothesis contemplatione est videre, quomodo ineffabilis quoque convenientia, omniumque consensus sese offerat... (*Narr. pr.*, D IIvs). (Cf Copernicus, *de revol.*, I, c. X, fol 10 r: Invenimus igitur sub hac ordinatione admirandam mundi symmetriam, ac certum harmoniae nexum motus et magnitudinis orbium).

Suntque ita sex tantum orbis Solem, universi medium, circumdantes, quorum orbis magnus terram deferens communis est mensura... Ad haec, ut ita à praedictis sex orbibus mobilibus harmonia coelestis perficiatur... (*Narr. prima*, D III r.).

4. In *Epinomis* (which is attributed to Plato) the world soul is conceived as the cause of the whole universe (Plato, *Epinomis*, 988 D).

According to Plato immortality, reason and harmony belong together: Immortality only belongs to a thing composed of a multiplicity of elements and which at the same time has the most perfect composition, i.e. a soul. (Plato, *Republic X*, 611 B-C).

21.

Job, however, appears to bear witness to the earth’s motion elsewhere when he says: “Who moveth the earth from its place, and its pillars are shaken”¹. This may be understood in this way: “who leadest the earth about from one place to another under heaven”, in an annual motion around the centre of a great orb, like the sphere of the moon in a monthly motion; and “its pillars are shaken”, so that it would be expressed in a figurative way, as if one were to say: its foundations or centres to which its motion is related² are themselves removed from their own positions, while the earth completes many periodic motions, and therefore are, as it were, shaken, because of the mingled motion of the foundations. Perhaps, the text in Isaiah should be properly interpreted as referring to the daily motion, when the Lord says: “Lift up your eyes to heaven and look upon the earth beneath, that the heavens will vanish away like smoke”³. When

1. Job 9:6.

2. See also p. 34. The Bible is used here in a manner which, as a rule, is opposed throughout the whole treatise.

3. Isaiah 51:6.

22.

we assume that the earth moves in a daily motion around its poles, we see, when a revolution is half completed, a part of the sky which, for us, had previously been under the earth. The passage is clear enough. For it demands that we study the sky from every angle, and it states that God will alter these so sublime works. Nicholas of Lyra¹, [writing] on the first chapter of Genesis, – “And the Spirit of God was borne over the waters”² –, interprets this according to the true Hebrew text: “And the Spirit of God, that is the Holy Spirit, brooded over the waters”³. For it is He Who gives life to everything from the beginning, as it is written in the Psalm: “Send forth Thy Spirit and they shall be created, and Thou shalt renew the face of the earth”⁴. Thus, as this life-giving is rightly attributed to the first and daily motion, it proves that in the very beginning of the creation of nature a mention is made of this first motion, as of

1. Nicholas of Lyra (c. 1270–1349), a Franciscan from Normandy. In his renowned commentaries on the Old Testament he went back to the Hebrew text and rabbinic sources. His *Postilla literalis super Biblia* (written from c. 1322 to 1332) has been printed many times, from 1471 on.

2. Gen. 1:2. Et Spiritus Dei *ferebatur* super aquas. (Vulgate).

3. The printed text has “forebat”, but it should be “fovebat”. In the *additiones* to Nicholas Lyrensis’ commentary on Genesis it is not this interpreter but Paul of Burgos (c. 1351–1435), who says: *Fovebatur* non debet intelligi aliquid passionis in spiritu domini, nec haec dictio *meraphet* quod in hebraico in hoc loco ponitur est verbum passivum sed mere activum, significans quod spiritus domini *fovebat* et *vivificabat* aquas ad similitudinem gallinae cubantis. *Postilla fratris Nicolai de Lyra de ordine minorum super Genesis... Cum additionibus Pauli episcopi Burgensis*. In: Nicolaus de Lyra, *Biblia Latina cum postillis*. Nuremberg (Koberger), 1493.

It is remarkable that Rheticus, on other occasions so eager to quote St. Augustine, does not mention that the Father of the Church had already pointed out the same:

... Nam et illud quod per graecam et latinam linguam dictum est de Spiritu Dei, quod *superferebatur super aquas*, secundum syrae linguae intellectum, quae vicina est hebraeae, (nam hoc a quodam docto christiano syro fertur expositum) non *superferebatur*, sed *fovebat* potius intelligi perhibetur... sicut ova foventur ab alitibus, ubi calor ille materni corporis etiam formandis pullis quodammodo adminiculatur, per quemdam in suo genere dilectionis affectum... Augustinus, *De genesi ad litteram*, lib. I, (XVIII), n. 36; Opera III, 218 C-D.

4. Ps 103 (104 A.V.):30.

23.

the life of natural things, by attributing this motion to God in the person of the Holy Spirit, whose property it is, as [we have] just stated, to give life¹. But since this opinion of Nicholas of Lyra², who performed an excellent work in interpreting the Bible, is accepted as not repugnant to Scripture, it will be much more easily accommodated to the mobility of the earth than to that of the Sphere of the stars, which he himself believed to have a daily motion. For if the Holy Spirit, in addition to the functions attributed to Him in the Gospel, (as being the Paraclete³ and giving life to the hearts of believers,⁴ etc.) fosters, moves, gives life, creates nature, and renews the face of the earth, – [then,] above all, as Scripture testifies⁵, the governance of those living on the earth is attri-

buted to Him. Consequently, by [the fact] that it has been established that the earth moves by reason of a unique divine

1. ...ad similitudinem gallinae cubantis et vitalem virtutem his quae foventur tribuentis, quae quidem vivificatio in hoc loco intelligitur per primum motum quod est praecipue vivificationem corporum naturalium. (Paulus Burgensis, *additio*, l.c.).
2. It should be "Paul of Burgos" and not "Nicholas of Lyra".
3. Joannes 14:16 and 26; 15:26; 16:7. "Paraklêtos" is "Comforter"; John 14:26: "But the Comforter, [which is] the Holy Ghost, whom the Father will send in my name, he shall teach you all things".
4. Rom. 5:5.
5. I Petr. 3:18; II Corinth. 1:22; Jo. 6:63.

24.

conservation of its movements, He also will have governed the whole lower world, (to speak in the way of the Philosophers), and He maintains the changes of the seasons and ensures that we participate in all the good qualities which God has given to the Sun, the Moon and to all the stars. By the annual motion we are subjected regularly to all the stars of heaven, whereas by the daily motion the Sun and all the furnishings of heaven rise and set for us.

Aristotle said that the life of animate beings subsists by motion in an oblique circle¹. So by the motion of declination we have spring, summer, autumn and winter, and all things are created, and the face of the earth is renewed in its season. The motion of declination seems also to find a confirmation elsewhere in the Psalms², for David says, after a long enumeration of the works of God: "Thou hast made all the ends of

1. Aristoteles, *De generatione et corruptione*, II, 10; 336 a 3 – 336 b 9.

25.

the earth, summer and spring, Thou hast formed them"¹. If, namely, by "summer and spring" you understand "the ends of the earth" to be explained by apposition, the movement of declination² will emerge. For this movement is the efficient cause of the change of the seasons by which, as it were, certain limits of it are marked off on earth. Here perhaps one might appropriately refer to Isaiah. "Dost not thou know, or hast thou not heard? [It is] God, the everlasting Lord, who created the ends of the earth and who will not fail, nor will He travail nor is there any searching of His wisdom"³. The Prophet declares this work among the outstanding works of God and uses for this purpose the word "creation", by which it seems that he intends some action which is peculiar to God, namely such as this divine ordaining, in that while the earth is directed in an annual circular motion by His intelligence, so that the poles of the earth

1. Ps 73 (74 A.V.): 17.
2. On "declination" see also n. 27 on p. 116 of our commentary. Quoniam si fixa manerent [ae-

quinocialis circulus et axis terrae] et non nisi centri motum simpliciter sequerentur, nulla apparet dierum et noctium inaequalitas... utcunque eadem temporis qualitas maneret sui similis. Sequitur ergo tertius declinationis motus annua quoque revolutione, sed in praecedentia, hoc est contra motum centri reflectens. Sicque ambobus invicem aequalibus fere et obvijs mutuo evenit: ut axis terrae, et in ipso maximus parallelorum aequinoctialis in eandem fere mundi partem spectent, perinde ac si immobiles permanerent... (Copernicus, *De revolutionibus*, lib. I, cap. 11, fol. 10 vs.)

Dicebamus autem centri et declinationis annuas revolutiones propemodum esse aequales, quoniam si ad amussim id esset, oporteret aequinoctialia, solsticialiaque puncta, ac totam signiferi obliquitatem sub stellarum fixarum sphaera, haudquaquam permutari. Copernicus, *o.c.* (Nuremberg 1543), fol. 11 vs.

3. Isaiah 40:28.

26.

by divine power will be able to look on the same parts of heaven, the earth will be so tilted towards the sun as to undergo all the changes of the seasons, as they are in fact perceived. The Prophet adds: "nor will He fail, nor will He travail"¹, which means that it is no labour for Him to maintain this His most beautiful order. And he continues: "Truly, the weakness of the human mind will never be able perfectly to understand it". As if the Spirit of God, Who spoke by the mouth of the Prophet, having spoken at some length about a matter not necessary for salvation, beyond what the human mind could perceive, stopped in the middle of His speech.

In Jeremiah the Lord says: "If I have not placed my covenant between day and night and the laws of heaven and earth, even so shall I cast off the seed of Jacob and of David my servant", etc.². Here

1. Isaiah 40:28.

2. Jerem. 33:25-26.

27.

the founder of nature tells us that the laws of heaven and earth are His ordination. Since, therefore, reason persuades us that the earth has its motions just as the moon has its motions, it may be understood that God has given Laws to the earth in the same way as He has given them to the other heavenly bodies of which it is certain that they move; that is to say that at a definite, preordained time, He effects the prescribed changes of movement, and assists the preservation of animate beings and makes us partake of all the benefits of nature.

It is written in the books of the Kings: "The hinges of the earth are the Lord's and He has placed the world upon them"¹, – which perhaps may be interpreted that the earth has been hung on its poles around which it turns as if on hinges. These are some passages of Scripture, by which we may say that, if the earth moves, something of this, albeit obscurely, is contained in the Bible.

1. I Reg. (= I Samuel) 2:8. “Cardo” is a vertical door hinge. The A.V. has: “...the pillars of the earth are the Lord’s, and he hath set the world upon them”.

28.

[*Revelation of truths about nature beyond the scope of science*]

St. Augustine warns us that not all things are to be scrutinized punctiliously, which is why we select what seems to us to be set forth without imagery and as simply as possible¹.

Yet, I do not affirm anything, but let each one follow what seems to him to be true. Holy Scripture testifies that there are waters above the firmament²: Because these are placed beyond [the range of] the senses, we cannot be misled by the senses so that we would state otherwise, but we simply accept the Scripture³. However, since our senses deem that the Sun and the heaven move, and that the earth remains immobile, we then seek other interpretations of Scripture. Thus Nicholas of Lyra interprets the text in Job – “Who moveth the earth”⁴ – not in its totality, (as it is [according to him] the centre of the world), but certain parts of it. Thereupon, he imagines pillars

1. This is a paraphrase of a passage from Augustine: An forte varietatis causa, ut textus sermonis in fastidium non veniret, supra non est positum quod infra positum est [Gen. 1:7] et non oportet scrupulose omnia rimari? Eligat quis quod potest... Augustinus, *De genesi imperfectus liber* (LX), n. 30; Opera III, 173 C.

2. Gen. 1:6-7.

3. Compare p. 8 of this tract, where the tenet of the eternity of the world is rejected solely on the basis of Scripture.

4. Job 9:6. “Qui commovet terram de loco suo et columnae eius concutiuntur”. Nicholas of Lyra interprets this as follows: ...sciendum quod in inferioribus creaturis terra videtur firmior et stabilior quia est centrum mundi. et in his quae sunt super terram: montes videntur magis stabiles. et tamen Deus in terraemotu ipsam terram movet: et montes aliquando subvertit per suam potentiam...”.

Paul of Burgos’ *Additio* to this statement says: Per columnas terrae possunt intelligi ad litteram columnae vel quaecunque alia edificia quae videntur adherere terrae vel etiam montes quae sunt quasi columnae super terram fundatae: quae omnia in terraemotu concutiantur.

29.

of the earth, rather like spokes in a wheel, which hold up the outer parts. However, it seems that we should conclude, as was stated also earlier, that from the sacred writings we can get exact knowledge of everything necessary for salvation. Then, [we discussed] about nature and other matters dealt with by the Philosophers, to the extent to which God has allowed human reason¹. And since God wishes us to be better versed in matters divine than in corruptible nature, – (Socrates’ opinion should here be followed that we, men, know either too little or nothing about these divine matters)², – we see the world sustained in a most beautiful order, whence reason concludes that there is one first cause which sustains it all, namely God. But what God is, how He governs these

things and what His will is towards us – we penetrate none of this, except in so far as He has willed us to know by His Word.

1. Cf pp. 16 and 64 of this treatise and Copernicus' declaration to pope Paul III: we have to seek truth (in natural science) "quatenus id a Deo rationi humanae permissum est" (Copernicus, *De revol.*, praefatio, fol. IIvs). This may be compared with a passage from Pliny (*Naturalis historia*, lib. II, 1, 1-2) which is quoted (with a slight alteration) by Rheticus in his *Narratio prima*. Pliny posited that it is no concern of man to investigate what lies beyond the sphere of the fixed stars, and Rheticus adds that we only know about it what Holy Scripture wanted us to know, and that we will not investigate further than God desired us to advance and that we will not transgress the limits imposed by Him: ...Hanc totius universi distributionem ex D. praeceptoris mei sententia mihi perpendenti diligentius, praeclare simul, ac recte Plinium sensisse intelligo, cum inquit: *Mundi, seu coeli, cuius circumflexu teguntur cuncta, externa indagare, nec interesse hominum, nec capere humanae coniecturam mentis*: ...Nam ubi D. praeceptorem meum sequemur, nihil extra concavum orbis stellati quod inquiramus erit, nisi quantum nos sacrae literae de his scire voluerunt.. Quare totam reliquam hanc naturam ceu sacrosanctam à Deo coclo stellato inclusam cum gratiarum actione admirabimur... Et quidem eo usque progrediemur, quo ipse voluit, neque ab ipso constitutos limites transgredi tentabimus, G.J. Rheticus, *Narratio prima*, D II r.

2. Probably an allusion to Plato, *Republic* VII, 530 B-C; see also *Phaedo*, 66 D-67 A; *Epinomis* 977B, 990A, 992D. Cf Xenophon, *Memorabilia* IV, VII,6. The same on p. 64.

30.

We perceive from their effects that spirits exist, but we do not know what they are. It is Scripture which shows us what kind they are. We see the Sun, the stars and all the heavenly bodies rise, set, and repeat their previous courses in a fixed plan. We perceive the innumerable advantages by which God, using them as His instruments, supplies our needs. As for what the Sun, etc., is, ... one says it is a lighted torch which is extinguished by night; another says it is a fiery stone; some believe it is luminous water; Aristotle¹, to avoid saying nothing at all, calls the heaven and the stars the fifth Essence. To say in fact that it is no less certain that the Sun does not rise than that it does rise, and that everything is equally uncertain, is a mark of insanity. As to whether the Sun appears to us to rise because the earth stands still, or whether he has a movement of his own –, we must say that reason and mathematics are for the former alternative;

1. Aristoteles, *De coelo* I, 2, 269 a; I, 3, 270 b 1-5 and 270 b 25; II, 7, 289 a 11-16.

31.

the senses are, however, for the latter. For this thanks should be given to God, for He gives us the knowledge and the use of the effects of nature, which has been made above all for man's sake¹. So it is enough for us to have a method of calculation which corresponds exactly to the observed phenomena. Indeed, the natural scientists, too, are forced to recognize how trifling [sometimes] is our knowledge of the causes of natural things, even on the most trivial matters, as when they say: this herb does not have this [particular] power on account of such and such right proportion of heat and humidity², but on account of a spe-

cific “nature” which God put into it. But when we shall put off this corruptible nature and the kingdom of Christ shall begin, we shall see face to face³, as Scripture testifies, and see all nature clearly and with eyes that are divine and not human.

1. In the preface to his main work Copernicus, too, considered the world as created by God for Man’s sake: ... coepit me taedere, quod nulla certior ratio motuum machinae mundi qui propter nos ab optimo et regularissimo opifice conditus esse, philosophis constaret... (Nicolai Copernici Praefatio in libros Revolutionum. In: *De revolutionibus orbium coelestium*, Norimbergae 1543, fol. III vs.)

2. temperamentum = equilibrium resulting from the strife between the elementary qualities (warm, cold, moist, dry) which moderate each other. If no explanation of the properties of a substance could be found in this way, scholastic philosophers resorted to the substantial Form of “the compound as a whole”, or to “occult qualities”.

3. Cf I Corinth. 13:12. Videmus nunc per speculum in aenigmate: tunc autem facie ad faciem.

32.

Therefore, let us be content with those things we can know, in the mean time praising God and thanking Him for all His benefits, Whose Name be blessed. Amen.

III

[4. *Holy Scripture on the structure of the sublunar world. IIIa*]

I would hope that what we have said so far on this question will be able to satisfy believers enlightened by a liberal education, and that they will easily find acceptable the interpretations of those passages, which are used against our position. And although I hand them this lamp asking them at the same time to defend this cause, so useful to the Republic of Letters, against the opinions of the more ignorant, yet, on account of the more troublesome, we have thought it best to add an interpretation of some of the main passages with which they could make protestations against us. In which matter, as in everything else, we submit to the judgement of the Church¹.

1. One of the many protestations of “catholicity” (Cf pp. 1, 11, 16, 33, 59, 63).

33.

[*The foundations of the earth*]

First, if anyone were strongly to contend that the sky is called a firmament not because of its immobility, but because of its solidity and its limit, which would separate the supracelestial world from the celestial, etc.¹, I would not go against him, as St. Augustine allows us another opinion² as well, and because I would not therefore be transgressing the bounds of the Catholic faith³, even if I assumed that the starry sky was immobile.

But we have to consider whether we rightly interpret “foundations” of the

earth as “centres”. In the “Data” of the Geometers a circle is given by position when its centre is given⁴. Thus when the centre of a Sphere is given, its position is also determined; so, when I say “the centre of the moon is under this or that degree of the Ecliptic”, it is understood that a fixed position is given for the whole lunar orb. Whence one would rightly call the centre the foundation of the Sphere,

1. See quotation from Augustine in note 2 to p. 17 of the treatise.
2. St. Augustine did not want to enter further into problems like that of the rest or motion of the heaven: to him who wishes to occupy himself with matters of salvation and of the holy church, these things are in his opinion superfluous and useless. (*De gen. ad litteram*, lib. II, (X), n. 23; Opera III, 235 A).
3. For Rheticus’ desire to remain within the bounds of “catholic” faith, see note 1 to p. 32.
4. Euclid (fl. ca 300 B.C. in Alexandria), the author of the very popular thirteen Books of *Elements* (of geometry), says in a similar work, “Data”: *Definitiones*. 6. *Positione autem et magnitudine circulus datus esse dicitur, cuius centrum datum est positione, radius autem magnitudine*. Euclides, *Data* (cum commentariis Marini et Scholiis Antiquis), ed. H. Menge; in: *Euclidis Opera omnia*, ed. P.L. Heiberg et H. Menge, vol. VI, Lipsiae 1896, p. 3 – In 1549 Rheticus edited that part of Euclid’s *Elements* which had been translated from Greek into Latin by his friend Joachim Camerarius (1500–1574): *Euclidis Elementorum libri sex, conversi in latinum sermonem à Joach. Camerario*, Lipsiae 1549.

34.

since all parts of the Sphere focus on it, and once it is located, the entire sphere is given at the same time. Therefore, once the mobility of the earth is assumed, its foundations or bases will be its own centre, the centre of the great orb¹, the centre of the small circle² and the centre of the Sun, so that the sum of the earth’s foundations³ is a quaternary, which the Pythagoreans call perfect⁴ and glorify with many other praises as well, just as do the Holy Scriptures.

Now that this point may be granted to us, another question arises, which on the surface appears to be much more difficult. David says: “For He founded it above the seas and made it ready above the rivers”⁵. Likewise: “Who established the earth above the waters”⁶. And in IV Esdras 16 we read: “Who made bounds for the sea in the midst of the waters and suspended the lands above the waters by His word”⁷. Here, if someone presses the strict letter,

1. With Copernicus “orbis magnus” denotes the circular orbit of the Earth; its centre does not exactly coincide with the sun; Proinde non pudet nos fateri hoc totum, quod Luna praecingit, ac centrum terrae per orbem illum magnum inter caeteras errantes stellas annua revolutione circa Solem transire. Copernicus, *De revol.*, lib. I, c. 10; fol. 9r.

Cf Rheticus, *Narratio prima*, G IIIr: Ideo autem est dictus orbis magnus, quia tam ad superiorum planetarum orbis, quam ad inferiorum magnitudinem notabilem habet, quae praecipuarum apparentiarum sit occasio.

2. With Copernicus the “circulus parvus” is the small circle whose centre lies somewhat excentrically with regard to the centre of the universe (the sun) and along which the centre of the “large circle” (orbis magnus) is moving. Copernicus, *De revol.*, lib III, c. 20; fol. 91r.

3. Cf p. 20, n. 2.

4. Quaternary (tetraktys) is the series of the first four numbers, which by addition yield 10. The

Pythagoreans called it the “perfect number”, as it has “the source and root of eternal nature”. The perfect number 4 was the source of the perfection 10. This is realized in the structure of the universe, in which 10 spheres turn round the central fire. – Other sets of four got also the name “tetraktys”, e.g. the four faculties of the soul in which are combined *sensus, opinio, scientia, mens* (Plutarch). Cf Johannes Kepler, *Harmonice mundi*, Linciae 1619, lib. III, “Excursus de tetracty pythagorico” (J. Kepler, *Gesammelte Werke*, ed. M. Caspar, Bd VI, München 1940, p. 97).

5. Ps 23 (24):2.

6. Ps 135 (136):6.

7. IV Esdras (Ezra) 16:59. Here an apocryphal book, regarded as such by Augustine and the Vulgate, too, is quoted without any qualification, together with canonical texts. See: Augustinus, *De doctrina christiana*, lib. II (VIII), n. 13; Opera III, 48 BD – 49 AB.

35.

he will say that Holy Scripture clearly teaches that the waters are the foundations of the earth and that no interpretations should be drawn from elsewhere. For in the beginning, when God created the heaven and the earth, the latter was totally covered by the waters¹; next, by the word of God, the waters were collected in one place, which is how the seas etc. were made, and the dry land appeared². Yet, the dry land did not float on the water, as the ancients said the island of Delos or Ortygia³ did, since it was fixed by God above the waters. –

These things could be matter for brilliant and lengthy discussion, just as Lactantius, otherwise a man of great learning and eloquence, ridicules those who claim that the earth is round⁴. Nicholas of Lyra briefly unfolds his thought on these matters; as a Philosopher he sees that in the order of nature earth is the heaviest element⁵ and that there is no reason why God should miraculously hold up the earth above the

1. Gen. 1:1-2.

2. Gen. 1:9.

3. The island of Delos in the Aegean Sea was said to be the birth-place of Diana and Apollo. (“As when Apollo quits Lycia... to visit his mother’s Delos”; “qualis ubi... Lyciam... deserit ac Delum maternam inuisit Apollo...”. Virgil, *Aeneid*, 1. IV, 144). It was said to have wandered round: “In mid-sea lies a holy land..., which, as it wandered round coasts and shores, the pious Archer [= Apollo] bound fast to lofty Myconos and Gyaros, making it lie unmoved...”, (Virgil, *Aeneid*, 1. III, 73-77; Cf Seneca, *Nat. Quaest.*, VI, 26,3).

“Ortygia” is an old name for Delos (Cf Virgil, *o.c.*, 1. III, 124 and 154). According to Isidorus Hispalensis “Delis insula in medio Cycladum sita... Ipsa est et Ortygia” (*Originum libri viginti*, 1. XIV, cap. 6; ed. B. Vulcanius, Basileae 1577, col. 345).

There is also an island Ortygia in the harbour of Syracuse: “an island over against wave-beaten Plemyrion” ([promontory near Syracuse]. Virgil, *o.c.*, 1. III, 694).

4. Lactantius (c. 250–c. 325). Cf Copernicus, *De revol.*, praef., fol IV vs. See note 56 on p. 30 and n. 53 on p. 29.

Augustine, on the other hand, says that he does not care whether the earth is considered a disk or a globe: Augustinus, *De gen. ad litt.*, lib. II, (IX), n. 20; Opera III, 233 B-C; n. 22, Opera III, 234 B.

5. Aristoteles, *De gen. et corr.* II, 3, 330 a 34; *De coelo* IV, 1, 308 a 14 ff; *De coelo* II, 14, 296 b 6-18. Cf Augustinus, *De gen. ad litt.* lib. II, (I), n. 3. Cf *o.c.*, 1. II, n. 4; Opera III, 225 B, C. (note 3 to p. 37).

36.

waters, that is: put the bed above the river and the heavy above the light. – In the same order in which the heavy seeks the centre, the earth is founded on the centre and thence, by rising up from its various parts, appears above the waters on all sides waters being interspersed for the convenience of the living beings¹. N.B. *Wherefore, leaving aside more subtle disputes, he says that Scripture speaks according to recognized popular usage*². “He founded the earth above the waters”³, i.e. adjacent to the waters, in the way that the land of Genoa is above the Mediterranean Sea, i.e. adjacent to it, etc. Furthermore, concerning the passage in Genesis and the places where it is repeated in Scripture, he is of the opinion that the earth was indeed surrounded by waters, but in a merely natural way⁴; afterwards, on the third day, it was contracted, as we find it now, in planned nature, confined within fixed limits, which, on account of the corresponding divine ordinance, it may not transgress¹.

1. According to Nicholas of Lyra, God, on the third day of creation, caused caverns in the earth to receive part of the waters, so that dry earth emerged in order to be inhabited by men and beasts.

2. Here again our author is on the side of Augustine, who wrote: *Hic occurrit admonere cavendum errorem, quem in libro primo cavendum admonui, ne forte quia scriptum est in Psalmis, “Fundavit terram super aquam”; arbitretur aliquis nostrum, adversus istos de ponderibus elementorum subtiliter disserentes, isto testimonio Scripturarum esse nitendum: quia illi non retenti auctoritate Litterarum nostrarum, et nescientes quemadmodum dictum sit, Libros sanctos facilius irridebunt, quam illud repudiabunt, quod vel certis rationibus perceperunt, vel experimentis manifestissimis probaverunt. Illud namque...* (Augustinus, *De gen. ad litt.* Lib. II (I), n. 4; Opera III, 225 A-B.)

Compare the sentence quoted above with the quotation in note 1 to p. 10 (from: *De gen. ad litt.*, lib. I, (XIX), n. 39; Opera III, 220 A.

3. Ps 135 (136):6. Cf Ps 23 (24):2; cf notes 5 and 6 to p. 34 of the treatise.

4. In agreement with Aristotle here the earth is considered as surrounded by a layer of water (and the latter is surrounded by the atmospheric air, which is surrounded by the fire sphere). This is the sequence according to their *nature*.

37.

St. Augustine, discussing the same passage, goes to more than ordinary trouble: First he interprets David’s words allegorically: “*Who founded the earth above the waters*”², that is: “*who, through baptism, confirmed the little ones, simple in the Faith*”³. Next, he interprets the passage in the literal sense, as meaning that the waters are stored in caves of the earth, and that the earth is fixed over them, so that they may not escape⁴.

That there are such caverns, we learn from earthquakes, which are normally followed by floods or inundations. For by such upheavals, with the opening of the passages, the waters burst out⁵. Perhaps this is the meaning of this passage of Scripture.

[The distribution of land and water on the globe]

Just as the general run of cosmographers⁶, on globes or maps depicting the whole of the earth, portray seas wherever no land has been explored, so e.g.

1. Gen. 1:9.

2. Ps 135 (136):6.

3. Augustine tried to find for the same text not only a literal (or “historical”) interpretation, but also an allegorical one: Illud namque in Psalmis, aut figurate dictum recte accipi potest: ut quoniam coeli et terrae nomine saepe in Ecclesia spirituales carnalesque significantur, coelos ostenderit pertinere ad serenam intelligentiam veritatis, dicens, *Qui fecit coelos in intelligentia* [Ps 135:5-6, “Qui fecit coelos in intellectu”: quoniam in aeternum misericordia ejus]. “Qui firmavit terram super aquas”: quoniam in aeternum misericordia ejus]; terram vero ad fidem simplicem parvulorum, non fabulosis opinionibus incertam atque fallacem, sed prophetica et evangelica praedicatione firmissimam, quae per baptismum solidatur, et ideo subjecerit, dicens, *Fundavit terram super aquam*. Augustinus, *De gen. ad litt.*, lib. II, (I), n. 4; Opera III, 225 B, C.

4. Augustinus then continues (the passage quoted above, n. 3): ... Aut, si ad litteram quisquam cogit intelligi, non incongruenter vel sublimia terrarum, sive continentium, sive insularum, accipiuntur, quae superiora sunt aquis; vel ipsa tegmina speluncarum, quae super aquas pendula soliditate firmata sunt. Quocirca nec ad litteram quisquam potest sic intelligere, quod dictum est, *Fundavit terram super aquam*; ut aquarum pondus terreno ponderi supportando naturali ordine quasi subjectum esse arbitretur. Augustinus, *De genesi ad litteram*, lib. II (I), n. 4; Opera III, 225 C, D.

5. Gen. 7:11; ...rupti sunt omnes fontes abyssi magni.

On the subterranean caverns, which played an important role in geological speculation from Antiquity until the 18th century, see note 40 on p. 124 of our commentary to this treatise.

6. “Vulgus cosmographorum”, i.e. the common cosmographers, who still made the old-fashioned globes and maps without taking into account the recent geographical discoveries.

38.

Ptolemy¹ believed that there were waters where the Portuguese have discovered in their maritime voyages that very fertile territories exist²; hence the Psalmist, accommodating himself to popular opinion and understanding, sang of the lands founded above the waters. And [for him] the abyss (was) like his mantle, etc.³, so that indeed the whole earthly element would be in one part, like an apple floating on the water⁴, and in the other part the waters would be gathered together as in a receptacle (bag)⁵, and God would have confined them “that they may not pass over, that they turn not to cover the earth”⁶, as is said in the same place [of Scripture]. From the fact that he says “they might be turned back”, it seems that David has in mind that [passage of] Scripture, which declares that the whole earth had been covered by waters⁷; whence, according to the experience of his own time about the known land, he seems to hold that the remaining waters, in order to preserve the living beings¹, did not overrun the dry land everywhere,

1. Claudius Ptolemaeus (ca 150 A.D.) was to the scholars of the Renaissance period one of the greatest authorities, because of his astronomical work “Almagestum” – which had been known to medieval astronomers in latin translation by Gerhard of Cremona (1179) –, and his “Geo-

graphia”, which was translated from Greek into Latin (in 1406) and printed in 1475 (without maps) and 1477 (with maps) and many times afterwards. An Epitome of the *Almagest* was edited by Regiomontanus (1496); the complete work was printed in 1515 (transl. from Arabic), 1528 (transl. from Greek), etc.

2. About the same time that Rheticus praised Ptolemy’s astronomy in his *Narratio prima*, he severely criticized his *Geography* (see note 46 on p. 127).

On the shock caused by the Portuguese discoveries: R. Hooykaas, *Humanism and the Voyages of Discovery in 16th century Portuguese Science and Letters*, Amsterdam 1979 (Mededelingen Kon. Ned. Akad. Wetenschappen, afd. Letterkunde nw reeks 42, n. 4). See note 41 on p. 124.

3. Ps 103 (104 A.V.):6.

4. The comparison of the terrestrial globe with an apple (pomum) had been made by Vadianus (1512). See note 48 on p. 130.

5. Ps 32 (33):7. Congregans sicut in utre aquas maris: ponens in thesauris abyssos.

6. Ps 103 (104):9. Terminum posuisti, quem non transgredientur: neque convertentur operire terram. Evidently, this passage is *not* “in the same place” (in eodem loco) as the previous one.

39.

[but] were gathered together in one place², the earth being fixed over them, so that it should not be submerged. And so the Ocean and the seas would be the foundations of the earth.

Many passages of Scripture could be collected by way of showing that Scripture often accommodates itself to popular understanding, and does not seek exactness in the manner of the Philosophers. So, on the authority of Nicholas of Lyra, it was because of the uncultivated state of the people that, in the beginning of Genesis, no mention is made of the air, much less of the element fire³, as being beyond the perception of the uneducated⁴. It is clear that for the same reason, except sun and moon, nothing is said in that place of the other planets, – however much Picus⁵ in his *Heptaplus* tries to extract them therefrom⁶ –, not to speak of still other things that are left out in the same place.

Therefore, some people, like St. Augustine,

1. Gen. 1:11. Cf Gen. 9:11.

2. Gen. 1:9.

3. Not the “Postillator”, Nicholas of Lyra, but Paulus Burgensis says in an “additio” to the commentary on Gen. 1:2-3 (...et Spiritus Dei ferebatur super aquas. Dixitque Deus: Fiat Lux), that “Many philosophers in Aristotle’s time did not know the element Fire” (Nic. de Lyra, *Postilla super Genesin*, cum additionibus Pauli episcopi Burgensis. Nuremberg 1493.

4. At the same place (see previous note) Paulus Burgensis says also the “beginning” is spoken of, as it were, in a stammering way (quasi balbuciendo) and that “uneducated people are addressed” (moyses rudi populo loquebatur), and that there was adaptation to their capacity of understanding (ut imbecillitati rudium seu simplicium audientium condescenderet...).

5. Giovanni Pico della Mirandola (1463–1494), important representative of the Italian Renaissance. He studied Jewish cabbala and tried to smooth away the differences between Platonism and Aristotelianism.

6. Sed cur tacet de reliquis quem tractaturum de omnibus sufficienter et docte in proemiis nostris promittamus. Cur inquam cum de decima, nona, octavaque sphaera, de Saturno, item Sole et Luna fecerit mentionem, de quatuor qui supersunt Venere et Mercurio, Iove item et Marte ne verbum quidem... hoc est praecipuum concludi à Sole Iovem et Martem, à Luna vero Venere et Mercurium... deque Sole ac Luna, qui reliqua complectuntur... Joannes Picus Mirandola,

Heptaplus, de septiformi sex dierum Geneseos enarratione. lib. II, c. 3. In: *Opera Omnia* Ioannis Pici, Mirandulae Concordiaequae comitis. Basileae 1557, p. 19–20. The full quotation in n. 63–65 on p. 32–33.

Augustine does something similar, when minimizing the fact that the Book of Genesis is silent about the element Air, when he interprets “heaven” as meaning “air” (*De gen. ad litt.* lib. II (IV) n. 7; *Opera* III, 227 A). And again in the following: *Nec ullo modo arbitrandum est praetermissum esse in hac Scriptura mundi hujus elementum, cum quatuor notissimis eum constare persuasum sit, quia videtur hic coelum, et aqua, et terra commemorari, de aere autem taceri. Consuetudo quippe nostrarum Scripturarum est, aut coeli et terrae nomine mundum appellare, aut interdum addere et mare. Aer itaque vel ad coelum pertinere intelligitur, ...; vel ad terram propter hunc turbulentum et caliginosum locum, qui humida exhalatione pinguescit, quamvis et ipse saepius coeli nomine nuncupetur: ac per hoc non scriptum est, Producant aquae reptilia animarum vivarum, et producat aer volatilia volantia super terram; sed utrumque hoc animantium genus ex aquis productam esse narratur.* Augustinus, *De gen. ad litt.*, lib. III (III) n. 5; *Opera* III, 247 D – 248 A–B.

Later commentators had the same opinion. Isidore of Seville (c. 560–636) even went so far as to quote Lucretius to corroborate this interpretation: *Interdum et coelum pro aere accipitur, ubi venti et nubes procellae et turbines fiunt, Lucretius, Coelum quod dicitur aer, et Psalmus, Volucres coeli appellat ... cum manifestum est aves in aere volare.* Isidorus Hispalensis, *Originum libri viginti*, c. 4; ed. B. Vulcanius, Basileae 1577, col. 313.

40.

think that the world was created in an instant and that [the act of] creation was distinguished into certain parts so as to relate it in an orderly way¹. Certainly the vacuum in Job is not to be understood in the Aristotelian sense², when it is said: “Who stretcheth out the north over the void, and hangeth the earth upon nothing”³. Likewise in the New Testament: “Except the seed, which is cast in the ground, die” etc.⁴, the discourse is adapted to popular understanding. Natural philosophers would certainly deny that dead seed grows into a plant and bears fruit. The authority of Holy Scripture, then, is not thereby damaged, if we admit that David⁵ paid heed to popular opinion on such matters. If the Holy Spirit had thought it necessary for salvation to tell that the earth was only the bed of the waters, who better than He could have shown us by maps

1. Sed quia illud unde fit aliquid, etsi non tempore, tamen quadam origine prius est, quam illud quod inde fit; potuit dividere Scriptura loquendi temporibus, quod Deus faciendi temporibus non divisit. Augustinus, *De gen. ad litt.*, lib. I (XV) n. 29; *Opera* III, 215 A.

Aut si quod de terra dictum est, non temporis intervallo, cum simul Deus materiam rebus creaverit, sed narrationis distributione intelligunt dictum; ... *De gen. ad litt.* Lib. II (XV) n. 31; *Opera* III, 240 C.

Ita jam non ex alio Scripturae sanctae libro profertur testimonium quod omnia simul Deus creaverit; sed vicina testificatio paginae consequentis ex hac re nos admonet, dicens, *Cum factus est dies, fecit Deus coelum et terram, et omne viride agri*: ut istum diem et septies intelligas repetitum, ut fierent septem dies; et cum audis tunc facta omnia, cum factus est dies, illam senariam vel septenariam repetitionem sine intervallis morarum spatiorumque temporalium factam, si possis, apprehendas; si nondum possis, haec relinqueas conspicienda valentibus... Augustinus, *De gen. ad litt.*, lib. V (III) n. 6; *Opera* III, 303 B–C.

2. According to the Atomists (Leucippus, Democritus, Epicurus, Lucretius) the universe essentially is nothing but atoms and empty space. This doctrine was vigorously combated by Aristotle and the scholastic philosophers.

3. Job 26:7.

4. Cf Joann. 12:24-25. "Nisi granum frumenti cadens in terram, mortuum fuerit..."
5. This reminds us that we are dealing with Ps 103 (104):6 and 9 (see above p. 38 of the treatise), i.e. with the waters originally covering the whole earth, which then were brought into one place (which was interpreted as an accommodation to the opinions current in the Psalmist's (David's) time.

41.

land known at that time, land explored in our time, and land to be discovered after some centuries, so as to convince us clearly that lands everywhere lay beneath the waters? In fact, since the words of Scripture are concerned with sublime and totally different realities, they should not be alleged to censure the Philosophers. But we must pay attention to the things which Scripture desires us to observe, as is stated in the presentation of the thesis of this disputation.

[*The firmament*]

St. Augustine, in spite of the fact that the Scripture appears clearly to teach what should be understood by "firmament" in the work of the fourth day¹, yet has praise for him who, because of the authority of Scripture, has managed to find an interpretation about the waters above the firmament both plausible and acceptable to the senses; namely that the clouds in the air

1. In *De genesi ad litteram* Augustine deals with the "firmament", when interpreting the *second* day of creation (lib. II, c. I: Et dixit Deus, Fiat firmamentum in medio aquarum). When he treats the *fourth* day (lib. II, cap. XIII: Fiant luminaria in firmamento coeli), the firmament is *not* mentioned. In *De genesi imperfectus liber* the problem of the firmament is only lightly touched when dealing with the *fourth* day.

42.

should be called waters, – which they are potentially – *and the space between us and them "the firmament", since in the Scriptures the air is often called "heaven"*¹. Thus also the passages in the Psalms could perhaps be understood in another way. Natural philosophers [commenting] on "Meteorologica"², when discussing the waters that pour forth from the mountains or from caves in the earth, say that air that enters the caves is changed into water, because of the surrounding coldness, and because, when this [water] falls by its gravity, air immediately comes in from the outside, and brings it about that the rivers remain always. *Therefore, air is nothing but potential water*³, being dissolved into water, either by the surrounding coldness, as said above, or by divine power, as happened in the Flood. Wherefore also the Apostle Jude says that the heavens, too, perished in the Flood⁴, speaking as men do commonly,

1. Gen. I:8: vocavit Deus firmamentum coelum; Gen. I:20: Producant aquae ... volatile super terram sub firmamento coeli; Gen. I:26: ... dominamini piscibus maris et volatilibus coeli...

Et dixit Deus: Fiat firmamentum in medio aquarum ... Et vocavit Deus firmamentum, coelum... et factum est mane dies secundus [Gen, I: 6, 8]... Utrum aut nunc illud coelum fiat, quod excedit aeris omnia spatia, eiusque omnem altitudinem, ubi etiam luminaria stellasque con-

stituuntur quarto die; an ipse aer vocetur firmamentum, merito quaeri potest. *De genesi ad litt.*, lib. II (I) n. 1; Opera Augustini III, 223 A, B.

Talibus eorum disputationibus cedens, laudabiliter conatus est quidam demonstrare aquas super coelos, ut ex ipsis visibilibus conspicuisque naturis assereret Scripturae fidem. Et prius quidem quod facillimum fuit, ostendit et hunc aerem coelum appellari... Cum ergo probasset et hunc aerem coelum dici, nulla alia causa etiam firmamentum appellatum voluit existimari, nisi quia intervallum ejus dividit inter quosdam vapores aquarum, et istas aquas quae corpulentius in terris fluitant. Et nubes quippe, sicut experti sunt qui inter eas in montibus ambulaverunt, congregatione et conglobatione minutissimarum guttarum talem speciem reddunt... Ergo ex aere, qui est inter vapores humidos, unde superius nubila conglobantur, et maria subterfusa, ostendere ille voluit esse coelum inter aquam et aquam. Hanc ergo diligentiam considerationemque laude dignissimam judico... *De gen. ad litt.*, lib II (IV) n. 7; Opera Augustini III, 227 A-C.

2. Aristoteles, *Meteorologica*, lib. I, XIII, 2; 349 b 19-27. Cf annot. 40 on p. 124.

3. According to Aristotle all "becoming" is a transition from potentiality to actuality: air (*warm* and moist) is transformed into water (*cold* and moist), when by continual strong cooling its heat is overcome by coldness. Cf Commentary p. 133.

4. This text is not in the Epistle of Jude (Thaddeus) but in II Peter 3:5-7 (Vulg.); moreover, the text is rather freely interpreted: ...coeli erant prius, et terra de aqua et per aquam consistens Dei verbo: Per quae, ille tunc mundus aquâ inundatus periit. Coeli autem, qui nunc sunt, et terra eodem verbo repositi sunt, igni reservati in diem judicii...

"...by the word of God the heavens were of old, and the earth standing out of the water and in the water: Whereby the world that then was, being overflowed with water, perished: But the heavens and the earth, which are now, by the same word are kept in store, reserved unto fire: against the day of judgment". (A.V.) There is in this passage no clear statement that the waters overflowed also the heavens. Rhetoric could have maintained as well that "world" here evidently means the inhabited "earth".

43.

as we find in Scripture: "the birds of heaven"¹, likewise: "thou knowest to judge the face of the sky"², etc. If, therefore, it be admitted then that air may in this text stand for water, *one will interpret: Thou hast suspended the earth*³, (*that is the whole globe*), *above the waters*, i.e. the air which, at God's command, would be compressed into water, and would cover the whole earth. Also the passage of Esdras: "Who shut up the sea in the midst of the waters"⁴, seems to take "air" for water. It is clear in fact that the sea was first surrounded by air. So also Habakkuk, in the well known passage: "for the earth shall be filled, that men may know the glory of the Lord, as the waters cover the sea"⁵, may be understood [as referring to] the surrounding air, or certainly the clouds, fog or vapours, as the Lord declares in Job⁶. Likewise, St. Augustine, Book I chap. 15 "*on Genesis, against the Manichees*", establishes that "*water*" also means "*air*"¹.

1. I Regum (= I Samuel) 17:44, 46; III Regum (= I Kings) 14:11 (aves coeli); Jer. 4:25; Ezech. 31:6; Dan. 2:38 (volucres coeli); Osee (Hosea) 7:12; Sophonias (Zephaniah) 1:3.

2. Matth. 16:4. (Matth. 16:3 in A.V.).

3. ...suspendit terram super aquas verbo suo. (IV Esdras (Ezra) 16:59).

4. IV Esdras 16:59.

5. Habacuc 2:14.

6. Job 26:8.

44.

Whatever interpretation, then, may be accepted, it will be clear enough that by “foundations of the earth” are not to be understood the waters, and thus, as follows from the above, they are the centres. Hence, it is rightly stated in Job that the earth is suspended above a void². For what else is a centre but a point, and what is a point but a certain relation to what is connoted³?

[5. *The new astronomy is physical truth, III b*]

Furthermore, there will not be lacking those who will bellow that it is monstrous to attribute movements to the earth, and who will take occasion to draw on and display their wisdom taken from the philosophers of nature⁴. They are ridiculous, as if God’s power could be measured by our force or our intellect. Are we to think that anything is impossible for God⁵, Who, by His Word, made the whole natural order out of nothing? Are we to tie God to the disputations of the Peripatetics about the heavy and the light, Him Who is tied to no

1. His solent reprehendere, quaerentes vel potius calumniantes, quare animalia non solum ea quae in aquis vivunt, sed etiam ea quae in aere volitant, et omnia pennata de aquis nata scriptum sit. Sed sciant omnes quos haec movent, istum aerem nebulosum et humidum, in quo aves volant, a doctissimis hominibus qui haec diligenter inquirunt, cum aquis solere deputari... Non itaque immerito non solum pisces et caetera quae in aquis sunt animalia, sed etiam aves de aquis natas esse, fidelissima Scriptura commemorat; quia per istum aerem volare possunt, qui de maris et terrae humoribus surgit. Augustinus, *De genesi contra Manichaeos*, lib. I (XV) n. 24; Opera I, 1060 A, C. This work was written about 389.

2. Job 26:7.

3. Cf pp. 21 and 33 of this tract.

4. “Ex Physicis”, i.e. from Aristotle’s book on “Physica” (on the *nature* of things).

5. The usual appeal to “rationality” here is abandoned for a moment and a voluntaristic argument introduced. See commentary p. 135.

45.

place, but Who fills the whole world and is everywhere present and powerful, and Who places the Antipodes firmly on the earth? And He Who decreed that heaven should everywhere be above, is He unable to give the earth natural movements in accord with its shape¹? Not in any way, in my opinion. Nor therefore is it necessary for us to agree with Aristotle, when he teaches that movements from the centre, to the centre, and around the centre are distinct from each other². We may indeed rightly insist, especially as mathematical reasoning compels us, that the whole earth moves in a circle, and that therefore this motion is present in all its parts. Furthermore, that motions from the centre and to the centre appear by accident in the elements³, as when air, confined by water or earth, tends upwards, and breaks out towards the place, which nature has assigned to it,

1. Compare this with Copernicus' statement: Cur ergo haesitamus adhuc mobilitatem illi formae suae a natura congruentem concedere, magis quam quod totus labatur mundus, ... N. Copernicus, *De revolutionibus orbium caelestium Libri VI*, Norimbergae 1543; lib. I, c. 8, fol. 6r.

2. Aristoteles, *De coelo*, lib I, c. 2; 268 b 17-26. Copernicus summarizes Aristotelian doctrine on this topic as follows: Itidem quoque comprobare nituntur ratione motus, et ipsius natura. Unius quippe ac simplicis corporis simplicem esse motum ait Aristoteles: Simplicium vero motuum, alium rectum, alium circularem. Rectorum autem, alium sursum, alium deorsum ... N. Copernicus, *De revol.*, lib. I, c. 7; fol. 5r.

...nempe et hoc, quod Aristoteles in tria genera distribuit motum simplicem: à medio, ad medium et circa medium, rationis solummodo actus putabitur ... Copernicus, *De revol.*, lib. I, c. 8; fol. 6 vs.

According to Rheticus, bishop Giese let the "vulgar" philosophers ponder: Amplius utrum possint tres motus, à medio, ad medium et circa medium, actu separari: et alia, quibus ut fundamentis Timaei et Pythagoreorum placita refellit. Atque haec et huiusmodi secum perpendent, si ad principalem Astronomiae finem et ad Dei et naturae potentiam ac industriam respicere voluerint ... G.J. Rheticus, *Encomium Prussiae* (added to *Narratio prima*, Gedani 1540), fol. I IIr.

3. Cf Copernicus on falling bodies: Cadentium vero et ascendentium duplicem esse motum fateamur oportet mundi comparatione et omnino compositum ex recto et circulari. Quandoquidem quae pondere suo deprimuntur, cum sint maxime terrea, non dubium quin eandem servent naturam quam suum totum ... Igitur quod aiunt simplicis corporis esse motum simplicem, de circulari imprimis verificatur, quamdiu corpus simplex in loco suo naturali ac unitate sua permanserit. In loco siquidem non alius quam circularis est motus ... Rectus autem supervenit ijs quae a loco suo naturali peregrinantur vel extruuntur vel quomodolibet extra ipsum sunt ... Rectus ergo motus non accidit nisi ... dum separantur a suo toto et eius deserunt unitatem. N. Copernicus, *De revol.*, lib. I, c. 8; fol. 6 vs.

46.

and earth that has been thrown up into the air, keeps falling downward, until it stops on the earth, or occupies the centre of the earth, that being its naturally allotted place. Wherefore we would say that to bring something into its place is nothing else than to bring it into its proper "Form", and that the ancients rightly held – in opposition to Aristotle – that like is attracted by like. For this is the reason and divine ordinance, on account of which the Sun, the Moon, the stars, and the earth are spherical, and it is not proved that heavy objects tend to reach the centre of the universe, but only towards the centre of their own globe¹.

[6. *Texts adduced against the mobility of the earth.* III c]

Indeed, if we are referred back to Holy Scripture, and someone first interprets what we have adduced about the mobility of the earth in some other way, and then alleges other passages of Scripture by which he asserts the earth's immobility, and

1. Cf Copernicus' statement that similar seeks similar, so that earthy particles agglomerate into the terrestrial globe and lunar particles into the lunar globe: Equidem existimo gravitatem non aliud esse quam appetentiam quandam naturalem partibus inditam à divina providentia opificis universorum, ut in unitatem integritatemque suam sese conferant in formam globi coeuntes. Quam affectionem credibile est etiam Soli, Lunae caeterisque errantium fulgoribus inesse, ut eius efficacia in ea qua se repraesentant rotunditate permaneant; ... Copernicus, *De revol.*, lib. I, c. 9; fol. 7r.

47.

shows the movements assigned to the Sun by God... As to his first point I will not spend much time in arguing with him, although the passages we have cited seem clear enough, and it would be easy to refute objections possible to find there. For we have not made those suggestions from eagerness to affirm them, but from a desire to investigate, – in this matter following, so far as our mediocrity allows, in the footsteps of St. Augustine¹. And we also have to take note of the fact that the Holy Spirit has not wished to compose a course of Physics, but rather a rule of life, and to teach how we may be made children of God.

Now, the passages of Scripture, which occur to us as the principal ones against the mobility of the earth, are roughly these: Isaiah 42: “Thus says the Lord God who creates the heavens and spreads them out, who settles the earth and the things which grow out of it, giving breath to the people which is on it, and His Spirit

1. “In the footsteps of St. Augustine”, cf pp. 2 and 9 of this tract.

48.

to those who walk upon it”¹. Likewise, chap. 44: “I am the Lord, who makes all things, spreading out the heavens and settling the earth, I alone and none with Me”². And later, chap. 48: “My hand also has founded the earth, and My right hand has spanned the heavens”³. David, Ps 92: “For He has so established the earth that it shall not be moved”⁴.

Ps. 101: “In the beginning Thou, Lord, hast founded the earth, and the heavens are the work of Thy hands”⁵.

Ps. 103: “Who hast founded the earth on its foundations. It will not be shaken for ever”⁶.

Ps. 118: “Thy verity is from generation to generation; Thou hast founded the earth, and it abides”⁷.

Zacharias ch. 12: “(Thus) said the Lord who spreads out the heavens, who founds the earth and forms the spirit of man within him”⁸.

On this account, the ancients believed

1. Isai. 42:5.

2. Isai. 44:24.

3. Isai. 48:13.

4. Ps 92 (93):1. “Orbis terrae” = the earth.

5. Ps 101:26 (Vulg.); Ps 102:25 (A.V.).

6. Ps 103 (104):5.

7. Ps 118 (119):90.

8. Zechariah 12:1.

49.

that the earth had been made immobile, and, following Aristotle¹, they asserted that it was placed at the centre of the universe, where it was to be in its place

of rest. But we say that it is not to be taken, as if He created an immobile world. And in support of this our belief we have, in the first place, Mathematics², in the second place, other passages of Scripture. What in heaven is more unfixed or mobile than the Moon? If, however, “to found” signified “to make immobile”, David would be saying that it [the moon], along with the rest of the stars, was immobile, when he says: “When I see Thy heavens, the works of Thy fingers, the moon and the stars which Thou hast founded”³. In a similar way, God did not render the earth immobile, either by fixing or by establishing it, for Scripture attributes the same to heaven, as when David says: “By the Word of the Lord were the heavens established, and by the Spirit of His mouth

1. Aristoteles, *De coelo*, lib. I, c. 14; 296 a 24 -297 a 8.
2. “Mathematics”, not only arithmetic and geometry, but also astronomy (one of the “more physical parts of mathematics”, as Aristotle called it). Kepler, the astronomer, called himself “imperial mathematician”. In ancient Rome the astrologers were called “mathematicians”.
3. Ps 8:4 (Vulg.); Ps 8:3 (A.V.).

50.

was all their strength (ordained)”¹. Likewise Solomon: “The Lord by wisdom has founded the earth, by understanding He has established the heavens”².

Therefore, to us the passage quoted from Ps. 103 unties the entire knot of the discussion. Just as David said that the earth was founded, – that is, fixed and established –, on its foundations, which it is to keep for ever³, so we also will correctly understand the Moon, and any other moving heavenly body, to be founded and fixed, as it were, on its stability, from which it will never decline. For it is clear that each of these bodies, by divine ordinance, is maintained in its “way of being” (as we usually say).

For, although on earth there occur corruptions, generations, and all kinds of alterations, yet the earth itself remains in its wholeness

1. Ps 32 (33):6.
2. Proverbs 3:19.
3. Ps 103 (104):5; Qui fundasti terram super stabilitatem suam: non inclinabitur in saeculum saeculi.

51.

as it was created¹. Fire, air, water, earth – everything keeps its place and fulfils the task for which it was created. Thus, as whatever Scripture means by the name “earth”, is founded on its own stability, so also are its parts, as the Psalmist bears witness when he says: “Thou hast established the sea in Thy strength”, etc². But, whether there are changes in the Moon and the other heavenly bodies, or not, I do not see, how we could determine. For, if somebody would live on the Moon, I do not think that he would be able to judge anything about changes on earth. And Nicholas of Cusa, in his “Learned Ignorance”³, argues at length that the earth also is luminous and so one of the stars⁴.

Furthermore, since motion also belongs to the way of being of the earth⁵ and of the other moving bodies, *it should be said that each of them has been founded on its stability,*

1. Aristoteles, *De gen. et corr.*, II, c. 11. "Alteratio", change, regards changes that leave the essence of a thing intact (*de gen. et corr.*, c. 4). "Generatio" and "corruptio" (coming-to-be and passing away) refer to an essential, specific, change.
2. Ps 73 (74):13.
3. Nicholas of Cusa (Kues), Cusanus (1401–1464), cardinal (1448), theologian, philosopher and mathematician.
4. ...unde si quis foret extra regionem ignis terra ista in circumferentia regionis per medium ignis lucida stella appareret, sicut nobis qui sumus circa circumferentiam regionis solis sol lucidissimus apparet... Nicolaus Cusanus, *De docta ignorantia*, lib. II, c. 12; in: Nikolaus von Kues, *Werke*, Berlin 1967, Bd I, p. 164 (Strassburg ed. of 1488, p. 47).
... Est igitur terra stella nobilis que lumen et calorem et influentiam habet aliam et diversam ab omnibus stellis... quoniam omnes stelle moventur tantum atque choruscant ut sint meliori modo..., Plato enim mundum animal dixit cuius animam absque immersione deum si concipis: et multa horum que diximus tibi clara erunt. Cusanus, *o.c.*, p. 166 (Strassb. ed., p. 48).
5. "motus... ad esse terrae... pertinet": a radically anti-Aristotelian opinion expressed in Aristotelian terms.

52.

that is, so created, that it maintains its established course, (to use a term of Pliny's), and attains its prescribed positions. And unless, for the sake of such a stability of motion, these things had been fixed in a definite and perpetual Law, we also would have no certain calculation of time, which God nevertheless wished us to have, as we read in the first chapter of Genesis¹. From all this it is plain that it cannot be proved from the sacred writings that the earth is immobile. Therefore, he who assumes its mobility in order to bring about a reliable calculation of times and motions, is not acting against Holy Scripture.

But let us come to the testimonies of Scripture concerning the Sun's mobility.

[7. *Passages from Scripture about the motion of the sun.* III d]

That the sun by its motion, assigned to it by God, is the originator of day and night and of all the changes of the seasons, and also is itself carried in an oblique circle, according to

1. Gen. 1:14.

53.

the hypotheses of Ptolemy and the ancients, seems to be proved by the following testimonies. *Genesis* 1: "And God made two great lights, a greater light to rule the day and a lesser light to rule the night and the stars, and God placed them in the firmament of heaven, that they might shine upon the earth and rule the day and the night, and to divide the light from the darkness"¹. *Genesis* 19: "The sun went out over the earth, and Lot went in to Zoar"².

Joshua ch. 10:12 ff: “Then Joshua spoke to the Lord in the day in which He delivered up the Amorite in the sight of the children of Israel, and he said in their presence: Sun, do not move over Gibeon and Moon do not move over the valley of Ajalon. And the Sun and the Moon stood still until the people had avenged themselves upon their enemies”³, and then he adds: “So the Sun stood still in the midst of heaven, and did not hasten to set for the space

1. Gen. 1:16-18.
2. Gen. 19:23.
3. Jos. 10:12-13.

54.

of one day. Never before and never since has there been so long a day¹, as when the Lord obeyed the voice of a man and fought for Israel”.

IV *Kings, ch. 20*², and *Isaiah ch. 38*, addressing Hezekiah when he was ill: “Behold, I shall cause the shadow of the lines through which it has gone down on the sundial of Ahaz to return ten lines. And the Sun went back ten lines, by which degrees it had gone down”³.

Ecclesiasticus repeats this same passage in ch. 48, speaking about Hezekiah: “In his days the Sun went back, and added life to the king”⁴.

David, *Psalms* 103: “He made the Moon for seasons. The Sun knows his setting”⁵. The passage quoted from Genesis is repeated in *Psalms* 135⁶ and in *Jeremiah ch. 37*⁷.

Baruch, ch. 6: “The Sun also

1. Jos. 10:13-14.
2. IV Reg. (II Kings) 20:8-11.
3. Isai. 38:8.
4. Ecclesiasticus (Jesus Sirach) 48:26.
5. Ps 103 (104):19.
6. Ps 135 (136):7: Qui fecit luminaria magna...
7. Jerem. 31:35.

55.

and the Moon and the stars obey, since they are magnificent and sent forth for their purposes”¹.

Ecclesiastes, ch. 1: “The Sun rises and sets and returns to his place, whence rising again he revolves through the south and turns to the north. Illuminating the universe in his course the Spirit goes on and returns along his circles”².

So David in *Psalms* 18: “He put His tabernacle in the Sun, who as a bridegroom coming from his wedding chamber rejoices like a giant to run the race; his coming forth is from the highest heaven. And his course is up till the highest [of it]; there is nothing which can hide from his heat”³. To these testimonies of Scripture concerning the motion of the Sun, the answer is not difficult. We admit that the Sun is the natural source of light, and God’s administrator,

1. Baruch 6:59.
2. Ecclesiastes (Preacher) 1:5-6. In the A.V. in vs 6 it is not the sun, but the wind that goes round: "The wind goeth toward the south... (A.V. 1:6).
3. Ps 18:6-7 (Vulg.); Ps 19:4-6 (A.V.).

56.

as the Psalmist says: "He put His tabernacle in the Sun", in order to lighten the whole of created nature, and sends forth light and it goes, and He calls it back and it obeys Him in awe¹, as is written in *Baruch*, ch. 3.

Moreover, we do not deny obvious experience, which is that thanks to the Sun we have day, spring, summer and the other seasons of the year. But when we say that we receive these things from the Sun, just as the Moon receives its light, according to its changing relation to the Sun, we do so that it may be known to the learned through the authority of Urania², to whom the lover of truth must defer. — .

Furthermore, neither do we deny the clear words of Scripture, — since it does not assign a daily and a yearly motion to the Sun and, if you would have it so, also does not assign a motion of precession, since from it

1. Baruch 3:33.
2. Here is used the term "Urania", denoting the Muse of astronomy or the starry Heaven itself. Rheticus seems to have had a predilection for it: ...ubique ipsius inter se consentientem docendi et demonstrandi Methodum nullus, cui quidem Urania est propitia, satis admirari et praedicare potest. G.J. Rheticus, *Narratio prima*, fol. C 1 vs.

Porro quae inde bona consequentia, Urania duce, collegit, ad Ptolemaei, et veterum hypotheses revocare. Rheticus, *Narratio prima*, fol. F 1 r.

...et suo illi baculo, divinos exhibens honores, ipsam Uraniam ab inferis revocatam, sibi congratulabitur... et Deo praeunte, Uraniam ad superos perduxerit, suaeque dignitati restituerit. Rheticus, *Narratio prima*, fol. F 1 vs. See also the present treatise p. 59.

In the flowery language of the Renaissance astronomers this term "Urania" was quite fitting. Gemma Phrisius used it in a letter to Dantiscus, when dealing with the work of Copernicus: "Certe videntur fato quodam Musae, relictis Pegasi fontibus in Sarmatiam commigrasse... Atque ut de aliis nunc taceam, ipsa sane Urania sedes ibi fixit novae... Gemma Phrisius to Johannes Dantiscus, from Louvain, XIII Kal. Aug. 1541. (Prowe, *o.c.* I², p. 284). Gemma had read the *Narratio prima*.

57.

the seasons, days and years are measured as from a [fixed] point. Surely, we must consider what sort of movements these are. Everything that appears to move does so either because of the motion of the thing itself, or because of the movement of one's vision, or because of the movement of the object, as well as of the centre of vision. Common speech, however, mostly follows the judgment of the senses. Therefore these differences of movement are not distinguished in this from each other. This also, when a point of view determines something, and we know that in fact the matter stands otherwise, as it may often be noticed in everyday speech and in writings as, when following the judgment

of our senses, while we sail from the harbour, we say that the land and the towns recede from us¹, and when navigating we say that the mountains and lands rise up out of the sea², and that the sun and the stars sink into it, and in our speech we do not distinguish

1. Copernicus uses the same example, quoting from Vergil, *Aeneid*, lib. III, vs 72 (see: next note).

2. Cur ergo haesitamus adhuc, mobilitatem illi formae suae a natura congruentem concedere, magis quam quod totus labatur mundus, cuius finis ignoratur, scirique nequit, neque fateamur ipsius cotidianaevolutionis in caelo apparentiam esse, et in terra veritatem? Et haec perinde se habere, ac si diceret Virgilianus Aeneas: "Provehimur portu, terraeque urbesque recedunt". Quoniam fluitante sub tranquillitate navigio, cuncta quae extrinsecus sunt, ad motus illius imaginem moveri cernuntur a navigantibus, ac vicissim se quiescere putant cum omnibus quae secum sunt. N. Copernicus, *De revolutionibus libri VI*, lib. I, c. 8; fol. 6 r.

58.

the truth from the appearances.

When, however, we think as [persons] who seek the truth about things, we distinguish in our minds between appearance and reality. As the saying goes: we will judge as the few, but speak as the many. Thus when right reason concludes that the Sun is immobile, even though our eyes lead us to think it moves, we do not abandon the accepted way of speaking. We say that the Sun rises and sets, establishes the day and the year by its motion, even though we hold this to be true only in appearance, as our reason concludes to its immobility¹. In fact, it is the same going north, when we say that the pole [star] rises, because so it seems to us. But reason knows well that it stays fixed, and only seems to grow higher as we see it, because of our own moving towards it.

1. From the Copernican standpoint "reason" demonstrates the immobility of the sun, whereas only *appearances* show him to be in motion. The text delivered to us, must be corrupt when saying that *reason* posits its mobility, for only the *senses* do so, in Copernicus' opinion.

59.

But it is too well-known to need further proof, that Holy Scripture uses common and received forms and figures of speech. Whence it is clear that, however much we insist on the many descriptions of the Sun's movement adduced from Scripture, these are to be understood as referring to its apparent motion, without in any way going beyond the bounds set by St. Augustine¹, nor introducing anything from which something inconvenient might follow. Therefore the texts of Scripture concerning the Sun's movement, which seem to argue against us, will not turn out to be at variance with the best verified results of the recent restoration of astronomy².

It is clear that, in these passages, we cannot keep to the letter, and accept the words and the letter in their proper meaning. Joshua orders the Sun not to move

1. Again an explicit appeal to St. Augustine's authority; cf pp. 2, 10, 16, 28, 33 and, in particular, p. 47.
2. The "recent *restoration* of astronomy". Cf note 2 to p. 56 ("Uraniam... dignitati restituerit". *Narr. pr.* F 1 vs). The editor (and commentator) of the third edition of Copernicus' *De revolutionibus* (Amsterdam 1617), Nicholas Mulerius, gave it the title "Astronomia Restituta".

60.

across Gibeon, and the Moon not to move across the valley of Ajalon¹. If Joshua had been in the city or on the other side of his army, it is certain that he would have seen these luminaries as though in other places, with respect to the earth. Therefore it is clear that he does not speak as a mathematician [astronomer]² and that Scripture does not depart from ordinary speech. To illustrate this: Nicholas Perotti³, a most learned man, talks in his "Cornucopia" of the comet, which was seen in the year 1471, but overlooks this, when writing that he saw it above the house of Bessarion⁴, and that it was the sign of his death⁵. Perhaps it seemed like that from his house, but it is certain that from Bessarion's house he would have seen it somewhere else. In their explanation of the miracle of the prolonging of the day effected by God in the times of Joshua and Hezekiah, interpreters insist that nothing in the order

1. Jos. 10:12.
2. "Mathematicus" = astronomer.
3. Nicolaus Perottus († 1480), Italian humanist, who was raised to high secular and ecclesiastical dignities. Jöcher, *Allgemeines Gelehrten-Lexikon* III, col. 1398.
4. Nicolaus Bessarion (1395–1472), born in Trapezunt (Asia Minor), emigrated to Italy (1438), where he became a cardinal of the Roman Church. He was the protector of N. Perottus, whom he made his secretary. He wrote theological and philosophical works in Greek and in Latin and was an advocate of Platonism.
5. Tot certe diebus ipse durare animadvertimus cometem sanguineo colore atrum, anno salutis MCCCCLXXI, Xysti pontificis maximi anno primo, singulis noctis supra, Bessarionis nostri lares errantem maxima, omnium admiratione, quo tempore designatus in Gallias legatus fuit. Unde paucis interiectis mensibus rediens Ravennae morbo inopinato medici quem secum habebat, opera correptus, extinctus est, et una literae, atque omnium bonarum artium studia perierunt, quemadmodum in illius vita latius a nobis perscriptum est. Nicolaus Perottus, *Cornucopiae, seu Latinae linguae Commentarii locupletissimi*..., Basileae 1532, col. 870 b.

61.

or progress of the seasons was changed, and each tries to show this by different arguments. If, however, the motion of the earth is assumed, this is very easy to demonstrate. It was as when Israel crossed over the Jordan: the waters coming down from above, kept increasing in mass until, by God's concession, they resumed their course. The lower waters, however, flowed on, unhindered by their natural properties¹. So, though the earth ceased from its daily motion, – to those to whom the Sun was above the horizon, the day continued until God allowed it to return to its natural course, – nevertheless we say that the Moon

held to its other apparent motions in relation to the earth and the Sun, and therefore nothing whatever in the year, nor in the month, nor in the celebration of the Passover was altered.

1. Et cum posuerint vestigia pedum suorum, sacerdotes qui portant Arcam Domini Dei universae terrae, in aquis Jordanis, aquae quae inferiores sunt, decurrent atque deficient: quae autem desuper veniunt, in una mole consistent. Jos. 3:13.

... Steterunt aquae descendentes in loco uno, et ad instar montis intumescentes apparebant... quae autem inferiores erant, in mare solitudinis (quod hunc vocatur mortuum) descenderunt, usquequo omnino deficerent. Jos. 3:16.

62.

Habakkuk, ch. 3, where, in the Spirit, he foresees the destruction of Babylon by the Medes and the Persians, alludes to the story of Joshua, saying: "The Sun and the Moon stood still in their dwelling", etc¹. This is interpreted that, just as the divine power was a help to Joshua, even so it brought assistance to the Medes and the Persians to occupy Babylon. Likewise, the Psalmist will be able to refer to this same story when, in *Psalm 75*, he predicts, in the Spirit, the destruction that was to be inflicted by the Angel on the Assyrians, saying: "From heaven Thou hast caused the judgment to be heard, o God; the earth trembled and was still, when God arose in judgment, to save all the peaceful of the earth"². Though there is no mention in the story of the movement of the earth, if it is taken literally, it could be so understood that, just as in the time of Joshua the earth, obeying the divine will in trembling,

1. Hab. 3:11: Sol et Luna steterunt in habitaculo suo, in luce sagittarum tuarum, ibunt in splendore fulgurantis hastae tuae.

2. Ps 75:9-10 (Vulg.) (= Ps 76:8-9, A.V.). Not the current version but the Vulgate (Ps 75:1) says: "In finem, in Laudibus, Psalmus Asaph. Canticum ad Assyrios". (The Assyrian king Sanehrib besieged Jerusalem (= Sion) in 701 B.C.).

Augustine's commentary is silent about Assyrians and gives a generalizing and allegorizing interpretation: "*Sion* interpretatur Contemplatio... Factus est in pace locus ejus, et habitatio ejus in Sion: id est, in contemplatione quadam et speculatione facta est habitatio ejus in *Sion*. Augustinus, *Enarratio in Psalmum LXXV*, n. 5; *Opera IV*, col. 1137 C.

"De coelo jaculatus es iudicium: terra tremuit, et quievit". Quae modo se turbat, quae modo loquitur, timere habet in fine et quiescere. Melius modo quiescerit, ut in fine gauderet. *o.c.*, n. 12-13, in vs 9-10; IV, 1143 A.

"Terra tremuit et quievit". Quando? "Cum exsurgeret in iudicium Deus, et salvos faceret omnes mites corde". Qui sunt "mites corde"? Qui frementes equos non ascenderunt, sed in humilitate sua peccata confessi sunt. *o.c.*, n. 13, in vs 10; IV, 1143 A.

63.

ceased from its daily motion when God fought for Israel¹, – so the Assyrians will fail when Thou removest their spirit from them² and they are turned to dust, and for this Thy liberation from their enemies, the remnants give Thee thanks, etc³. As far as I am concerned, anyone may interpret this passage figura-

tively, or in whatever way⁴. What to the learned and pious has seemed the most suitable assumption in all this debate, we, too, shall follow.

[8. *Epilogue*, IIIe]

As, however, everyone should in his calling, and by his talent, be of some service to the Catholic Church of Christ, the work of my lord preceptor⁵ should be examined (approved), which he gives to the Republic of Letters and which, under the guidance of mathematics, imparts to us a theory, – certain and in agreement with all the ages –, of the seasons, years and days.

1. Jos. 10:14. Non fuit antea nec postea, tam longe dies, obediēte Dominus voci hominis, et pugnante pro Israēl.
2. Here the author freely quotes Ps 75:12-13 (Vulg.) (Ps 76:11-12, A.V.): Vovete, et reddite Domino Deo vestro, omnes qui in circuitu eius affertis munera Terribili. Et ei qui aufert spiritum principum, terribili apud reges.
3. Free quotation from Ps 75:11 (Vulg.): Quoniam cogitatio hominis confitebitur tibi: et reliquiae cogitationis diem festum agent tibi. (Ps 76:10 A.V.).
4. May be an allusion to his ignoring Augustine's exegesis of this passage (see note 2 to p. 62 of the treatise.)
5. "Praeceptor meus" used again to denote Copernicus (cf p. 15).

64.

Finally, it also transmits an emended calculation of all the heavenly phenomena, whence, the way being pointed out by example, let us pursue, (in so far as God allows us), the knowledge of how the Lord also wished these most perfect bodies of the world to be known by us¹. The Philosophers say that some things are known to nature, but unknown to us. To this category let us indeed consign also disputes about hypotheses. For it appears that the Lord rightly said to Job: "Hast thou known the order of heaven, and dost thou set up its plan on the earth?"²

1. See also pp. 15-16 and 29, of the treatise and Rheticus' *Narratio prima*, fol. D 2 r: ... eo usque progrediemur, quo ipse voluit, neque ab ipso constitutos limites transgredi tentabimus.

Also Copernicus: ... veritatem omnibus in rebus, quatenus id a Deo rationi humanae permisum est, inquirere. Copernicus, *De revol.*, praefatio, fol. IIvs.

2. Job 38:33.

THE END

Commentary

1. *Introduction* (pp. 1-3)

The whole treatise would have been superfluous if Rheticus had held the opinion that astronomical hypotheses need not be true. He declares, however, that it is *demonstrated* by astronomy that, in order to account for the motions of the heavenly bodies, it is necessary to assume the mobility of the earth (p. 1). This statement leads to the question: what does Scripture say about it? Throughout the whole tract he now tries to find the answer on the basis of St. Augustine's principles of biblical exegesis. For this purpose he mainly resorts to Augustine's several commentaries on *Genesis*, but references to *De doctrina christiana* are also frequent. No other author is so often quoted as this great Father of the Church. Sometimes the precise place is indicated, but on other occasions the paraphrase of some Augustinian verdict is given without a precise reference, and very often a mere turn of phrase shows the overwhelming influence of Augustine's writings on the author. The Augustinian exegetical principles determine the limits of the exegetical freedom he allows himself. He testifies that he follows in the footsteps of St. Augustine (47; 14), and in doing so he is convinced that he remains within the bounds of catholic doctrine (1; 11; 16; 32; 33), which to him is practically identical with Augustinian doctrine. Thus he could rightly say "in nothing have I transgressed the bounds prescribed by St. Augustine" (59). Augustine is to him a guarantee that the principle of accommodation is fully "catholic"; his name eliminates any doubt of Copernicus' orthodoxy.

An Augustinian principle of exegesis, according to the author, is that the Bible is intended to teach what is necessary for salvation (8, 9): philosophy and religion should not be mixed up, and we should not back up obsolete ideas about scientific subjects as if they were apodictically stated by Scripture, which – when speaking about natural things – adapts itself to the common way of speech or to vulgar opinion (8; 28; 38-39). Holy Scripture should not be interpreted by philosophy but by itself, i.e. by comparing difficult texts with perspicuous ones that deal with the same subject (2; 11; 12).

Apart from these general principles, the interpretation of particular texts, too, is often borrowed by our author from St. Augustine (16; 33; 37; 41; 43). The literalists say that Scripture must be accepted without asking questions and

that the true understanding of all that is contained in it is to be found by use of Scripture itself and not by Reason or Philosophy and secular arts, and that the Bible, being the Word of God, needs no further proof (2). St Augustine (and our author as well) certainly agrees with this latter exegetical directive. But he would have made some qualifications, which lead (as the next chapter shows), to controversies. Augustine (and Rheticus) unquestioningly accepted the truth of the articles of the christian faith; their difference from the literalists was that they refused to attribute an apodictical character to *all* words and passages of the Bible, as they made a distinction between divine revelation in the proper sense and the time-bound ways of speech in which the absolute truths are expressed and the time-bound world-view in which they are framed.

At first sight it may seem strange that, in order to reconcile the mobility of the earth with the acceptance of Scriptural teaching, an appeal is made to a Church Father who accepted the Greek geocentric world picture which implied the *immobility* of the earth. But Augustine, too, had had to cope with passages in Genesis (“the waters above the expanse”) which did not fit in with the generally accepted (Greek) cosmology. If the highly sophisticated world-picture of Aristotle and Ptolemy was accepted by that mainstay of the orthodox (St. Augustine), without being found in the Bible, there could in principle be no obstacle to admitting the rival Copernican world-picture on the ground that it was not in the Bible.

2. *No scientific statements in Holy Scripture* (ch I. pp. 3-13)

The general principles of exegesis advanced in the first chapter of the treatise are:

- a. Holy Scripture is authoritative in the proclamation of salvation.

- b. Holy Scripture accommodates itself to everyday ways of speech when speaking of things of nature.

- c. Holy Scripture accommodates itself in some cases to common errors when speaking of things of nature.

The first thesis, which is the basis of the others, is particularly at stake in the first chapter of the tract.

In Rheticus’ opinion the aim of Genesis I is to warn against polytheism and nature-worship (in particular of the heavenly bodies which were the main gods of the Babylonians) and to proclaim the dogma that there is one God, the creator of all things. In our author’s opinion, because of this clear teaching of Scripture, the (christian) physicists are right to reject Aristotle’s doctrine of the eternity of the world (7).

Rheticus raises here an important point, which often turned up in discussions about “philosophy” (science) and religion: the general opinion was that God has left to man the difficult task of finding out how nature is and how it works¹; but those things which man *cannot* find out (e.g. whether the world

1. “And I gave my heart to seek and search out by wisdom concerning all things that are done under heaven: that sore travail hath God given to the sons of man to be exercised therewith” (Ecclesiastes 1:13). “...no man can find out the work that God maketh from the beginning to the end” (Eccles. 3:11). “Then I beheld all the work of God, that a man cannot find out the work that is done under the sun... (Eccles. 8:17).

had a beginning or not) He has *revealed* to us by a special revelation. Yet our author shows great respect for Aristotle, and he points out that the great philosopher had adduced against Plato strong arguments for the eternity of the world, arguments which cannot be refuted *logically* (7)².

On this issue Rheticus evidently shared the opinion of his Wittenberg teacher Philip Melancthon, who, though in general a strict Aristotelian, did not follow the Stagirite in every respect. The “praeceptor Germaniae” distinguished (1545) between things of which the human mind can attain a “certain and unshakable doctrine” and those secrets which divine revelation alone can teach us. Unaided reason cannot find out whether the world is eternal or only 5507 years old. As Reason cannot decide, we have to content ourselves with God’s *revelation* of the act of creation. In hindsight, there is in the doctrine of creation much that offends human reason, which, seeing no change in the laws of heavenly motions, imagines that the world has always existed and that these motions have always been there. “Yet, human curiosity should be restrained and the mind should be kept within the bounds God put around us”³. Creation, so Melancthon goes on, may seem ridiculous to the Physicists, but Aristotle’s arguments in favour of the eternity of the world have not the force of demonstrations, but are only “probable”⁴.

Rheticus approached the problem from the philosophical side: the arguments *against* Aristotle’s doctrine of the eternity of the world have not the force of demonstrations either!

He agreed with Melancthon that the problem cannot be *solved* by philosophical arguments. To both Rheticus and Melancthon the fact that Scripture clearly teaches that God created heaven and earth was a sufficient reason for rejecting any human “opinion” contrary to it⁵.

2. Aristotle (*Physica* VIII, 1, 251 b 18) advocated the eternity of the world and took position against Plato, who had said that time had taken origin together with the universe (*Timaios*, 38 B). The christian Platonists in general interpreted “*Timaios*” not as a timeless myth, but as intended “historically” and as a parallel to the history of creation of the Book Genesis (“the first book of Moses”). See below 132.

St. Augustine, too, held that Plato believed a real “creation” (ex nihilo), and that he owed this to the Hebrew tradition (*De genesi ad literam* I, n. 29 (c. 15); Opera III, 215 A-C; *De gen.* II (c. 15), Opera III, 240 C; *De gen.* V, n. 6 (c. 3), Opera III, 303 A-B). According to St. Augustine we should follow Plato in this respect (*De doctrina christiana*, lib. II, n. 60, Opera III, 75 C).

At first he believed that the prophet Jeremiah had taught Plato the doctrine of creation (*De doctrina christiana*, lib. II, n. 43, Opera III, 67 A), but afterwards he was less certain about the contemporaneity of Plato and that prophet (*Retractiones*, lib. II, c. LV, 1; Opera I, 1, 17 A).

3. *Necessaria diligentia est in omnibus doctrinis, videre, quae certo asseverari possint, quae non possint, et de quibus rebus humana ratio certam et immotam doctrinam habet. De quibus verò arcanis positus extra conspectum hominum, erudiat nos vox caelestis. Neutrum humana ratio invenire per sese potest, videlicet fuisse mundum inde usque ab infinita aeternitate, aut conditum esse recens, ante annos 5507. Haec cum ratione inveniri non possint, contenti simus ea doctrina, quam Deus certis et illustribus testimoniis tradidit... Denique multa sunt, quae vehementer offendunt rationem, si tam recens initium mundi constituatur. Tamen frenanda est humana curiositas, et continenda sunt mentes intra m e t a s, quas Deus nobis circumdebit. Philippus Melancthon, *Doctrinae physicae Elementa, sive Initia*, dictata in Accademia Witebergensi, Basileae 1550, lib. I, p. 63.*

Cf Rheticus’ treatise pp. 1-2: *Catholicae fides m e t a s non debet excedere.*

4. *Ex nihilo nihil fit, videlicet in natura condita et ordinata. Caeterorum argumentorum solutio facilis est, enim non demonstrationes, sed probabilia argumenta. Melancthon, o.c., lib. II, pp. 287-288.*

5. *...et quanquam brevitatis temporum mundi, physicis ridicula videtur, tamen doctrinam divinitus patefactam amplectamur, nec ab ea avelli nos sinamus, seu ludis Platonis, seu temerè ficta antiquitate Aegyptiorum, aut Chaldaeorum, aut aliorum... Aristoteles recitat argumenta, quibus*

Rheticus shared Aristotle's conviction that Plato borrowed from the ancient philosophers of Egypt the doctrine that the world has a beginning (7). This interpretation of Plato's myth of creation was also held by St Augustine. In particular in the Renaissance period, when a certain hostility towards Aristotle's heathenism manifested itself, Plato had the reputation of greater piety. In Plato's famous dialogue, *Timaios* declares that he has got his information from Egyptian priests, and this implied, in the opinion of his later admirers, that Plato himself had been imbued with Egyptian wisdom, so that, consequently, there was affinity between Plato's *Timaios* and the story of creation given in *Genesis*, attributed to Moses. And as Moses, too, had been instructed in the wisdom of the Egyptians, Plato's story of "creation" thus made him the "Attic Moses".

It was overlooked that Plato's demiurge did not create in sovereign freedom but had to follow as models the eternal Ideas when ordering chaotic matter into a cosmos. Moreover, *Timaios* expressly says that "gods", like sun and moon, are created but will never be destroyed; whereas in the biblical story of creation the sun and the moon are not singled out as being less creaturely than e.g. the herbs.

Following St. Augustine our author argues that the only way to silence literalists is to deny to those passages of Scripture which deal with things of nature *that* kind of absolute authority in natural science which Scripture does possess in historical and religious matters. Knowledge of nature should be acquired by scientific investigation and not by positive assertions allegedly based on the Bible (9).

On the other hand, what Scripture says about Nature should be interpreted with due respect (13). Evidently this is a warning to extremists of the opposite side, who mocked biblical passages on nature because they are not conformable to *our* scientific opinions. If such Scripture passages are not given as scientific statements, they should neither be accepted nor rejected as if they were meant scientifically. We will see below that the author uses this argument also with relation to the discrepancy between the geographical knowledge of the biblical writers and the information recently acquired through oceanic navigations⁶.

3. *Scientific data in the Bible?* (ch. II. pp. 14-32)

Having expounded Augustine's exegetical principle of accommodation, Rheticus now uses it in defence of the mobility of the earth (14), which he could easily do because, as said above, the principle of accommodation was not

movetur, ut magis existimet mundum aeternum esse... Ea argumenta... ostendemus non esse demonstrationes. Adsentiamur autem doctrinae à Deo traditae, quae ait hunc mundum conditum esse. Melanchthon, *o.c.*, lib. I, p. 64.

6. Cf Rheticus's treatise pp. 38, 40. About the impact of the discoveries see R. Hooykaas, *Humanism and the Voyages of Discovery in 16th century Portuguese Science and Letters.* Amsterdam 1979. (*Mededelingen Kon. Nederl. Akad. v. Wetenschappen, afd. Letterkunde*, 42 (1979, nr. 4)).

tied up with particular scientific ideas, but bore a merely methodological character.

Yet, the difficulty of applying it on behalf of the theory of a mobile earth should not be underestimated, as there was an age-old tradition of reconciling the Aristotelian system with the text of the Bible. To most people the Aristotelian system contained *the* truth about nature, which could not be at odds with God's revelation in Scripture. The "philosophy" of the Bible was not only deemed compatible with that of Aristotle, but it was often believed to be the root of it. To the principle of the Holy Spirit's accommodation to common speech had been added the belief that on further scrutiny the tenets of Aristotelian philosophy turn out to be conformable to Scripture.

The mobility of the earth, however, agreed neither with the letter of the Bible nor with the system of Aristotle.

That most people read the Bible through the spectacles of Aristotelian philosophy, is evident e.g. in the tenet of the immutability of biological species. The creation of plants and animals "each after its own kind" (Gen. I:11, 21, 24) implies that nothing exists by chance and that all things owe their properties not to their own eternal "nature" or Form (nor to nature-gods), but to the will of Jahveh. Moreover, it expresses the common experience that living bodies propagate only their own kind. In the context of the story of creation it has not the weight of a *scientific* assertion. Yet, the "kind" ("species" in the Vulgate) of Genesis I:21 was identified with the "species" of Greek philosophy, that is, with the Platonic concept of the eternal "Idea" and the Aristotelian concept of the immutable (substantial) Form. And thus the "constancy of species" became not only a scientific, but also a quasi-religious tenet.

Once the authority of Aristotle was established, it must have been more difficult to apply the principle of accommodation to the mobility of the earth (which is emphatically *rejected* by Aristotle) than to the hypothesis that there are eight heavenly spheres (which had been *put forward* by Aristotle). To the human eye it made no difference whether there is one expanse or eight invisible spheres, but the daily motion of the celestial bodies was immediately visible and its abandonment would undermine the Aristotelian world picture.

Yet, Rheticus (certainly in agreement with Copernicus) did precisely this: he applied the principle of accommodation to the mobility of the earth. He would not have gone so far, if he had believed that this mobility was just a "mathematical" device, and not a physical truth. And that is why he now repeats what he had said at the beginning of the treatise, viz. that his teacher's hypotheses not only agree with observed phenomena (which was said also about purely "mathematical" astronomical hypotheses), but that they may be "converted" into the facts (14): that the hypotheses and the phenomena can be mutually interchanged, like a good definition and the thing defined, a statement that had already been made in his *Narratio prima*⁷.

Next it is recognized that scientific truth is never absolute, but "reason can-

7. G.J. Rheticus, *Narratio prima*, fol. H. Iir. Quoted in note 1 to p. 14 of the treatise.

not produce any other hypotheses nearer to the truth” (14); they go as far as is granted to man to know about these divine things, “as is shown by our lord Praeceptor in his work” (15).

Here, as already pointed out, we have the decisive proof that Rheticus was the author of this anonymous tract, as nobody else could call Copernicus his teacher⁸.

The mobility of the earth in the Bible?

So far, Rheticus seems to be arguing that Holy Scripture does not contain any statement of a scientific character, and that neither the Ptolemaic nor the Copernican system could use Scripture to its own advantage. And, in good faith, he has made us suppose that the converse, too, applies: that neither the Ptolemaic nor the Copernican system can be used to interpret Scripture. Why then does he now make the disconcerting plea that he should not be accused of impiety when he inquires whether the mobility of the earth (– “a demonstrated truth” –), may lead to certain interpretations of “rather obscure passages of Holy Writ which refer to nature” (15). After all, the Aristotelian system, too, was considered a “demonstrated truth” by its adherents; but to them the right of using it for the interpretation of Scripture had been denied, and this quite independently of its being right or wrong. Had not Rheticus said that “true understanding of everything contained in the sacred writings is to be sought from Scripture itself and not elsewhere” (12), and had he not warned against reading passages touching nature “as if Scripture were a philosophical textbook” (12)? The following pages, however, make clear that these golden rules were strictly valid only when they helped to prevent the opponents of the earth’s motions from corroborating their arguments by quotations from Scripture.

It must be recognized, however, that Rheticus himself seemed to realize that he was venturing on dangerous ground. Before undertaking his risky interpretations, he makes the necessary qualifications. He quotes the Preacher, who says that man “cannot discover the work of God from the beginning to the end” (Ecclesiastes 3:17), and he declares that he does not assert the motion of the earth “as if we are heedless of our weakness” (15).

It is significant that, in spite of his loud proclamations of the truth of the Copernican system, Rheticus recognizes that even this “certainty” is but “human” and thus not infallible.

Rheticus now starts the treatment of his problem in a rather unfortunate way by giving the impression that St. Augustine, while favourably inclined toward the idea of an immobile heaven, implicitly admitted the possibility of the motion of the earth. Augustine had referred to certain co-believers who doubted that the heaven moves, for (so they said) when it is called a “firmament”, it must stand *firm*. Rheticus argues that Augustine did not reject their

8. On the first page of the *Narratio prima* (A IIr) already four times. On the last page (I IIvs) he speaks of “D. Doctoris mei hypothesis”.

REMBERTI DODONAEI
Cælum Empyreum. Beatorum sedes & habitaculum.



De Planetarum orbibus. Cap. VIII.

1. Diagram of geocentric universe with 9 spheres and empyreum (Dodoens 1548).

opinion, as he found a theory by which the phenomena fit in with an immobile heaven (17).

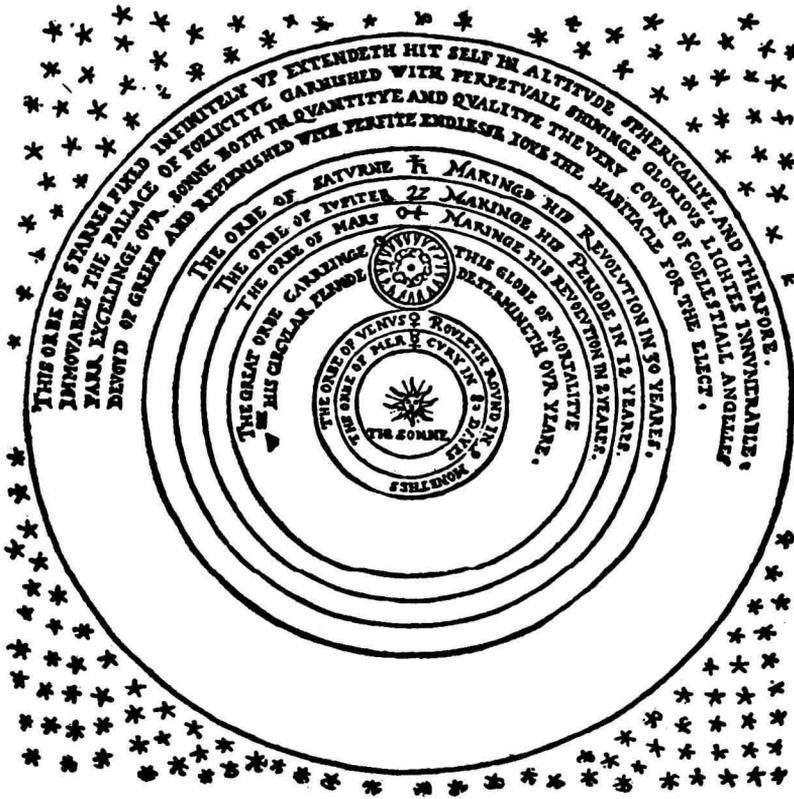
Our author, however, does not tell us *how* the Church Father reconciled an immobile heaven with the phenomena, viz. by admitting (against Aristotle's opinion) that it might be possible that the stars are *not nailed down* on the heavenly spheres, and that *they* revolve, whereas the invisible heaven itself is standing still. And it is only later on (p. 33) that we are told that in Augustine's opinion the name "firmamentum" has nothing to do with standing still, but refers to the solidity of the heaven, which makes an impassable partition between the waters above and the waters below⁹.

This shows that St. Augustine did not think for one moment that the phenomenon of the apparent daily rotation of the stars could be caused by a daily rotation of the earth.

Rheticus, though well versed in Augustine's works, makes no mention of all this, for it would not serve his own apologetic purpose. From the statement

9. See notes 1 and 2 to p. 17 of the treatise.

A perfit description of the Caeftiall Orbes,
according to the moft antient doctrine of the
Pythagoreans. &c.



2. Diagram of heliocentric universe with empyreum (Thos. Digges 1576).

that St. Augustine admitted at least the possibility of an immobile heaven, Rheticus jumps immediately to passages dealing with “heaven” as God’s dwelling-place, which is “free from all disquiet” (17). Evidently, our author was familiar with the debating trick of switching from one concept to another denoted by the same term, in order to win a point by confusing the opponent. He mixed up the so-called “heaven of the fixed stars” (for which Augustine recognized the possibility of admitting its immobility while letting the stars move independently of it) and the “empyreum”, the heaven of the blessed. According to the then current world pictures there were 8, or 9, or 10 (or even 11) heavens, which shared in a daily rotation in the geocentric universe. But the “empyreum”, the dwelling-place of the angels and of “God and His elect”, was beyond the outermost sphere (or “first moving” heaven of Aristotle), and it was supposed to be without any motion, precisely because it ought to be “free of all disquiet”. Biblical passages about God’s tabernacle could easily be interpreted as referring to that “empyreum”, which, however, had *no* relation with the problem of the rotation of the earth. The empyreum fits in with the con-

ception of movable, solid, transparent celestial spheres, but it can also go together with the Copernican system: the whole concept lies beyond the bounds of astronomy proper. In the 16th century this “heaven of the blessed” was added to the Aristotelian world picture by Petrus Apianus, Rembertus Dodoens and D. João de Castro (1538), but it figured also in the *Copernican* world picture of Thomas Digges (1576)¹⁰.

From the above it is evident that Rheticus, in his apologetic zeal, not only twists the Church Father’s exegesis in order to support his own hypothesis of the mobility of the earth, but that he also admits, rather inconsistently, the use of Bible texts on its behalf. Moreover, he uses texts proclaiming the *inalterability* of heaven as a support for the Copernican *immobility* of heaven (18).

In general Rheticus’ quotations from the Bible are taken from the Vulgate, which was the current latin translation. But on this occasion he quotes Psalm 33 from the then recent translation from the Hebrew (the *Enchiridion Psalmorum*, 1532) by bishop Dantiscus’ protégé, the Netherlandish humanist Johannes Campensis (1490–1538). In fact, it is not the translation itself but Campensis’s paraphrase of it that says that God’s tabernacle is “free from all disquiet (ab omni inquietudine liberum)¹¹, whereas the Vulgate (Ps 32) says that God’s dwelling-place is “prepared” or well-designed (de praeparato habitaculo). Though humanists, in general, liked to go back to the sources and to resort to new and better translations, in this case the preference may be due to the fact that the new translation could serve the set purpose of demonstrating that the Bible, too, says that the heaven stands still. For as a rule Rheticus quotes the Psalms from the Vulgate and not from Campensis’ edition. In general, too, he follows the Vulgate in the numeration of the Psalms; but on this occasion he speaks of Psalm 33 (and not of Psalm 32), thus, like Campensis, keeping to the Hebrew numbering.

Rheticus then interprets allusions in Isaiah, the Psalms and Job to God’s “tent” (17–18) or “seat”, as proclaiming the “immobility” of the heaven. Even the apocryphal fourth book of Ezra¹², is drawn into the service of the good

10. Petrus Apianus, *Cosmographia*, Antverpiae 1539; Rembertus Dodonaeus, *Cosmographica in Astronomiam et Geographiam Isagoge*, Antverpiae 1548; Thomas Digges, *A perfit description of the caelestiall orbes*, London 1576. The diagrams are reproduced in a.o.: R. Hooykaas, *Introdução á História das Ciências*, Coimbra 1963, pp. 30, 83. and *Science in Manueline Style*, Coimbra 1980, p. 25. This latter also inserted in (eds. A. Cortesão e Luís de Albuquerque), *Obras de D. João de Castro*, vol. IV, Coimbra 1981, pp. 231–426.

I have tried to explain why in diagrams of the universe the christian heaven is often depicted, whereas hell is ignored (except in popular descriptions). *O.c.*, pp. 23–27 and 35–40.

11. Joannes Campensis, *Enchiridion Psalmorum*. Eorundem ex veritate Hebraica versionem ac Joannis Campensis à regione paraphrasim complectens. [1532], Lugduni 1534. See note 3 to p. 17 of the treatise.

12. The Council of Trent recognized several books of the Old Testament (e.g. Liber Machabaeorum; Baruch; Judith; Tobia), as canonical, which the Reformed considered apocryphal. The third and fourth books of Ezra, however, were not recognized as canonical; they are inserted in

cause. (We may be sure that he would not have felt the temptation to follow this same book in its geography, when it says that the sea covers only one seventh of the globe¹³.)

Quite unexpectedly now is added an argument which is neither biblical nor physical, but rather metaphysical. He says that it is more appropriate to attribute motion to something that is contained than to something that is containing, and to that which is placed (located) than to that which is the place (locus). This implies that the earth (which is contained within the celestial globe) should move and not the heaven (which surrounds the earth). Rheticus uses almost the same words as Copernicus, whose manuscript he had read. Copernicus was of the opinion that since the heaven contains all things and is their common space, it is not clear why movement should not be attributed to the contained rather than to the containing, to the thing placed rather than to the thing that gives the place¹⁴.

Such arguments about what is more noble or more beautiful were also current among Aristotelian philosophers and even more among Platonists. They could easily be used on behalf of opposite theories. Copernicus and Rheticus considered the new system more harmonious and beautiful, and consequently more in accordance with the dignity of the Creator, than the Aristotelian universe; the adherents of the geocentric system held the contrary opinion.

Up till now only the *daily* motion – either of the heaven or of the earth – has been at stake. This problem had already a long history. In all discourses in which biblical passages were adduced *against* the earth's motion and *for* the sun's (daily) motion, the daily rotation was the subject. The quoted passages either seem to testify to the sun's daily motion (as in the story of Hezekiah's sun-dial on which the shadow went back, and in that of Joshua who said "sun, stand thou still", or in Psalm 19, where the sun is described as rising and running his daily course along the sky), or they seem to support the immobility of the earth, "which shall never be shaken" (Ps 92).

It had been a standard topic of medieval disputes. Aristotle had already put the question and he had demonstrated by physical arguments that the heavens rotate and the earth stands still. Medieval books on natural philosophy, which for a large part were commentaries on Aristotle's writings (e.g. "On the Heaven"), had followed him. The *annual* rotation of the sphere of the sun, however, was taken for granted.

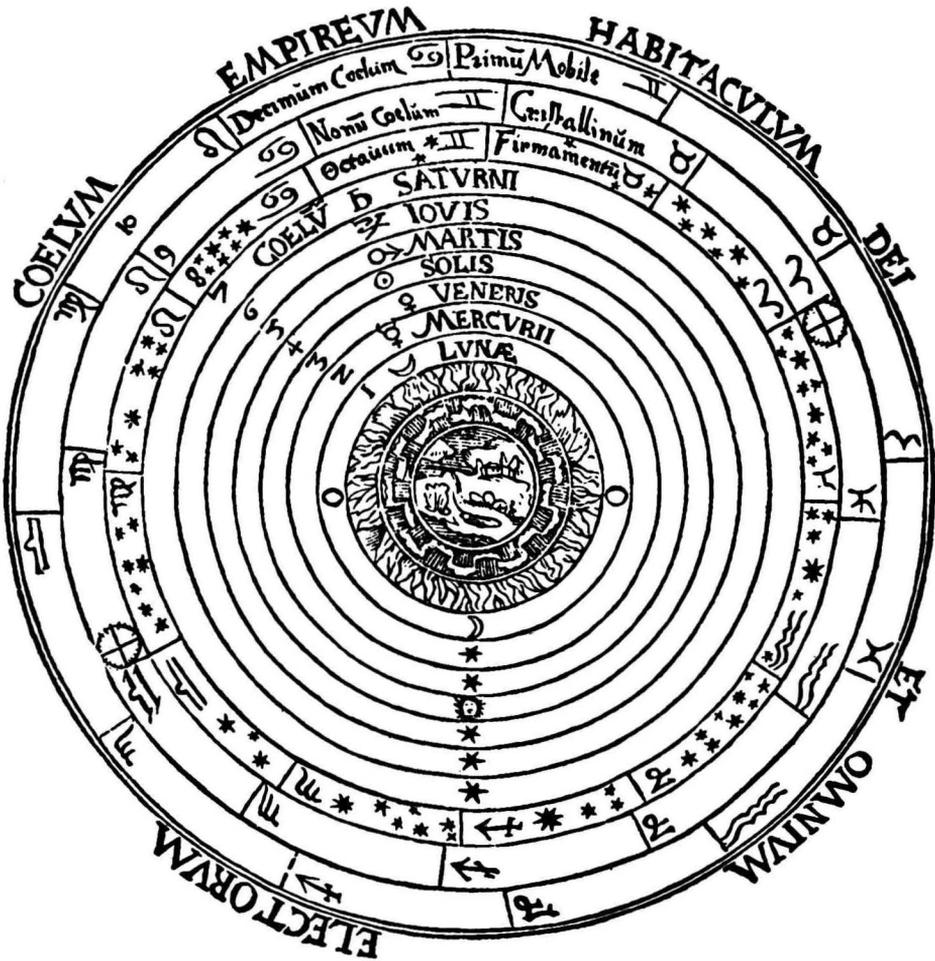
Originally, the specific daily rotation of the 8th sphere (of the fixed stars) was held to be imparted to all lower heavenly spheres, and it thus explained the apparent daily motion of all heavenly bodies. Afterwards, additional spheres,

an appendix to the Vulgate (...Libri duo..., hoc in loco, extra scilicet seriem Canonicorum Librorum, quos sancta Tridentina Synodus suscepit, et pro Canonicis suscipiendos decrevit, sepositi sunt...).

13. Et tertiâ die imperasti aquis congregari in septima parte terrae. IV Ezra 6:42. – Pierre d'Ailly, in his widely read *Ymago mundi* (1410), c. 8, as well as Roger Bacon, shared this opinion. Cf E. Buron, *Ymago mundi de Pierre d'Ailly*, T.I, Paris 1930, p. 210.

14. Copernicus, *De revol.*, lib. I, c. 5, fol. 3 vs.

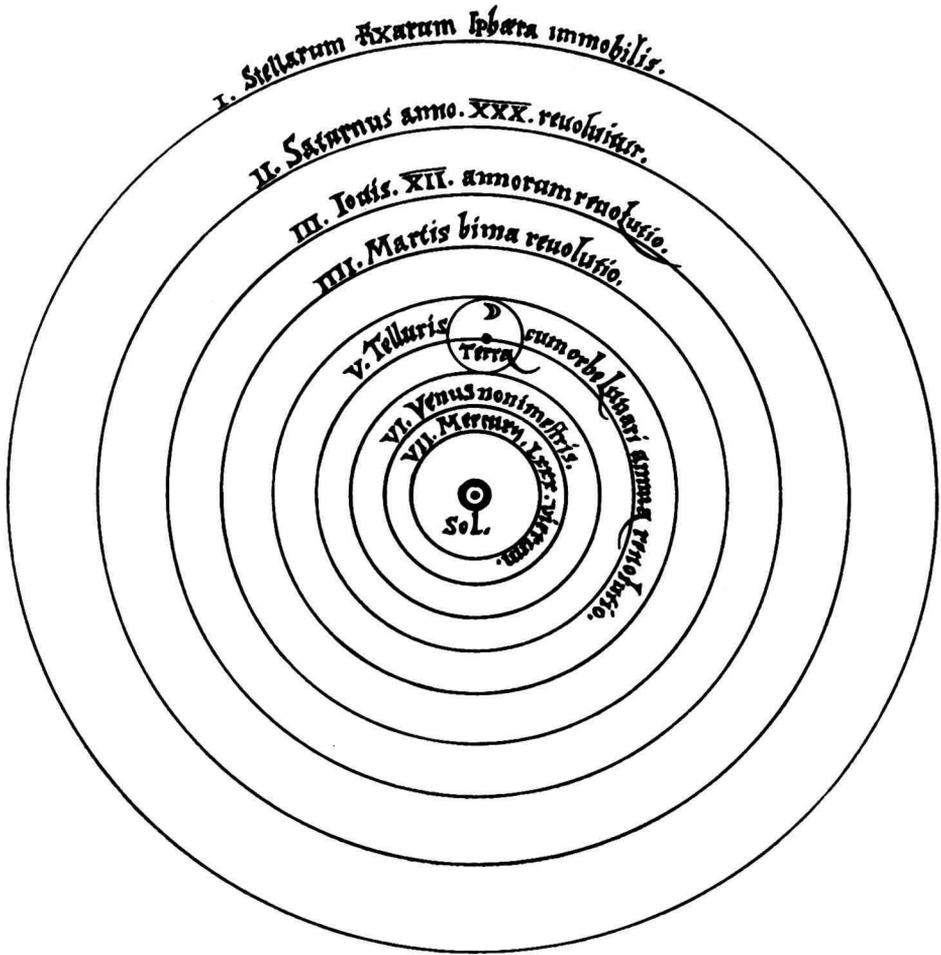
Schema huius præmissæ diuisionis Sphærarum .



3. Diagram of geocentric universe with 10 spheres and empyreum (P. Apianus 1544).

(without any stars or planets fixed upon them), were introduced beyond the sphere of the fixed stars, in order to account for slow secular movements in the heavens. The tenth sphere then became the First Movable (primum mobile), imparting its daily rotation from East to West to all lower ones. The ninth sphere had, besides this daily rotation, the secular motion of praecession from West to East. And the eighth sphere (of the fixed stars) possessed the daily rotation, the praecession and, moreover, the alleged (but spurious) periodical oscillatory motion (trepidation) superposed on the uniform praecession of the equinoxes. Each lower (i.e. planetary) sphere had also its own specific rotation.

Through Copernicus all this was changed. Not only did he advocate the daily rotation of the earth, but he also attributed to the earth an annual revolution around the sun. Moreover, he added a third motion to the earth, the motion



4. The structure of the universe according to Copernicus (*De revol.*, lib. I, c.10).

of declination, which seemed to explain the praecession of the equinoxes. Finally, he attributed to the earth two motions of “libration”, oscillatory movements which he ingeniously reduced to combinations of circular motions (uniform, circular motions being, in his opinion, the only “natural” motions)¹⁵.

Copernicus, then, transferred various motions which the medieval astronomers had attributed to the outer heavens, as well as the annual apparent motion of the sun, to the *earth*.

Having proved to his own satisfaction that several passages of Scripture agree with the Copernican tenet that the heaven stands still and the earth performs a daily rotation, Rheticus now boldly claims the conformity with Scripture also for the other Copernican motions of the earth (18-20). His arguments, not surprisingly, are far-fetched. The fact that the earth has not *one* motion but sev-

15. Copernicus, *De revol.*, lib. III, c. 2-c. 4.

eral motions is, in his opinion, suggested by passages from Job, the Proverbs and the Psalms, which speak in the plural about the foundations of the earth (18). In his opinion this plural form, “foundations”, points to the various circular motions of the earth, which must have various centres (18).

Rheticus then suddenly abandons exegetical arguments and enters into natural theological considerations on the great handiwork displayed in the harmony of these various movements. The combination of these “foundations of the earth” (i.e. of the various circular motions of the earth), is according to him the clearest revelation of God in Nature; it knits together the phenomena of the planetary world by one sole bond (*apparentium vinculum*, p. 20).

Probably, what the author wanted to say is that the motions of the earth are projected in apparent motions of the heavenly bodies, and so he could indeed maintain that Plato recognized the necessity of such a bond, though he did not know it himself (20).

To Copernicus and Rheticus this “common measure” of the periods of the revolutions of the celestial bodies was the most important cause of the celestial harmony¹⁶. When speaking about it they must have had in mind Plato’s cosmological dialogue *Timaios*, which mentions the bond that holds the world together¹⁷. The universe, Plato said, is penetrated by the world soul, “which gives to it Reason and Harmony”¹⁸, i.e. the rational relation between the planetary motions and the motion of the heaven of the fixed stars¹⁹. Consequently the “bond” may refer to the mathematical laws of motion as well as to the *cause* of these Laws (the world soul itself), and this the more so because the demiurge relates the immortality of the universe to its beauty and rationality²⁰. Again and again Plato put forward the idea that the life of the universe implies its harmony: the elements, too, are linked together by a mathematical bond, which manifests itself in “proportio” and “ratio”²¹.

When Rheticus interprets Plato’s rather vague statements about “the bond that keeps the world together” as references to the motion of the earth, he shows that his skill in using texts from classical authors for backing up his own scientific tenets was equal to his boldness in interpreting biblical passages to that same end. Copernicus did something similar when, without explicitly saying so, he established the impression that ancient writers (Hermes Trismegistos; Cicero), when they placed the sun “in the midst of” the planets, meant the same

16. G.J. Rheticus, *Narratio prima*, fol. D IIIr. Cf note 2 to p. 20 of the treatise; fol. D II vs. The “symmetry and bond” of the (Copernican) universe is more easily understood by the human soul “because of the affinity she has with the heaven” and because the Idea of those beautiful things has been implanted in our soul.

17. See the treatise p. 20 (“*cuncta componens... in connexionione fundamentorum*”) and p. 34 (*Fundamenta seu bases*).

18. Plato, *Timaios*, 36 E.

19. Plato, *Timaios*, 39 D.

20. Plato, *o.c.*, 41 B.

21. Plato, *o.c.*, 32 A.

as he himself meant by such a statement²². Yet, it is quite evident that in the former case this phrase was used in a geocentric context. Renaissance scholars tried hard to imitate the Ancients, but the result was often an extremely free handling of their spiritual heritage²³, so that, in fact, they introduced more novelties than they themselves realized.

So, Rheticus may have blamed Pico²⁴ for his exaggerations in harmonizing statements of the Pythagorean-Platonic cosmology with passages of the Bible, but to a certain extent he lapsed into something similar when suggesting that Scripture in some places reveals cosmological truth to the initiated. A text from the Book of Job – (“Who moves the world out of its place”) – is interpreted by him as referring to the *annual* motion of the earth around the centre of the Great Orbit, and the subsequent words (“...and its pillars are shaken”) – are said to refer to the other motions of the earth: “pillars”, Rheticus says, is figurative speech for the “foundations” or “centres” of the various motions. These “centres of motion” themselves are in motion, and thus the result of the “mixed motion” is a “shaking” (21)²⁵.

The problem of the “foundations” or centres of motion will turn up again when Rheticus tackles the meaning the term “foundations” has in the Bible (34-36).

Quite artificial is Rheticus’ interpretation of the second verse of the Book of Genesis: “the Spirit of God moved upon the face of the waters” (Gen. I:2). On this occasion again he leaves aside the Vulgate and resorts to what he calls “the true, Hebrew text”, which then should be read: “the Spirit of God *brooded* over the waters”. This time, however, not a humanist translation is quoted, but that of the medieval commentator of the Bible, Nicholas of Lyra, or rather the additions made to Lyra’s commentary on Genesis by Paul of Burgos, who as a former Jewish rabbi was thoroughly familiar with the Hebrew text. It is strange that Rheticus, – usually so quick to bring in St. Augustine –, does not on this occasion mention that the Church Father, too, had preferred the translation “brooding” to “moving” or “hovering”.

As “the giving of life” is a function of the Holy Spirit, – Rheticus argues with reference to Psalm 103 –²⁶, and as the daily motion is the life of natural things, it follows that this text refers to the diurnal motion (22). It is recognized,

22. Copernicus wrote: “In the middle of all sits the Sun enthroned... ruling his children the planets, which circle round him” (*De revol.*, lib. I, c. 10, fol. 9vs).

23. Cf R. Hooykaas, *Humanism and the Voyages of Discovery in 16th century Portuguese Science and Letters*, pp. 20, 25, 41.

24. See p. 39 of Rheticus’ treatise, and also pp. 32–33 of our introductory part.

25. Perhaps our author refers not only to the praecession (and “declination”), but also to the “librations” and the motion of the line of apsides. The earth (in Copernicus’ theory) takes part in 8 circular motions.

26. Ps 104:30 (A.V.): “Thou sendest forth Thy spirit, they are created: and Thou renewest the face of the earth...”. Cf John 6:63: “It is the spirit that quickeneth... the words that I speak unto you, they are spirit, and they are life”.

however, that “Nicholas of Lyra” conceived this as referring to the daily motion of the *heaven* of the fixed stars; but in the light of Copernicus’ theory, Rheticus holds that it is “more easily accommodated to the mobility of the earth” (23).

Copernicus’ “third motion”, by which the earth’s axis (and thus the pole, too) maintains practically the same direction during an annual revolution, is in Rheticus’ opinion also mentioned in the Bible²⁷. When the psalmist mentions the “ends of the earth” (27)²⁸, this is said by our author to mean that summer and spring are caused by the constant direction of the poles of the earth, so that the “declination” (third motion) emerges (25). His effort to demonstrate this is an additional proof of the early date of this anonymus work, for the followers of Copernicus soon abandoned his theory of declination and propounded the circular translation of the earth round the sun, instead of an annual rotation that goes together with an (almost) annual rotation of the earth’s axis round the axis of the ecliptic in the opposite direction.

It must be recognized, however, that Rheticus was aware of the fact that the texts he had quoted lacked the precision necessary for relating them to the motion of declination. For he says that the Spirit of God, after having entered into a matter not necessary for salvation, stopped speaking halfway (26; cf 56). Nevertheless, immediately afterwards, he draws from Jeremiah’s statement that God appointed “the ordinances of heaven and earth” (Jer. 33:25) the conclusion that the moon has its laws of motion and that – as Reason shows that the *earth* has its motions –, this text implies that God gave the laws of the motions of the earth for the same reason as He established the laws and motions of the other heavenly bodies, that is for the benefit of living beings (27; cf 31).

This teleological view was in agreement with the opinion of Copernicus, who in his dedicatory letter to the Pope wrote that the “*machina mundi*” has been created “for our sake by the best Maker, who works according to the most exact rules”²⁹.

27. According to Copernicus the “third motion” (motion of declination) is caused by the fact that the earth’s axis turns in an (almost) annual rotation around an axis perpendicular to the ecliptic in a sense opposite to the annual motion of the earth in its orbit. The fact that its period is not exactly equal to that of the annual revolution explains the praecession of the aequinoxes (Nic. Copernicus, *De revol.*, lib. I, c. 11, fol. 10 vs; *De revol.*, l. I, c. 11, fol. 11 vs).

28. Tu fecisti omnes terminos terrae; aestatem et ver tu plasmasti ea (Ps 73:17, Vulg.). The A.V. and modern translations have “summer and *winter*” (not: summer and spring) (Ps 74:17, A.V.).

29. ...coepit me taedere, quod nulla certior ratio motuum machinae mundi, qui propter nos, ab optimo et regularissimo omnium opifice, conditus esset, philosophis constaret... N. Copernicus, *De revol.*, praef. authoris, fol. IIIvs.

To Copernicus (and Rheticus) astronomy was a practical and theoretical science as well as a natural theology: the beauty, order and providential care for man manifested in the universe, reveal the character of its Creator. The *structure* of the universe as presented in the geocentric system, however, could not satisfy Copernicus’ platonizing mind. In the prooemium to the first book of *De revolutionibus* he says that he wanted “to investigate that which had been created ac-

Perhaps this verdict may damp the enthusiasm of those who proclaim that the Copernican “revolution in science” delivered Man from the anthropocentric illusion of the Christian world view and that for this reason the theologians were so much against it. This has often been claimed, but never proven. As John Donne pointed out (1610), the new theory did not change anything in religious belief³⁰. Consequently, the theological opposition was not of a *dogmatic* (doctrinal) character; it did not ensue from the fear that man would lose his central position in the universe, for this central position was not in the first place of a cosmographical and geometrical but rather of a moral character. Copernicus himself expected only opposition based on *exegetical* arguments from some theologians, and the present treatise, too, refutes only exegetical, and no doctrinal, objections against the motions of the earth. –

After having interpreted the “hinges of the earth” (I Samuel 2:8) as the poles of the axis of the earth’s daily rotation (27), Rheticus finally states that all those passages, “if the earth moves”, say something – albeit obscurely – about its motions (27).

Immediately after this seemingly modest statement (“if” and “obscurely”), he unblushingly declares that he has heeded St. Augustine’s warning against hair-splitting and over-clever interpretations and, therefore, has selected simple (!) texts without any figurative speech in them (28). However, his linking passages like the one from Jeremiah (26–27) to the motion of the earth was far-fetched in the extreme, and he must have felt this himself, for his audacious interpretations alternate with humble declarations about the weakness of human thinking.

Rheticus seems to have been convinced that there is a difference between the texts he quotes *in support* of the earth’s motions and those the “vulgar” astron-

ording to the most perfect order and is conducted by divine Providence”: “... ea praecipue amplectanda existimo, summoque prosequenda studio, quae in rebus pulcerrimis et scitu dignissimis versantur... Quis enim inhaerendo ijs, quae in optimo ordine constituta vident divina dispensatione dirigi... non assidua eorum contemplatione et quaedam consuetudine non provocetur ad optima, admireturque opificem omnium, in quo tota felicitas est et omne bonum? Neque enim frustra divinus ille psalter delectatum se diceret in factura dei et in operibus manuum eius exultandum, nisi quod hysce medijs, quasi vehiculo quodam, ad summi boni contemplationem perducamur?”. Nikolaus Kopernikus, *De revol.*, in: ed F. und C. Zeller *Gesamtausgabe*, Bd II, München 1949, p. 8. This prooemium was omitted in the printed version (1543).

30. In John Donne’s *Ignatius his Conclave* (1611), Loyola, as Lucifer’s helper, says to Copernicus: “... what new thing have you invented by which our Lucifer gets any thing? Hath your raising up of the earth into heaven brought man to that confidence, that they build towers or threaten God againe?... Do not men believe? do they not live just as they did before?... Besides... those opinions of yours may very well be true”.

Donne at that time expected the Jesuits to try to obtain a condemnation *ex cathedra* of Copernicanism. – Obviously there is no trace of the idea that man would feel *humiliated* by being thrown out of the centre. Quite the reverse: he might perhaps feel *exalted* because of his abode being raised into the heavens. For this feeling, however, there would be no reason either; for, as Donne points out: though the Copernican system may have raised mankind to a higher level, it widened much more the distance to the outer heaven (Letter of J. Donne to Sir Henry Goodere; 1615).

omers put forward *against* them. The basis of his demonstrations remains that *he* possesses the *scientifically* ascertained truthful interpretation of the Book of Nature in its astronomical aspects, and that he has obtained this knowledge by the study of nature itself and not by study of Scripture.

Though Rheticus' main principle is that the Bible teaches the way of salvation and, when speaking about nature adapts itself to popular belief or naive observation, he holds also that "under a veil" some scientific "truth" is hidden in it (15, 18-21, 34). In such cases Science may enable us to recognize it and thus to give some correct interpretations overlooked before such scientific truths had been discovered.

This procedure, however, is in flat contradiction to the Augustinian principle (which he approvingly quotes), that Scripture should be explained by Scripture alone (2; 12).

Rheticus criticized Pico for trying to "extract" all planets from the first chapter of Genesis (39), but, when extracting some Copernican tenets from the Bible he did himself something similar. It must be recognized, however, that there was a large difference of degree: to Rheticus the Bible did not deliberately and apodictically "teach" scientific truth and he had some reserves about his own exegesis; Pico's claims went further and, moreover, he rejected the idea that there is in the Bible any accommodation to popular belief. To Rheticus, on the other hand, this adaptation is the main principle of exegesis of passages touching cosmological subjects. In principle he is against efforts to obtain scientific information from the Bible. Nevertheless there is some inconsistency which weakened his otherwise strong position.

It is probable that Rheticus would have defended himself against such a critique by stressing that he did *not* let his scientific conceptions be influenced by a certain interpretation (literal or allegorical) of biblical texts, but that only *after* having ascertained his scientific tenets by reason and experience he came to a more profound insight in the meaning of some passages.

One might ask, however, what would be the use of such a cryptic information about nature (which had to wait till the 16th century to become evident), when it does not serve the essential aim of the Bible which, according to his own belief, is the revelation of the way to salvation (Cf 12)? Should some cosmological data that were in principle obtainable by scientific research have been inserted in a veiled way in order to confirm in hindsight its character of a divine revelation? But why then should the Holy Spirit demonstrate His astronomical knowledge to the benefit of people who otherwise, because of the Copernican "discoveries", might begin to doubt its reliability, whereas in the case of some *geographical* data discovered at about the same time (15th-16th cent.) no doubts about the Bible's authority were raised?

It seems that the reasons Rheticus had for his introduction of this biblical "confirmation" of Copernican tenets, were, firstly, the hope to score some points even with the literalists, and, secondly, his inclination towards "Egyptian" (and "Pythagorean") astronomy, allegedly known to Moses, "who had

been instructed in all the wisdom of the Egyptians” and who was held to be the author of the Book of Genesis.

Summarizing, we may conclude that Rheticus’ procedure is first of all to interpret those texts that are adduced against the earth’s mobility as accommodated to the common way of speech, and, secondly, to trace texts that in hindsight could be read in favour of this mobility.

Revelation of truths about nature beyond the scope of science

When Scripture says something about natural things that lie beyond the range of the senses, the senses cannot mislead us about them and thus the letter of Scripture may simply be accepted. This principle was followed by Rheticus with regard to the question whether the world has a beginning, and now he follows it with regard to the “waters above the firmament” of Genesis I:7. These waters being inaccessible to observation, no accommodation to the senses can be at stake and their real existence has to be accepted (28). On the other hand, as the *senses* judge that the sun and the heaven are moving and the earth is at rest, we seek for other interpretations than the literal one (28; cf 41), because Copernicus’ astronomy and philosophy have shown us that both tenets are wrong.

Evidently our author, when interpreting passages touching natural things, attributed greater authority to the physicists than to the theologians. It is the physicist who decides whether such a text should be taken literally, allegorically, or as an adaptation to naive observation. For the physicist has knowledge of nature, and no theologian should interfere with him. His teacher Copernicus was of the same opinion when he repudiated all interference with astronomy by non-professionals: “astronomical matters are written for astronomers”³¹.

It goes without saying that in Rheticus’ opinion, when the physicist is no adherent of the *true* philosophy, his exegesis should be rejected, as in the case of Nicholas of Lyra’s interpretation of the passage about God’s “moving the earth from its place”. It is pointed out that from Lyra’s philosophical standpoint (“as a physicist”), which implied that the earth stands still in the centre of the universe, this movement cannot refer to the whole earth, but only to some of its parts (28), i.e. to an earthquake. Rheticus himself had already used this same text in support of the annual motion of the earth (21), but now he seems to have forgotten this and he piously declares that Scripture gives precise information about all that is necessary for salvation, but that it leaves scientific information about nature to be acquired by natural philosophy (29). This latter statement is made with an equally pious qualification: “as far as God allows to human reason” (29), a phrase borrowed from Copernicus³². Similarly, Rheticus himself had written in his *Narratio prima* that he did not want to investigate

31. *Mathematica mathematicis scribuntur*. Copernicus, *De revol.*, praef. auctoris, fol. IV vs.

32. The philosopher’s task is “veritatem omnibus in rebus, quatenus id a Deo rationi humanae permissum est, inquirere”. Copernicus, *De revol.*, praef. auctoris, fol. II vs.

what lies beyond the sphere of the fixed stars, as God had evidently imposed this limit on us³³.

Having made these modest statements, the author easily glides into a digression on human ignorance, a topic beloved by many Renaissance philosophers. The man who so proudly proclaimed the complete certainty of Copernicus' theory, now recognizes with Socrates that we, human beings, know little or nothing about divine matters. We see that the world is sustained in a most perfect order, and reason concludes therefrom that a First Cause exists³⁴. But we do not know what God is, and what is His will toward us, except what He wishes us to know about these matters through His Word (29).

Evidently, the author allowed to natural theology only a subordinate role, and that mainly in astronomy (cf 20).

Our ignorance in matters of natural philosophy, too, is now pointed out: we observe the fixed laws of the rising and setting of the sun, the moon and the stars, but about the question what the Sun *is* only wholly gratuitous opinions have been put forward (30).

Rheticus then intimates that from a purely practical standpoint it does not matter whether we hold that the sun rises because of the earth's motion or because of its own motion: God grants us the knowledge and use of the *effects* of nature which have been created "above all for man's sake" (31). This would be compatible with the standpoint he so vigorously defends throughout his work, if it were not followed by the astonishing verdict: "so, it is *enough* for us to have a computation which corresponds exactly with the observed phenomena" (31).

That means that he assumes here the same position as, shortly afterwards, Osiander was to advocate in his notorious anonymous preface "to the reader" of *De revolutionibus*. In this almost skeptical mood he seems to forget that in the *Narratio prima* he had purported to demonstrate that the *realistic* conception of Copernicus' theory is scientifically true and indispensable, whereas this second treatise had to demonstrate that it is not incompatible with Holy Scripture, but even supported by it. All these claims here are suddenly dropped; he relativizes all *physical* knowledge and seems to reduce the task of astronomy to description of phenomena in a way accessible to calculation, and to renounce all claims to causal explanation.

He then emphasizes how small is our knowledge of the *causes* of natural things, and how the physicists themselves are obliged to recognize this even in apparently simple cases, e.g. when they say that a certain herb does not owe its

33. Rheticus, *Narratio prima*, D IIr. Cf note 1 to p. 29 of the treatise, and n. 1 to p. 16. While attributing the secular motions (precession, etc.) to the earth, Copernicus had made the (9th and 10th) spheres beyond the "concauum" of the fixed stars superfluous (*De revol.*, lib. III, c. 10, fol. 63 vs.).

34. Cf p. 117 the quotation in note 29 from Copernicus' (cancelled) prooemium to the First Book of *De revolutionibus*.

power and virtue to a certain proportion or equilibrium of elementary qualities, but to a specific “nature” which God has put into it (31).

In general, the inherent powers of a medicinal herb found their causal explanation in the proportion (“*temperatura*”) of the four elementary qualities (hot, cold, dry, moist) at which they had arrived by a natural strife and which was characteristic of that remedy. In many cases, however, such an explanation could not be given and the specific character was attributed to a “specific nature” of the “compound as a whole” or to an “occult quality”. Such an “explanation”, however, was considered by many contemporaries an “*asylum ignorantiae*”. Rheticus seems to be of that opinion when he compares it to Aristotle’s dubbing the unknown material of the heavens “*quinta essentia*”, by which the Greek philosopher tried to cover up his ignorance while giving a *name* to an unknown cause³⁵.

It is strange that on this occasion Rheticus puts such notorious examples of the failure of natural science to find real physical causes on the same level with the lack of certainty as to the physically true astronomical system.

Holy Scripture on the structure of the sublunar world (ch. IIIa. pp. 32–44)

The foundations of the earth

The author’s doubting mood does not last long. In the next paragraph he reverts to his old certainties and he intends to offer other interpretations of the biblical passages that were adduced against the mobility of the earth by the rather “ignorant” people. Of course he promises again to remain within the bounds of the catholic faith, a submission not to the papacy, but to the faith the Roman and the reformed Catholics had in common.

Having reminded his readers of the problem of the “firmament” (discussed already on pp. 16–17), he turns again to the question of the “foundations of the earth”, also tackled before (pp. 17–21). He had interpreted “foundations” as the centres of the circles described by the earth’s motions, and he now tells why he does so: the centre of a sphere may be called its foundation: the “foundations of the earth” are: the centre of the terrestrial globe, the centre of the earth’s annual great orbit round the sun, the centre of the small circle along which the centre of the great one moves, and the centre of the solar globe. These centres are [thanks to a rather free selection] *four*, as 4 is a perfect number in Pythagorean as well as biblical writings (34; cf 20). A veneration for Pythagoras Rheticus shared with Copernicus, who quoted Pythagoreans as being in favour of the mobility of the earth. It must have been with great satisfaction that Rheticus now could mention together the Pythagorean and the Hebrew writings, for he believed that both had derived their wisdom from the ancient Egyptians.

The “foundations of the earth”, however, give rise to another and even more difficult problem. Time and again Scripture says that the foundations of

35. “Denn eben wo Begriffe fehlen, Da stellt ein Wort zur rechten Zeit sich ein. Mit Worten lässt sich trefflich streiten, Mit Worten ein System bereiten”. Goethe, *Faust I*, vs 1995–1998.

the earth are “above the waters” (34). The literalists conclude from this text that the Bible unambiguously teaches that the earth is founded upon water. But, according to our author, this does not mean that the earth *floats* on the water, for it is also said in the Bible that the earth is *fixed* upon water (35). He puts these literalistic conceptions on the same level as the opinion of Lactantius, who ridiculed those who held that the earth is a globe (35). Following Copernicus (see above, p. 30) Rheticus singles out Lactantius as the archetype of a literalistic interpreter of the Bible, but, also like Copernicus, he adds the qualification that Lactantius was “otherwise a very learned and eloquent man”³⁶, an expression one meets again with many Copernicans, e.g. Johannes Kepler (1618), Philip Lansbergen (1629) and John Wilkins (1638).

The example was well-chosen, as the spherical shape of the earth was no point of controversy between the scholastic philosophers and the Copernicans: in the systems of Plato and Aristotle, too, the spherical shape of the universe, the heavenly bodies, and the earth was an essential tenet.

Rheticus did not add the usual criticism of Lactantius’ odd arguments against the existence of *antipodes*. Perhaps he kept quiet about this topic because his sacrosanct Augustine (who accepted the sphericity of the earth), had rejected the possibility of the existence of antipodes, though he did so not for philosophical but for theological reasons³⁷.

The passages about the earth’s *foundation upon water* did not admit of any Copernican interpretation, and they seemed to make the effort to identify “foundation” with “centre of motion” null and void. Therefore Rheticus now chooses a wholly different approach, while reverting to the principle that the Holy Spirit accommodated Himself to the way of speech or the opinions of the common people. Again Nicholas of Lyra, though himself a believer in the central position and the immobility of the earth, serves Rheticus’ purpose of using natural philosophy not so much as a basis for a right interpretation of biblical passages as to ward off a wrong interpretation. In his capacity as a philosopher Lyranus is cited as arguing that the earth is not miraculously held above the water; being the heaviest element, it is, “in the order of nature”, surrounded by water, except in some places where the land protrudes. In this way the earth (its submerged parts included) is founded *upon the centre of the universe* (35–36). This does not seem to agree with the statement in Scripture, but Lyranus was of the opinion that “Scripture speaks according to accepted popular custom”, an opinion Rheticus fully approves. Lyranus concluded that “He founded the

36. See note 4 to p. 35 of the treatise, and notes 53 and 56 of the Introductory Part.

37. In 1538 the Portuguese explorer D. João de Castro, who was an Aristotelian in philosophy, referred to Lactantius’ denial of the existence of antipodes, and he added that even Augustine held this opinion, which, however, now has been disproved by the Portuguese seafarers: “...tal engenho como de S. Augustinho teve os antipodas por patranhas”. (D. João de Castro, *Tratado da Esfera*; Obras I, p. 58).

earth above the waters” (Ps 135 (136):6) really means “adjacent to the waters” and Rheticus agrees with this interpretation, though, of course, he does not share Lyra’s opinion that the waters were indeed congregated in *one* place (36).

According to the ideal picture given by Aristotle, the sphere of the heaviest element (earth) should be wholly surrounded by a mantle of the less heavy element water. The first chapter of Genesis, too, says that in the beginning the waters covered the whole earth; on the third day, however, God decided that the waters should gather within fixed bounds, so that dry land emerged in order to provide habitation for animals and men (Gen. I:9; Ps 32:7; Ps 103:9; cf n. 6 to p. 38 of this tract). Henceforth, according to Rheticus this latter situation is “*the order of nature*” as ordained by God (*natura ordinata*). The implication seems to be that this new order, no less than the original one, consequently is a *natural* order³⁸. A never-ceasing *miracle* would be no miracle in the proper sense of a special sign from God to man.

Rheticus then refers to the “literal” explanation of “the foundation of the earth above the waters” given by St. Augustine. As he so often did, Augustine had advanced also an allegorical explanation, according to which the “earth” should refer to the simple faith of the unsophisticated believers and its confirmation by the water of baptism – (cf n. 3 to p. 37 of the tract). This interpretation, however, does not seem to be taken very seriously by Rheticus^{38b}.

According to Augustine’s *literal* interpretation the “foundation of the earth above the waters” refers to the huge caverns inside the body of the earth into which the water that had become superfluous on the third day had been gathered and on which the outer crust may be said to be “founded” (37; cf n. 2 and n. 4 to p. 37). Our author admits the existence of such caverns, as earthquakes are followed by inundations caused by the water then squeezed out of them (37).

It is understandable that he was ready to accept this “fact” and to use it in his explanation, for it linked ideas from Plato’s *Timaios* (and *Phaedo*) and from other ancient sources, with the Book of Genesis. In *Timaios* the “Egyptian” relates how Atlantis was destroyed by earthquakes and inundations; whereas according to Genesis during the Deluge the subterranean “fountains of the great deep” were broken up³⁹.

The idea of subterranean caverns was widespread among the philosophers of

38. This was also the medieval conception: ... mutatio tamen seu separatio centri aque a loco sibi in prima productione debito ad alium locum distantem, non potest causari nisi a deo qui solus est institutor naturae. In hoc enim quod deus dixit. Congregent aque etc. modo praedicto, dedit deus aliam naturalem inclinationem ab illae quam in primordio habuerant. (Lyra) *Biblia latina, cum postillis*. Norimbergae 1493, T. I, fol. A d IVr, col. 1 (de opere tertie diei).

38 b. Another reference to Augustinian allegorical and literal interpretations of the same text is given by Rheticus on p. 63 of the treatise, and here, too, he shows little enthusiasm. It is remarkable that, whereas Augustine added a cryptic *spiritual* conception to the literal one, Rheticus sometimes combined the literal interpretation with a hidden *cosmological* one.

39. *Timaios* C-D; Genesis 7:11.

Antiquity and of Rheticus' own time and it was shared by influential theologians, like the "Postillator" Nicholas Lyrensis⁴⁰.

In spite of the fact that Rheticus recognizes the truth of the generally accepted scientific image of the structure of the terrestrial globe, he is not satisfied by Augustine's interpretation, which he regards as an adaptation to a belief that had become obsolete to him and his contemporaries. He suggests (37) that the Scriptural statement is an accommodation to "vulgar cosmographers" (cf n. 6 to p. 37), i.e. to the ancient and scholastic writers on geography, who on their globes depicted seas at all places that had remained unexplored (37). But, as he will remind us later, if cosmography would be necessary to salvation, the Bible would have taught us the correct conception that there is land on all sides of the globe and that the earth is the bed of the waters (40-41).

The distribution of land and water on the globe

Rheticus now launches forth into a geographical and cosmographical discussion, which introduces another literalistic conception of "foundations above the water". In his opinion this conception is less conformable to physical reality than that of the caverns full of water. Nevertheless it is to this erroneous conception that, in his opinion, the biblical texts are usually accommodated. It is the "natural" explanation of the divine act by which the dry land emerged, – a medieval explanation of which the memory was still alive in his own time, and which Rheticus (and Copernicus, too) combated, as it was based on a geography that had recently been proved completely false.

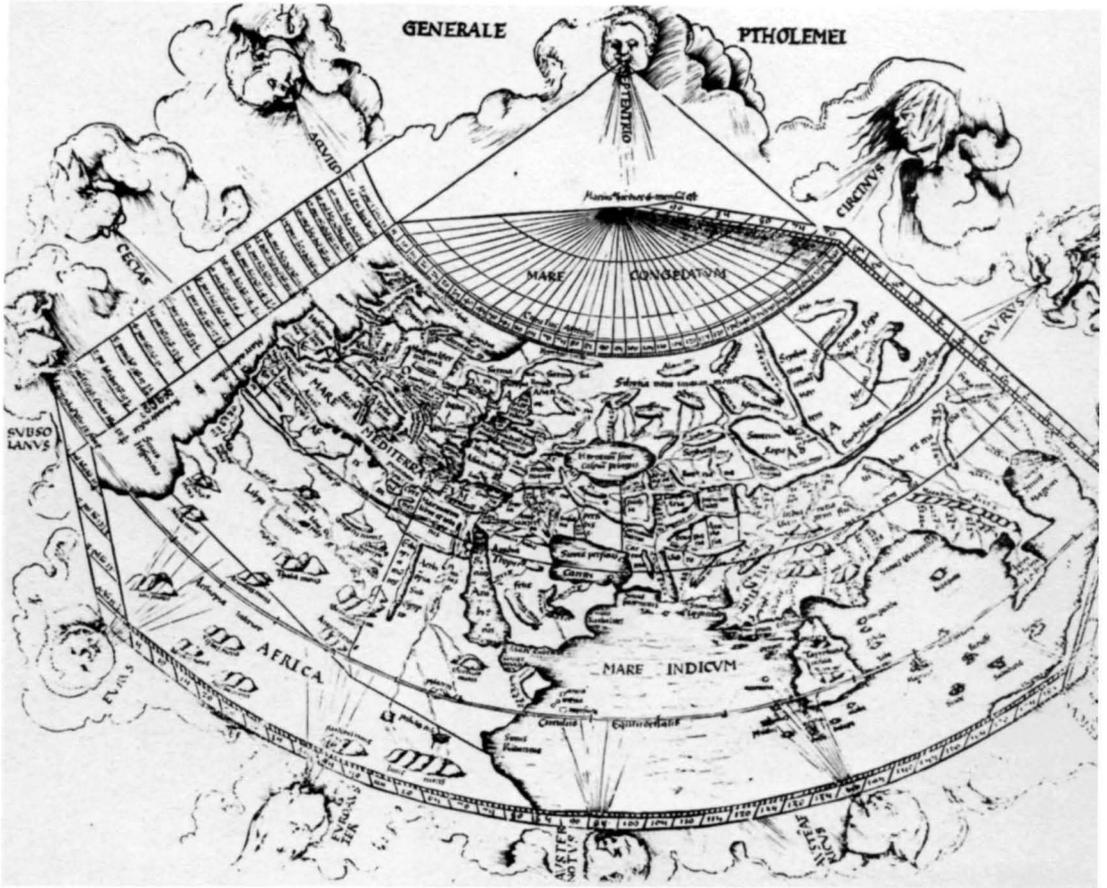
In Rheticus' time Ptolemy was not only in astronomy but also in geography *the* great authority. Since his *Geographia* had been translated into Latin (1406), it had exerted an immense influence. The multitude of editions printed in the late 15th and early 16th centuries testifies to its wide popularity amongst Renaissance scholars, for, unlike most geographers of Antiquity, Ptolemy was a "mathematician" and as such he paid much attention to latitudes and longitudes of places. He had assumed that the large mass of land known in his time (Europe, Asia and the northern part of Africa)⁴¹ covered about one fourth of the globe, and this was generally interpreted as tacitly affirming that the rest of the earth was covered by an ocean. In this way Ptolemaic geography was in

40. According to Plato there are a multitude of caverns, connected by channels with each other and with a huge reservoir in the centre of the earth (*Phaedo* 111 C-D), supplying water to rivers and seas (*Phaedo* 112 C). Aristotle, who rejected this theory (*Meteor.* II, 2, 355 b 32 ff), recognized that there are subterranean caverns filled by rain water and by the subterranean condensation of vaporous air; but most water on the surface is squeezed out of the earth as from a wet sponge (*Meteor.* I, 13; 349 b 20 –350 a 15).

The Roman philosopher Seneca supposed that there are subterranean caves filled with air (Seneca, *Quaestiones naturales*, lib. III, c. 9; lib. VI, c. 12-13), which may be the cause of earthquakes (*o.c.*, lib. VI, c. 14). Like Aristotle, he held that the air becomes water by condensation (*o.c.*, lib. III, c. 9-10), so that there are caverns full of water.

In the Middle Ages Isidorus of Sevilla held that there is a subterranean "abyss" of hidden caves from which fountains and rivers proceed. Isidorus, *Originum libri viginti*, 1. XIII, c. 20.; ed. B. Vulcanius, Basileae 1577, col. 324).

41. Ptolemy, *Almagest*, 1. II, c. 1.



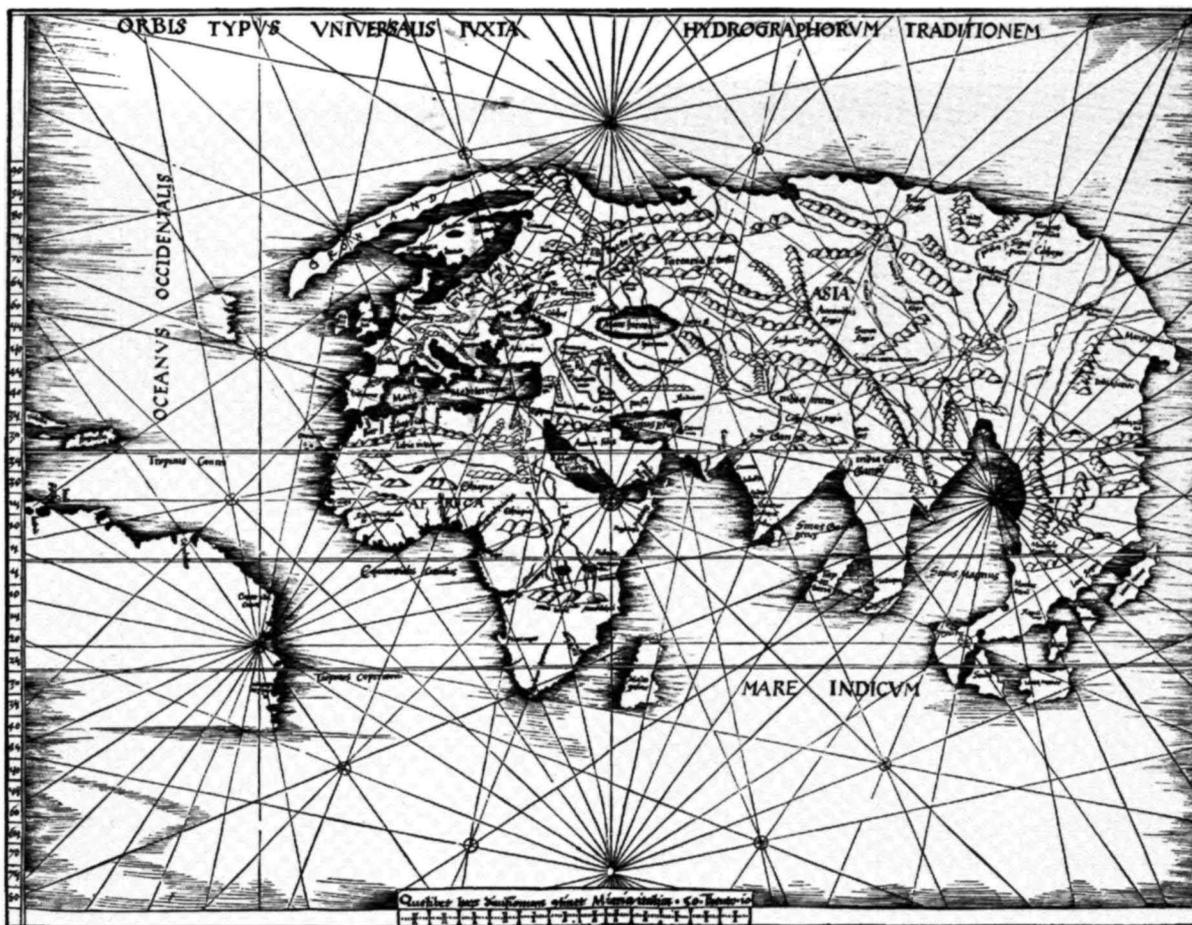
5. World map according to Ptolemy (“Geographia”, ed. Argentinae 1513 and earlier editions from 1477 on). In the south a “terra incognita” shuts off the “Indian Sea” from the Ocean.

harmony with the biblical saying that the waters were gathered into one place.

However, in many places where Ptolemaic geography had envisaged nothing but water, the Portuguese had discovered, as Rheticus says, “fertile regions” (38), and this gave the lie to the belief that there was *one* large continent, *the* dry land.

At the same time that Rheticus wrote this defence of Copernicus’ system, he addressed the dedicatory letter of his *Chorographia* to Duke Albrecht of Prussia, wherein he pointed out that “as to geography Ptolemy is of little use” for the reformation of this discipline, and that at long last the navigators “have brought us another and as it were a new world” in just those places that were formerly believed to be wholly covered by the waters of the one sea, the so-called Ocean⁴².

42. Endlich haben die gewaltige segelationes uns auch gantz wie man sagen wil, zw ainer andren und newen welt gebracht, do man vor gedacht hat, wie es alles mit wasser beflossen und nur ain mer, das man Oceanum nennet, waere. Rheticus in Frauenburg an Herzog Albrecht von Preussen, August 1541. Burmeister, *o.c.*, III, p. 29.



6. World map added to Ptolemy's "Geographia" (1513), showing the world according to the "modern" seafarers.

The voyages of discovery had also shown that the geographers had been wrong in supposing that the tropical regions are uninhabited and uninhabitable. This was a great shock, for at the moment when the reputation of ancient learning had risen to the top, it turned out that the Ancients were ignorant of many things and that they held many erroneous opinions. It became a commonplace in literature, that by the hard facts they had discovered, unlearned sailors had outdone the greatest philosophers and demonstrated that in many cases their acute reasonings were wrong⁴³.

In the preface (1540) of his edition of the *Geographia*, the Swiss hebraist and geographer Sebastian Münster (1488/89-1552) highly praised Ptolemy as an astronomer and a mathematical geographer, but he concluded that Ptolemy, al-

43. R. Hooykaas, *The Impact of the Voyages of Discovery on Portuguese Humanist Literature*, *Rev. Univ. Coimbra* XXIV (1970), 37-49; *Humanism and the Voyages of Discovery in 16th century Portuguese Science and Letters*, Amsterdam 1979, p. 14.

though surpassing all mortals in astronomy and the mathematical part of geography, was less successful in his chorography⁴⁴. This was, so he says, forgivable because one cannot describe lands if one stays in one place and has to rely on the information given by other people. In our time, however, the seafarers have visited the unknown seas and discovered innumerable new islands. All learned people have always believed that the waters were congregated in one great mass and that there could be no dry land beyond it, but now it has turned out that this opinion was wrong and that everywhere islands emerge from the sea⁴⁵.

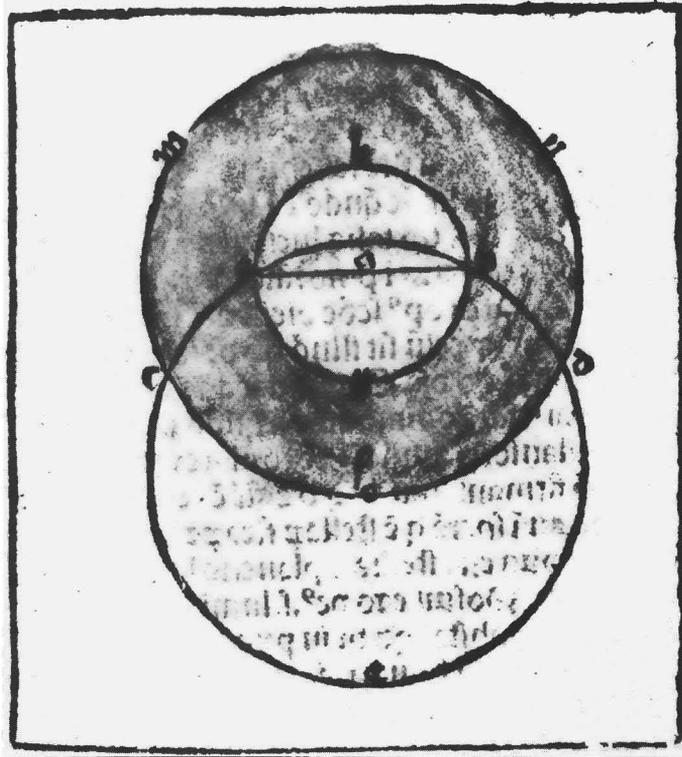
Copernicus, Rheticus, and other humanists praised Ptolemy because of his achievements in astronomical and geographical mathematics (in the *Narratio prima* the author emphasizes again and again that his D. Praeceptor has the greatest admiration for the Alexandrian astronomer), but on the other hand they must have welcomed the occasion to point out Ptolemy's fallibility in geography which helped to undermine belief in his infallibility in astronomy. It is as if the first Copernicans felt it still a hard job to overthrow Ptolemy's authority in astronomy, but found some compensation in his evident failures in geography. In the same letter in which Rheticus deems Ptolemy "of little use" for the reformation of geography, he mentions his astronomical work without any critique, alongside that of Copernicus⁴⁶. Evidently he had not yet the courage for a frontal attack on the astronomer Ptolemy.

Tackling the *geographical* problem of the distribution of land and water on the terrestrial globe in *astronomical* works was not new. Ptolemy had done so in his *Almagest* and Sacrobosco in his popular astronomical textbook *Sphaera*. Copernicus, too, devoted a chapter to this subject. Astronomy and mathematical geography were closely linked by their methods of measurement. It is therefore understandable that Rheticus dealt with the subject, the more so as it provided him with a strong argument against those biblical literalists, who had connected the "congregation of the waters unto one place" with the Ptolemaic tenet of the one coherent continent. There was similarity between Copernicus' opposition to Ptolemaic astronomy and biblical literalism, and the contemporary opposition by geographers to Ptolemaic *geography* and biblical literalism. The new geography, however, was in a stronger position than the new astron-

44. Similar remarks were made by João de Barros (*Rópica pñefma*, 1532) and Pedro Nunes (*Annotações no livro primeyro da Geographia de Ptolomeu*, 1537), both closely connected with the maritime enterprises.

45. Seb. Münster [ed.], Claudius Ptolemaeus, *Geographia*. Basileae 1540, Praefatio, fol. aa 2vs.

46. An der Astronomie hat es auch kainen fel, dan es ist nun vorhanden Ptolemaeus [Almagest] graece. So werden wir auch durch das loblich opus des achbaren und hochgelarten herren Doctoris Nicolai Copernicj, meines herren Praeceptoris, ain gewisse rechenschafft haben, der Zeit und des Jares... Aber die Geographej bleibt noch ligen, und ist wänig hoffnung, das sie selbig folkümlich moge renewret und reformirt werden. Dan der alten scripta, als Ptolemaej, wiewol sey verhanden seint, komen sey uns doch waenig in dem zw nutz". Rheticus an Herzog Albrecht von Preussen. Burmeister, *o.c.*, III, pp. 28-29.



7. Diagram showing 1° the sphere of the earth (small white globe) originally surrounded by water (dark); 2° the situation after the separation of land and water: the earth (small white globe) “floating” on the aqueous globe (large white globe). The author recognized that the proportions in the picture are not correct. (From the Additiones to Nicholas of Lyra’s Commentary on Genesis).

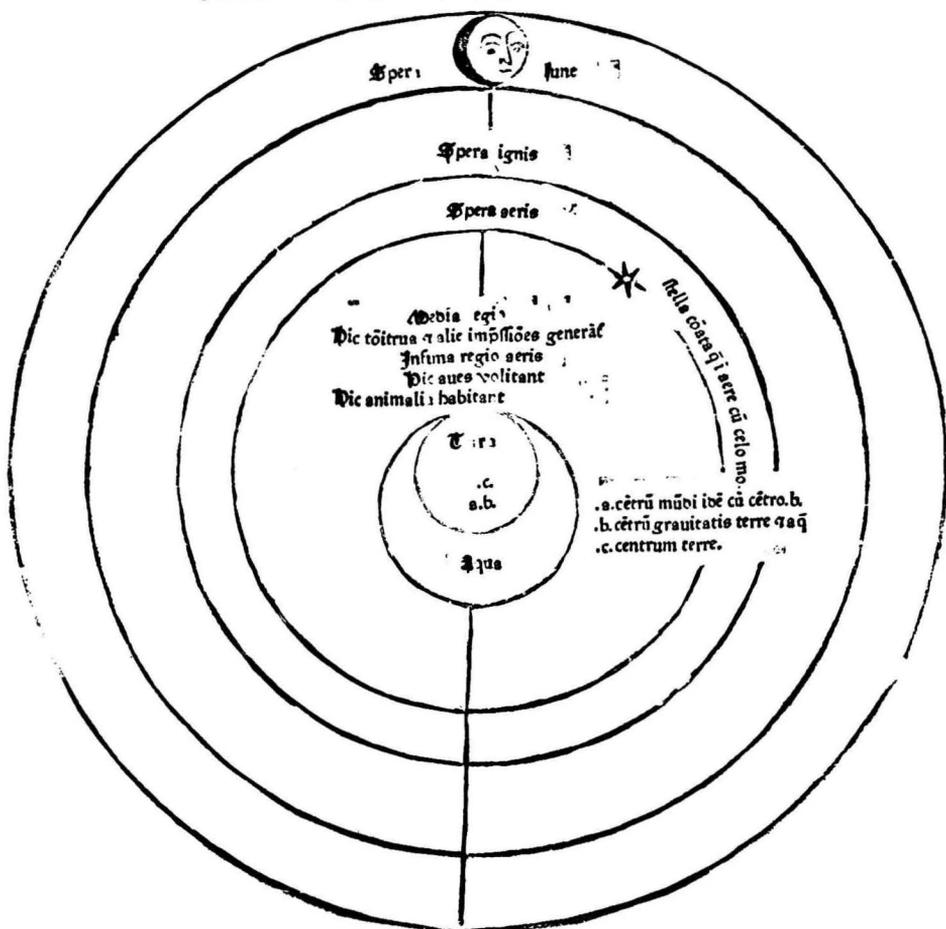
omy, as its opposition was based upon hard facts and not upon merely plausible hypotheses. Consequently, though the geographical discoveries undermined the position of the literalists already before the publication of Copernicus’ system, the new geography met with no serious opposition. Copernicus thus could use the results of the navigations as an argument by analogy for the application of the principle of “accommodation” in interpretation of “astronomical” passages of the Bible.

Our author now points out that the generally accepted opinion of the ancient cosmographers agreed with the Psalmist’s saying that “the lands are founded above the waters”, and that the Psalmist here adapts himself to the popular opinion (cf n. 3 to p. 38 of R’s tract) according to which “the whole element of earth would be in one place, like an apple floating on the water, and that in the other part the waters were congregated as it were in a bag” (cf n. 5 to p. 38 to Rheticus’ tract).

The saying that the earth is floating “like an apple” on the waters goes back to the then famous letter of Joachim von Watt (Vadianus) to Rudolph Agricola the younger (1512). In this letter the Swiss reformer criticized Lactantius for his

Quarta figura.

Hec figura scribitur quarto capitulo: In qua circulus principalis representat orbem lune: in fra que sunt quattuor elementa et omnia generabilia et corruptibilia. Ignis est calidus et siccus immediate post spheram lune situatus: ibi tam pars et clarus que est inutilibilis. Aer est calidus et humidus in tres regiones diuisus. Quas supra spheram ignis iungitur et utraq; cum celo de oriente in occidentem mouet. Aqua est frigida et humida que inter aerem et terram naturaliter situatur. Sed tamen una pars terre que est minus grauis que alia supereminet et pro magna portione discooperit aquis ut sic habitabilis. Maxima autem profunditas oceani est. xiiii. miliaria ut quidam a marinariis inuentum esse asserunt. Dicitur etiam que eadem profunditas minor est que dupla ad distantiam centri mundi et centri terre. Terra est frigida et sicca que figuram habet quasi rotundam. Cuius circuitus continet. CCC. lx. portiones totidem gradibus celestibus correspondentes: et cuiuslibet gradui correspondent in terra septingenta stadia: quorum octo valent miliaria: et duo miliaria leuca. Unde concludunt aliqui totum circuitum terre continere quindecim millia septingenta et quinquaginta leucas.



8. Diagram of the universe according to Pierre d'Ailly's "Imago Mundi" (ca 1483). a = centre of the universe; b = centre of gravity of the terraqueous globe (the same as a); c = centre of gravity of the earth.

denial of the existence of antipodes and for even "demonstrating" its impossibility⁴⁷. This topic led him to a discussion about the distribution of land and water on the globe; for, if the southern hemisphere were covered by water, the possibility of the existence of antipodes would be an unrealistic question. To

47. Ioachim Vadianus, *Ad Rudolphum Agricolum Rhetum Epistola*, Basileae 1522, fol. Gg 2r.

Vadianus, who had information about the recent geographical discoveries, the idea of a southern hemisphere wholly covered by water was an obsolete one. He rejected the conception that the earth “like a round mound or hill, emerges from a plane lake like a floating apple, – as some Ancients held –, in the manner of Nicholas of Lyra who, when expounding Moses’ Book of Genesis, shows figures in which the sphere of earth and the sphere of water are so entwisted that their parts, thus connected and linked together, do *not* form a round globe”⁴⁸.

The drawing referred to by Vadianus may be found in the “additiones” by which Paul of Burgos (1350–1435) expanded Lyranus’ commentary⁴⁹. There, Lyra’s idea that subterraneous caverns had served as receptacles for the water that became superfluous after the formation of dry land, is rejected because these caverns have too small a volume. It is supposed that on the third day of creation the centre of the aqueous globe was removed from the centre of the universe, so that one fourth of the earthy globe (the centre of which remained coincident with the centre of the universe), emerges⁵⁰. Henceforth, *water* should strive after the centre of gravity of its own mass, a centre not coinciding

48. *Videri posset hoc Rudolphe, his qui terram ex aqua, tanquam clivum rotundum aliquem ex plano lacu, iusta parte sui prominere existimant: aut veluti p o m u m natans, ut prisci quidam putarunt, quomodo Nicolaus Lyranus in exponenda Mosis Genesi, proposita figura, sphaeram terrae, et sphaeram aquae, ita innectit, ut partibus harum tantum connexis, concertisve, globum simul rotundum non absolvant. Vadianus, o.c., fol. Ff 4vs.*

Rheticus was well versed in the geographical literature of his time and he was personally acquainted with Vadianus.

The comparison of the terrestrial globe with an apple was quite usual. In 1484 the Nuremberg patrician Georg Holzschuher had paid for “the apple of the world map” (“den apffel der mapa mundi so her Martin Peham zugericht hat”), “the apple or world map like a globe” (“den apffel oder mapa mundy in die runden einer kugel geleich”). J. Willers, *Der Erdglobus des M. Beheim*. In: [ed. R. Schmitz u. F. Krafft] *Humanismus und Naturwissenschaften*, Beiträge zur Humanismusforschung Bd VI, Boppard 1980, p. 198.

The comparison of the earth with a floating body may also bear some relation to what Aristotle wrote about Thales (600 B.C.): “Others say that it [the earth] rests on water. This is the most ancient explanation that has come to us, and it is attributed to Thales of Milete. It supposes that the earth is at rest because it can float like wood and similar substances, whose nature it is to rest upon water” (Aristotle, *de coelo*, II, 13, 294 a 28). This, however, was not the opinion of the “vulgus cosmographorum”. In principle they followed Aristotle’s conception of a spherical earth surrounded by a spherical mantle of water (Aristotle, *de coelo*, IV, 5, 312 c 25 ff.; cf *De coelo*, II, 4, 287 a 32 ff.; *Meteor*, II, 2, 354 b 23 ff).

49. The drawing is reproduced in: R. Hooykaas, *Science in Manueline Style*. Coimbra 1980 (also in [eds. A. Cortesão e L. de Albuquerque]. *Obras Completas de D. João de Castro*; vol. IV, Coimbra, 1981, p. 305).

50. He compared this with the excentric spheres of the planetary orbs: *Sapientia autem divina que disposuit omnia suaviter sic disposuit ut elementum aquae servando suam rotunditatem naturalem haberet centrum separatum a centro terre et universi, sicut firmamentum astronomos... centrum quorundam orbium planetarum est separatum de centro universi. ... nam omnes aque ubicunque sint habent inclinationem ad centrum aquae ad quod fluunt cessante impedimento, sicut partes terre etiam si sint in aere et extra terram suspense supra habent inclinationem ad suum centrum.* Nicolaus de Lyra, *Postilla super Genesim*, Cum additionibus Pauli episcopi Burgensis. In: *Biblia Latina*, cum postillis Nic. de Lyra, Norimbergae 1493, T. I.

with the centre of the universe and the element of earth⁵¹. This separation of the centre of the water from that of the earth could be caused by God only; He is the only one to give nature its constitution. By saying “let the waters be gathered unto one place” God gave them a *natural* inclination different from that which He had given them in the beginning⁵².

Against the image of the “floating apple” Vadianus adduced the demonstration put forward by Pliny and Georg Peurbach (in his commentary on Sacrobosco’s *Sphaera*), which proved that earth + water form *one* sphere, as is seen by the “round” shadow of the earth during a lunar eclipse. Consequently, the land which the Creator left without water, emerges only like a small sod of grass from a morass⁵³.

This theory distinguished between the centre of the universe, the geometrical centre of the sphere of earth, and the latter’s centre of gravity. In various forms it became prevalent in the 14th century (Jean Buridan) and it was widely known through the popular work of Pierre d’Ailly. The terraqueous globe is considered to be practically spherical, but the sphere of earth is excentric with regard to the sphere of water from which it slightly emerges.

With an eye to this theory, Copernicus, without entering into the niceties of its various versions, emphatically rejected the idea that the centre of gravity of the earth does not coincide with its geometrical centre, his main argument being that the recent geographical discoveries had shown that water and (dry) land are more evenly distributed over the globe than Ptolemy and the medieval geographers had supposed, so that the dry land emerges from the waters in more than one “sod”.

Not only Rheticus’ “dominus praeceptor” in astronomy, but also his Wittenberg teacher Philip Melanchthon, the “praeceptor Germaniae”, rejected the theory of the two centers. In the latter’s opinion the center of gravity and the geometrical center of the terraqueous globe are one and the same, “as the recently found land shows that the whole earth is not covered by the ocean in the way the ancients supposed”⁵⁴.

Unlike Copernicus, Rheticus did not mention the late medieval theories of the slightly emerging “sod” and the non-coincidence of the centre of gravity and the geometrical centre. His sole purpose was to show the irrelevance of an appeal to Holy Scripture in matters of natural science. The problem of the distribution of land and water, which in the past could so easily be harmonized

51. Ex quo patet hoc pertinere ad omnipotentiam divinam solum et ad eius ineffabilem providentiam qua disponens omnia suaviter locum dedit aquis miro modo connaturale, ne ulterius terram cooperirent, iuxta illud ps. 103. Terminum posuisti quem non transgredient. *O.c.*, T. I, fol. A d IVr, col. 1.

52. See above note 50.

53. Vadianus, l. c.

54. Et quanquam multi discernunt inter centrum magnitudinis et gravitatis, tamen unum revera centrum sit, quod idem et gravitatis et magnitudinis centrum est, ut recens inventa terra ostendit, non ita circumfundi totam terram Oceano, ut veteres suspicati sunt. Philippus Melanchthon, *Doctrinae physicae elementa sive initia*, Basileae 1550, lib. I, p. 60 (first ed. 1545).

with a literalistic interpretation of Genesis 1:9 and which therefore had been such a strong weapon in the hands of his literalist opponents, could now, in the light of the modern discoveries, be turned against them. Therefore, when David wrote (Ps 103, Vulg.; 102, A.V.), that the waters were turned back, he borrowed this, in Rheticus' opinion, from Genesis I, which says that in the beginning the earth was covered by water (cf n. 6 to p. 38 of treatise). Following *the experience of his time* concerning the known parts of the earth, he held that the waters, for the sake of living beings (cf n. 1 to p. 39 of the tract), no longer covered the whole earth but had been collected in one place (39, n. 2).

Next several passages from Scripture are cited to demonstrate the adaptation to the understanding of the people (*ad vulgi captum*).

Nicholas of Lyra (or the "additiones" to his work) is again the auxiliary. He had said that the elements air and fire are not mentioned in Genesis I, and that this omission is on behalf of the uneducated people, who know only what strikes the eye (cf n. 3 and 4 to p. 39 of the tract). Rheticus adds that for the same reason only the sun and moon are mentioned and not the other five planets (Mercury, Venus, Mars, Jupiter, Saturn), "however much Pico tried to extract them therefrom" (39)⁵⁵. [We will see soon that Rheticus himself was quite able to "extract" data from Scripture].

Another example of God's stooping down to the capacity of the "uneducated" is drawn from the creation narrative in Genesis. Some people [St. Augustine in the first place] thought that the world was created in an instant, and Rheticus seems to share this opinion: the history of creation in six days serves to make the whole act more concrete [and seemingly more understandable] for the common people (40; also p. 7, n. 1). – This reminds us of Plato's *Timaios*, in which an ontological order was transformed into a chronological one for the sake of making it accessible to a wider circle.

Another example of accommodation is that the Bible at first sight seems to admit the existence of empty space ("He stretches out the North over the empty place and hangs the earth upon nothing"⁵⁶). Not only Aristotle, but also Copernicus and Rheticus rejected the idea of a vacuum as an absurdity, but in Rheticus' opinion Scripture simply adapts itself to the common people, to whom, with the exception of the earth and the heavenly bodies, the universe seems to be empty (40).

The firmament

But, now again, just after having shown how wrong it is to extract scientific

55. Rheticus had still another reason to criticize Pico. The latter had written a work against astrology (published in 1496, i.e. after his death in 1494). Rheticus, on the other hand, spoke about astrology in highly laudatory phrases (*Narratio prima*, fol. B IIr) and wrote himself prognostications. He was of the opinion that, if something like Copernicus' theory had existed in Pico's time, the Italian philosopher would have found it impossible to attack astrology (*Narratio prima*, fol. B IIIvs). See also notes 5 and 6 to p. 39 of the treatise.

56. Job 26:7.

data from Scripture, he rather inconsistently tries to discover some truths hidden in texts that seemed at first sight to propound obsolete tenets. Once more this is done under the shield of St. Augustine, who had deemed it praiseworthy to find a realistic interpretation (i.e. an interpretation according to reality as uncovered by Aristotelian cosmology) of the “waters above the firmament”. The Aristotelian system could not admit “waters above the firmament”, and Augustine tried to adapt his interpretation to it when he deemed it plausible that by these “waters” were meant the clouds (which may be transformed into water). In this way the space between the earth and the clouds could be called “firmament”⁵⁷. Rheticus seems to be sympathetic to this interpretation, as in Scripture the air is often called “heaven” (43), so that “waters above the firmament” means the (potential) “waters above the *air*”. Moreover, it is evident that the air is bordering on the terraqueous globe, so one would be free to identify firmament with “heaven” and “water” (41–42). This tortuous exegesis (which reminds one of Pico) is then corroborated by an example from Aristotle’s *Meteorologica*, showing that “air” easily turns into “water” (air is “potentially” water).

In Aristotelian physics this change of air is attributed to supervening coldness which overwhelms the heat of the air (which was *hot* and moist) and thus makes it into something “*cold* and moist”, i.e. water. Aristotle had introduced a mode of existence between not-being and being, viz. “potentially being”. An egg is not a chicken, but a “chicken in potentia”; its aim, the full realization of the Form, has not yet been wholly reached.

Now that air may be conceived as “potential water”, our author is able to expand his exegetical “tour de force”: When the apostle Peter says⁵⁸ that the heavens, too, perished in the Flood, this is, in Rheticus’ opinion, an adaptation to the common way of speech (like the biblical expression “birds of heaven” which means “the birds of the air”); it means that the air (the “heavens”) perished in the Flood, which is another way of saying that the air was condensed to water which merged with the ocean so that the whole earth was covered by water (43).

The saying that the earth is “suspended above the waters”, which Rheticus had interpreted already in this same treatise as an adaptation to the naive impression that the earth is “floating” upon the waters (or, alternatively, as the mere use of a common way of speech), now gets a “deeper” interpretation, as meaning that the earth is “suspended above the *air*”, i.e. the “air” which, at God’s command, was compressed into water. – Another passage, which says that “the sea is in the midst of the waters”, is said to become more sensible by interpreting “the waters” as meaning the air of the atmosphere that surrounds the globe of land and sea. Similarly, “waters covering the sea” is said to refer to “air, or clouds, or vapours covering the sea” (43). And all this licentious in-

57. This was also the opinion of Calvin in his commentary on Genesis.

58. II Peter 3:6. Freely quoted and even more freely interpreted. See note 4 to p. 42 of the treatise.

terpretation (firmament = heaven = air = water) is shielded by an appeal to the authority of St. Augustine (43).

After these divagations the author returns to his starting point, and recapitulates: “the earth’s being founded upon the waters” means “founded upon the air”. But, quite inconsistently, his capricious mind remembers that originally he had said that the “foundations” of the earth were the *centers* of the diverse circular motions of the earth (21; 33) and he reverts (44) to the passage in Job that describes the earth as suspended above the *void* (cf 40), which, in his opinion, is now wholly clarified.

Thus three meanings of the term “void” have been put forward. In the first concept it is an adaptation to the common people who speak of a “void” or empty space when nothing in it meets the senses. In a more scholarly conception it is interpreted as the air (43), whereas the most profound meaning conveys to the learned a message (hidden up till the Copernican revelation): the void stands for the centres of the circles of the earth’s motions, which are no concrete things, for “what else is a centre but a point?” (44). In all three cases the void is synonymous with “the earth’s foundations”.

5. *The new astronomy a physical truth* (ch: IIIb. pp. 44-46)

Rheticus’ exegetical artifices would be senseless if the mobility of the earth were not philosophically true, for what would be then the use of demonstrating that it coincides now and then with a more “profound” exegesis of some passages of Scripture? Perhaps this is the reason why in the very long third chapter the proper subject is abandoned for a moment by entering into a digression on the physical arguments for the truth of the Copernican system. This is remarkable, for in the *Narratio prima* he had not pointed out that Copernicus’ theory required a considerable change of the physical theory of motion.

Rheticus’ exposé of Copernicus’ physical principles must have been borrowed immediately from the Praeceptor, for it closely resembles what Copernicus advances in the 4th chapter of *De revolutionibus* against the Aristotelian physical principles that were used to defend the stability of the earth and the motion of the heavens.

These alternative physical principles mainly touched the daily rotation of the earth and the central position of the sun, both of which clash with the principles of Aristotle’s physics. Copernicus was no revolutionary: he changed physical principles in so far as his system of the world demanded, but for the rest he simply accepted the traditional doctrine. His disciple Rheticus did the same: we saw above that he (like Copernicus) accepted the four elements that were recognized by the main schools of Greek natural philosophy (namely those of Plato, Aristotle and the Stoics) and that he also accepted the mutability of these elements. Copernicus also maintained the Aristotelian distinction between *natural* movements (which belong to the essence, the Form, of a substance) and *violent* movements (which do not belong to their “nature” and, consequently, cannot last). This general distinction played a preponderant rôle in Copernican physics, too: it was on this issue, however, that Copernicus introduced a most

important specific change. Whereas according to Aristotle the *natural* motion of terrestrial matter is rectilinear and that of celestial matter is circular, Copernicus held that the circular motion is natural to all things, both terrestrial and heavenly.

Over against people who, with an appeal to Aristotle, cry that it is “monstrous” to attribute motion to the earth, Rheticus now says that God’s power cannot be measured by our forces and our understanding and that we cannot tie the Almighty to the Peripatetic discussions on “heavy and light” (44).

He touches here an old controversy which had become acute in the 13th century as soon as Aristotelian philosophy had gained a large influence. In 1277 the bishop of Paris, Etienne Tempier, condemned a great many theses that put limits to God’s omnipotence (e.g. God cannot give a rectilinear motion to heavenly bodies). It was a protest against the identification of what seemed possible (and rational) to Aristotelian philosophy and what is possible in Nature and is willed by the Creator. It was a clash between theological voluntarism and intellectualism and it anticipated the nominalistic empiricism in its opposition to extreme rationalism. The medieval nominalists, when suggesting things that seemed impossible and irrational to orthodox Aristotelianism, made a similar appeal to God’s omnipotence, e.g. when they tentatively suggested that the earth might have a rotatory motion or that new species might arise. But at the same time they would try to rationalize *a posteriori* their alternative hypotheses.

It is remarkable that Rheticus (who as a rule was as rationalistic in his Platonism as the anti-Copernicans in their Aristotelianism) here also chose the line of theological voluntarism: if the motion of the earth may seem non-rational, this should be no reason for rejecting it. It does not behove man to put limits to God’s power which transcends *our* reason.

Yet, Rheticus, like the nominalists, after having made a “voluntaristic” statement, tries to rationalize it. He appeals to God’s omnipotence which effectuates an event that seemed to be above reason (*viz.* the motion of the earth) and at the same time he makes this event reasonable by the argument that such circular motions fit to the spherical shape of the earth (45)⁵⁹.

Using practically the same words as Copernicus, our author argues that it is not necessary to follow Aristotle by distinguishing *three* natural motions, a rectilinear motion towards the centre of the universe (the natural motion of the *heavy* elements, earth and water), a rectilinear motion away from the centre of the universe (the natural motion of the *light* elements, air and fire), and a circular motion around the centre of the universe (the natural motion of the celestial substance of the lunar sphere and all that lies beyond it). This distinction is rejected because astronomy shows that the whole terrestrial world moves in a circle and that, consequently, its parts, too, move by nature in a circle (45).

This is a most important statement, for it implies that a fragment of the earth, when thrown upward, will keep at the same time the natural circular,

59. Copernicus asked: why should we hesitate to attribute to the earth a motion that agrees with its shape? Copernicus, *o.c.*, lib. I, c. 8, fol. 6r.

motion of the earth's globe and, consequently, fall down to the same spot on the earth's surface. It was a counter-argument to the argument adduced by the opponents of the daily rotation, who argued that, if the rotation were true, a stone could not come down on the same spot.

Next, it is said that motions towards the centre or away from the centre are not *essential* properties of the four elements, but only *accidental* ones, – (a statement showing how much the debate remained within an Aristotelian framework!) –. For example, a piece of earth projected into the air, falls down, and if possible, would go on until it had reached the centre of the earth, which is “the place allocated to it by nature” (46). Again, this is almost literally what Copernicus wrote and again it is of great significance, for it implies that the “natural place” (an Aristotelian notion!) of heavy things is not the centre of the universe (as Aristotle maintained), but that it is in (or as near as possible to) the centre of the earth itself (46); attraction is not by a *point*, the centre of the universe (as Aristotle held), but by the main body of the Earth⁶⁰ and this is also the case with the so-called “light” elements. Moreover, the centre of the universe is occupied by the sun, who in the Aristotelian system should be turning round that centre, as he is one of the planets.

The rectilinear motion of a falling stone, then, is neither a “natural” motion, nor a “violent” one (against nature). It is an “accidental” motion, caused by the “accident” of a part of the earth being separated from the mother-body to which it belongs. “Nature” tries to restore it into its right position; it is by the rectilinear fall that it returns to the place where it belongs according to its nature or “Form”. Therefore, says Rheticus, the motion towards the natural place is nothing but the motion towards its “Form” (46).

Copernicus and Rheticus thus gave an explanation of the rectilinear fall of bodies towards the earth that was wholly in conflict with Aristotelian *physics*; it remained, however, within the framework of Aristotelian *metaphysics*. For here the “form” is not the geometrical figure but it is the “Form” in the sense of Aristotelian metaphysics, which is much more than an outward shape: it is the “essence”, the “forma substantialis”, which makes a thing what it should be according to the order of Nature. A caterpillar, which has not yet reached the fullness of its being (its final aim of being a butterfly), is “moving” (i.e. changing) until it arrives at this ultimate goal. Now a fragment of terrestrial matter separated from the main body may already possess all properties belonging to its “nature” (Form), but as long as it is not in its natural place, i.e. in the Copernican view, as long as it is not united with the main body, it will have a natural tendency to attain its full being (to which its being in its natural place belongs). Consequently, it will *move* (and this time “movement or change is a local motion or change of place) towards the main body in order to reach its perfection, its full “Form”.

60. Half a century later William Gilbert mockingly called those who believe that a point (a “place”) has an attractive force: “locastris”. Gul. Gilbertus, *De mundo nostro sublunari Philosophia nova*, Amstelodami 1651, lib. II, cap. XI, p. 166. This work had been written about 1600.

On the other hand, it should be stressed that the consequence of Copernicus' and Rheticus' physics is that here a doctrine of the "ancients" (i.e. pre-aristotelian philosophers) is put forward explicitly "against Aristotle", namely the platonian tenet that like is attracted by like (46), and thus Earth attracts earthy matter, etc. This is not only why all earthy matter is gathered round the centre of the earth, but also why all solar matter is gathered round the sun, and all lunar matter round the moon, and why, in consequence, all heavenly bodies (the earth included) have a spherical shape.

In making the earth a planet, Copernicus attributed to it the planetary circular motion, and at the same time he gave the matter of each planet a property similar to that which the terrestrial matter possessed, viz. that of trying to unite with its own kind by a rectilinear motion. – In Aristotle's system celestial matter was totally different from terrestrial matter: the former had a natural circular motion, the latter a natural rectilinear one; the former was weightless, the latter either had a positive or a negative weight; the former was unchangeable, the latter was liable to change. With Copernicus and Rheticus the absolute difference between the earth and the heavenly bodies has disappeared. No complete similarity has come in its place, but the difference is specific instead of generic.

Neither Copernicus nor Rheticus gave any particulars about the matter of the planets. Evidently they recognized that this was beyond their ken (cf p. 51). Rheticus' earlier scathing remark about Aristotle's covering up his ignorance about the matter of the heaven by giving it a name, was already a sign that Rheticus rejected this fifth element: it was an obstacle to his own theory that the earth, too, had a natural circular motion.

6. *Texts adduced against the mobility of the earth* (ch IIIc. pp. 46-52).

Reverting to the proper subject of the treatise, the author now sums up the texts usually quoted against the mobility of the earth (47-48) and then provides arguments to ward off the attack based on them. The opponents refer to passages speaking of "founding" and "establishing" the earth and of "foundations of the earth", but these provide no convincing arguments against its mobility. The earth's mobility may be backed up firstly by astronomy and, secondly, by *other passages from Scripture* (49), which prove that "to found" does not mean "to make immobile". For it is also said of the *moon* that it is "founded" ("the moon and the stars which Thou hast founded")⁶¹. Yet, neither the vulgar nor the new astronomy denies the *mobility* of the moon! Moreover, Rheticus says, it is said of the heavens that they are fixed⁶² (49) and "established"⁶³, and by this remark he implies that, if we follow the way of interpretation of his opponents, these texts would be on the side of the Copernicans (who reject the mobility of the fixed stars).

Consequently, according to Rheticus, this stabilizing and founding of the

61. Ps 8:3 (Vulg.), "fundasti"; Ps 8:3 (A.V.), "ordained".

62. Ps 32:6 (Vulg.); Ps 33:6 (A.V.).

63. Proverbs 3:19.

Earth, the moon, etc. can but mean that they remain in their unchangeable mode of being (50)⁶⁴.

It is immediately recognized that on earth there is change, – (generation and corruption, transmutation) – of all things, but, the author remarks, this cannot be said of *the whole*, which remains in the state in which it has been created (51). This is genuine Aristotelianism! But there is a great difference with regard to the supralunar world, in which Aristotle did not admit any generation and corruption of its parts. Copernicus and Rheticus, however, did not make such a distinction between heaven and earth, for the latter, too, is a planet. Does this imply that there are changes on the planets similar to those on the planet Earth? Our author confesses his ignorance as it is impossible for us to ascertain this (51). But he supposes by analogy that there may quite possibly be changes on the heavenly bodies as well as on the earth. He refers then to Cusanus, who (the other way round) argued, on the ground of analogy with the luminous character of the moon, that the earth, too, must be luminous (51).

This reference suggests that our author might be influenced by “On Learned Ignorance” of this 15th-century philosopher on other points, too. Though no further references are made, several statements in Rheticus’ treatise (when he interrupts his solid assertions by relativizing remarks) give rise to this supposition. Cusanus said that we cannot grasp Truth so precisely that it could not be grasped even more precisely, and that only God has full knowledge of things: our intelligence cannot attain the true causes or the true essence (*quidditas*) of things, but only their appearances (*species*; *similitudo*), and Rheticus makes similar remarks⁶⁵.

According to Rheticus the Bible, when speaking about the world, the earth, the moon as “established”, “founded” or “fixed”, does not refer to immobility in the kinematic sense, but to a different kind of fixity or immobility, viz. the constancy of the laws of nature, the order established once and for all: if there is change (as in the transformation of one element into another), this change, too, is subject to fixed laws; and the same applies to changes of place of the earth, for motion, too, belongs to the *essence* (way of being) of *the earth* and the other moving bodies (51). “Motion belongs to the essence...”: it would hardly be possible to express more pregnantly in Aristotelian terminology the great difference from Aristotelian doctrine on this issue⁶⁶!

64. That is (in his opinion) that in this case the Aristotelian-Copernican controversy is not at issue. The moon is mobile according to both Aristotle and Copernicus; the earth, on the other hand, is mobile only to Copernicus, whereas Aristotle maintained the mobility of the Sun, which was denied by Copernicus.

65. Compare what is written above on p. 120 and below on p. 141 commenting on pp. 15–16, 31 and 64 of Rheticus’ treatise.

66. When it is said against the earth’s rotation, that if this were true, the earth would disintegrate by some centrifugal force, Copernicus gives a similar mixed counter-argument: if the earth moves, it must be a natural motion and not a violent one (This is an Aristotelian tenet, too!). If some thing moves by an outward cause (i.e. “by violence”) it would fly apart, and the motion could not persist. But a motion that takes its origin in nature does not produce decomposition (*De revol.*, lib. I, 8, fol. 5vs).

Rheticus, then, does not consider the texts about the stability of the earth as showing an accommodation to the popular belief that the earth does not move, whereas the “fixity” is meant as a fixity of a natural ontological order, the constancy of natural laws and natural species. This was a belief common to the uneducated and the philosophers, so that it can hardly be regarded as an adaptation to the capacity of understanding of the vulgar; it rather is another example of “philosophical” truth cryptically laid down in the Bible.

From the above it has become evident that, however much Copernicus and Rheticus may have admitted fundamental changes in cosmography and physics, they still remained for a large part within the framework of Aristotelian thought. It was easier to abandon Aristotle’s cosmography than to dispense with his logic, metaphysics and general physical principles. The difference between heaven and earth may have disappeared (and this is extremely important), but the permanency of Forms is maintained, and each part in the whole fabric of the world for ever performs the tasks assigned to it in the beginning. In Copernicanism the ontological and teleological conceptions which Plato, Aristotle and the Stoics had in common remained in force in a christianized version.

7. *Passages from Scripture about the motion of the sun* (ch. III d. pp. 52-63).

The author quotes a large number of biblical passages that are usually adduced to support the motions of the sun. They seem to corroborate the view that God gave motions to the sun in order to cause the alternation of day and night and the seasons, and also ordained that he moves along an oblique circle according to the hypotheses of Ptolemy and the ancients (53-55). It is now emphasized that the obvious *words* of Scripture are not denied, but it does not *really* attribute the daily and yearly motions and (perhaps) also the motion of precession, to the sun: Scripture’s statements imply only that seasons, years and days are measured by the earth’s *relation* to the sun (56).

As it is the author’s intention that neither immediate experience nor the words of Scripture should be taken at their face value, he now enters into a digression on the relativity of motion. In common speech, which is based upon sensual observation, this is not taken into account, e.g. when sailing from the harbour, we say that the land and the town recede from us (57).

Precisely the same example had been chosen by the praceptor Copernicus, who quoted some lines from Virgil in order to illustrate this⁶⁷.

The author points out that Scripture, too, while using the common way of speech, when it mentions the sun’s motion, refers to his *apparent* motion (59).

The objections against the mobility of the earth made by the Bible interpreters practically always concerned the *daily* motion (see above p. 111).

The biblical passages quoted by Rheticus stating that the sun serves “for signs, for seasons, and for days and years” (Gen. I: 14) did not play such an important role as those mentioning the immobility of the earth and the daily

67. Provehimur portu, terraeque orbesque recedunt. Virgilius, *Aeneid* III, 72.

course of the sun: it was only after Copernicus had made the annual motion a serious problem that such texts entered also into the theological discussion.

Finally, a far-fetched argument is advanced in favour of the earth's motion, whereby our author links together texts from the Psalms⁶⁸ ("Thou didst cause judgment to be heard from heaven; the earth feared and was still") and Habakkuk⁶⁹ ("the sun and the moon stood still in their habitation") with the story of Joshua⁷⁰ ("And the sun stood still, and the moon stayed"). Though he recognizes that in Joshua's story there is no mention of the motion of the *earth* (62), the author nevertheless tries to use the text from the Psalms with its rather ambiguous reference to the earth as "still" or "quiet" as an intermediate means to elicit the desired meaning from the passages in Habakkuk and Joshua:

Habakkuk predicted the destruction of the Babylonians, while recalling God's intervention against Israel's enemies in Joshua's time (when the sun and the moon were made to stand still);

the Psalmist predicts destruction of the Assyrian enemy of Israel, while recalling God's judgment by which the peaceful were saved and "the earth trembled and stood still".

In both cases, in the author's opinion, a reference is made to the same event, viz. the miracle that occurred in Joshua's time. The "standing still" of the sun in the realistic, historical account of Joshua thus is considered by the author as *not* meant as literally true, but rather as an accommodation to the vulgar opinion ("there is no mention in the story of the movement of the earth, if it is taken literally" (62));

the figurative speech of the passage from the Psalms, on the other hand, is taken *literally* as referring to the earth's stopping its motion ("standing still"). Yet the text and context of the psalm do not cogently indicate a local motion of the earth, but rather a "holding its breath" in fear and trembling (or, at most, an earthquake). The analogy between the texts is extremely weak, and the author must have felt this himself, for he leaves it to the reader to decide whether he prefers to interpret the passage from the Psalms as figurative (63).

An interesting detail is that the Vulgate gives a heading to Ps 75:1, saying that this psalm is a "canticum ad Assyrios"⁷¹, whereas St. Augustine, in his commentary on the Psalms, does not speak of Assyrians, but of the wicked and the righteous in general⁷². Evidently here St. Augustine's authority was of no use to the ultimate purpose of the treatise, viz. the explaining away of the biblical statements about the motion of the sun and the eliciting of statements from the Bible in favour of the motion of the earth.

It must be recognized, however, that the principle of accommodation was

68. Ps 75:9 (Vulg.); Ps 76:8 (A.V.): Thou didst cause judgment to be heard from heaven.

69. Hab. 3:11.

70. Joshua 10:13.

71. In the Authorized Version and modern translations this statement does not occur (Ps 76:1, A.V., is the same as Ps 75:2, Vulgate).

72. See note 2 to p. 62 of the treatise.

the mainstay of Rheticus' apologetics, and that the rather artificial "positive" arguments which he claimed to find in the Bible had less weight with him.

8. *The epilogue* (ch. IIIe. pp. 63-64)

The task has now been accomplished. Looking back, the author claims that he has followed what seems right to the learned and pious (63; cf 16).

After urging each in his own calling to put his talents at the service of the catholic church of Christ, he asks his readers to study the work of his "Dominus Praeceptor", which will show them a theory (ratio) that is *certain* and in agreement with all phenomena. In its wake we should pursue, as far as God permits us, the knowledge of how the Lord wished the heavenly bodies to be known by us (64). Similar remarks had already been made in the *Narratio prima* with regard to our ignorance of what lies beyond the fixed stars⁷³.

Like Copernicus, Rheticus is convinced that the new theory is the only rational one. The reservation, that our investigation does not go farther than God allows, does not detract anything from that claim. Copernicus himself made such a restriction when he said that the philosopher should investigate the truth "in so far as this has been permitted by God to human reason"⁷⁴, a phrase, intended to ward off beforehand any accusation of impious suggestions that man could know the world in the way the Creator knows it.

Strangely enough, however, at the moment that he felt with certainty that he had proved his master's theory to be what was perhaps not the absolute truth as God sees it, but at any rate the truth as God wanted it to be known by man (64; cf 29-30), Rheticus made all his results questionable. After all these proofs, allegedly built upon observation, mathematical demonstration and right reason, and after all these plausible arguments extracted (or rather extorted) from the Bible, he suddenly drops his claim to have found the full truth (as far as this is possible to man). "The philosophers say that some things are known to nature but unknown to us" (64), [which evidently means: on such an issue objective truth is hidden to man and known only to God.] To this category Rheticus now reckons the astronomical hypotheses (64), about which there are so many controversies. And he ends the treatise with a quotation from that part of the Book of Job (chapters 38 and 39) in which God hammers into Job's head the limitations of human knowledge: "Hast thou known the order of heaven?". So he comes very close to Osiander's saying that nobody should expect astronomy to give certainty about hypotheses (see Pt I, ch. IV, p. 37).

In an earlier passage Rheticus had declared that he did not assert the earth's motion without being conscious of human weakness (15), and on another occasion he had stressed the limitations of human knowledge (29-31). He had then even gone so far as to assert that "it is enough for us to have computations that

73. Rheticus, *Narratio prima*, fol. D Iir. Cf pp. 15, 16, 29 of the treatise.

74. ... homini philosophi... studium sit, veritatem omnibus in rebus, quatenus id a Deo rationi humanae permissum est inquirere... Copernicus, *o.c.*, praefatio, fol. IIvs.

correspond exactly with the observed phenomena” (31). This lapse into a conception he had explicitly and implicitly combated throughout the whole treatise, is now even more strongly expressed and that precisely at the moment that his goal seemed to be reached and immediately after his assurance that reason had demonstrated the Copernican system to be the true one.

This seems to point to a wavering mind⁷⁵. It is as if he had been swept away by his colourful dream and then finds himself awakening in grey daylight. It is true that an alternation of almost absolute certainty and total skepsis was not uncommon with scholars in the period of upheaval that we term the Renaissance. Old certainties were undermined; scholasticism was attacked from all sides, and other systems – platonism, hermeticism, etc. – were recommended. But there were so many “true” systems; and who could without doubt establish which was the right one? Many Renaissance scholars loudly and boisterously overshouted their own doubts and then suddenly recognized that their thirst for a full understanding could not be quenched. Their Faustian yearning for absolute knowledge alternated with the realization that this is as impossible as reaching the horizon. Like Fracastoro they tried to grasp always fleeing Nature, which, after showing herself for a moment, like Proteus, changing her face in thousand manners, mockingly escapes.

Even in Rheticus’ *Narratio prima*, – the work in which Copernicus’ system was proclaimed the *true* one –, this wavering mood of the time came to the fore. He depicted there in vivid colours the oscillation between hope and despair of the Renaissance scientist. He compared the astronomer, who with the help of mathematics studies the motions of the stars, to a blind man who, with only a staff to guide him, has to make an endless journey and, groping his way with the help of this staff, sometimes will cry out in despair, but must learn that he cannot be rescued by this staff. Similarly, the astronomer must learn that the senses and mathematics are not sufficient to reach his aim, if God does not in compassion lead him with His hand. Trusting in reason and mathematics, he hopes that one day he will rejoice in the recall of Urania⁷⁶ from the underworld. But then he considers the matter more closely, and perceives that he is in the same situation as Orpheus, who was aware that his beloved Eurydice followed him when he went up from the underworld; but when at the exit he turned his head to look her in the face, she disappeared from view and slipped back in the infernal regions⁷⁷.

Evidently in this symbolic language Rheticus wants to say, firstly, that astro-

75. Such wavering, in a work that was intended to defend the truth of the Copernican system, gave already at a first reading the impression that it had been written by a not very stable person. This was confirmed, afterwards, when reading Rheticus’ biography. When he was a child he must have received a severe shock, when his father was executed for witchcraft. In 1547 he was in a state of nervous stress. His whole career shows unrest and whimsical behaviour. Cf Burmeister, *o.c.*, I, 16, 81; III, 73.

76. Urania, the Muse of astronomy. Cf the treatise p. 56.

77. Rheticus, *Narratio prima*, fol. F 1vs.

nomical truth is reached partly by observation and mathematical theory and calculation, partly by divine grace. Secondly, he suggests that, although truth (like Eurydice) has once been in the upper world, she has slipped back into darkness. Whereas the astronomer in his first enthusiasm may think he has recovered her, – when looking more carefully, he will find that a satisfactory theory ever escapes him. Rheticus then proposes to examine “the hypotheses of the Doctor, my praeceptor” ... “that we may see whether with persevering devotion, and with God leading” ... “he has led Urania back to the upper world and restored to her her dignity”⁷⁸.

Of course the conclusion of Rheticus’ examination was wholly positive. In his opinion true astronomy (which had got out of sight since early Antiquity), after unsuccessful efforts towards her restoration by Ptolemy and others, had been at long last *restored to her pristine glory* by Copernicus. Rheticus did not say that Copernicus (who had also looked to the past for astronomical principles), had *borrowed* his ideas from ancient sources. His theory is a *new* one, though its essence must be the same as that of the ancient one that had got lost. In the same way Renaissance authors, who praised the circumnavigation of Africa by Vasco da Gama, would recognize this as an original feat, though they maintained that there had been predecessors in Antiquity who had done the same as the Portuguese. Their nautical records, however, had got lost, so that the Portuguese achievement was an original and “new” one⁷⁹. Similarly, Rheticus could speak of Copernicus’ “new – if I may so call them – hypotheses”⁸⁰. It is as if Rheticus wants to say: “new”, when compared with the old ones of Ptolemy, but nevertheless closer to those of the true astronomy, which are even more ancient than those of the Alexandrian astronomer.

9. *Rheticus’ character*

Rheticus had an impetuous character and he was prone to exaggeration. Having gone to Prussia in order to get first-hand information on Copernicus’ astronomy, he became so enthusiastic that he almost immediately began to write an apologetic of it, and hardly cared for the chair he had left unoccupied at the university of Wittenberg.

Copernicus, on the other hand, was calm and prudent. He waited several decades before he gave his work free for publication; and in spite of his great love for astronomy he did not neglect his professional work, but meticulously carried out his duties as an administrator of the diocese of Warmia.

78. Perpendamus itaque ut incoepimus et in reliquis planetis D. Doctoris, praeceptoris mei hypotheses, ut videamus, an constanti animo, et Deo praeunte, Uraniam ad superos perduxerit, suaeque dignitati restituerit. Rheticus, *o.c.*, fol. F 1vs.

79. R. Hooykaas, *Science in Manueline Style*, Coimbra 1980, p. 11. Damião de Goís was convinced that the Ancients, too, had circumnavigated Africa, and that the Portuguese now had become their equals in that respect.

80. ... ut interim plura de veterum in quinque planetis hypothesisibus, quam forte ipsa novarum (ut sic dicam) hypothesisium cum enumeratio, tum ad veteres collatio requirit, non adducam. Rheticus, *o.c.*, F IIIr.

There was, then, a great difference of temperament between master and pupil, and Copernicus had to curb his disciple's enthusiasm now and then. In the preface of the *Ephemerides for 1551* Rheticus relates how in youthful desire for knowledge, he wanted to penetrate as it were into the innermost secrets of the stars and how this gave rise to disputes with Copernicus. But the Master took delight in his sincere aspiration and gently brought him into line and used to admonish him that he should learn not to go too far⁸¹. When, after Rheticus' return, temperate Melanchthon (1542) considered his former pupil to be animated by a certain intemperate "*Enthusiasmus*" and hoped with indulgence to moderate him to a sounder philosophy, his aim may have been different from that of Copernicus, but his judgement of Rheticus' character was similar.

10. *When and where was the treatise written?*

The date at which Rheticus' treatise was written cannot be ascertained with precision. In the opinion of his biographer K.H. Burmeister it was produced either in Frauenburg before Rheticus left that town, or in Wittenberg shortly after his return to Saxony. But in the Bibliography this same author chooses for Wittenberg 1541/'42, where "it originated under the impression of the repelling attitude of Luther and Melanchthon towards the Copernican doctrine"⁸².

This may sound plausible, but in the present author's opinion it is more probable that the tract was written during Rheticus' stay in Poland. This more easily explains the fact that Giese had read it and then wondered why Rheticus had not added it to Copernicus' text when he put *De revolutionibus* to the press in Nuremberg.

A more cogent argument for its earlier date, however, rests upon inner evidence, viz. the character of the contents of the tract, of which of course Burmeister had no knowledge.

There is a certain crampedness in Rheticus' reiterated statements that he remains within the bounds of the catholic faith (he mentions this six times!) and that he wishes to walk in the footsteps of St. Augustine, and in his repeated protestations that he keeps to the exegetical directions given by that great Church

81. Recordor, cum et ipse iuvenili curiositate impellebar et quasi in penetralia siderum pervenire cupiebam. Itaque de hac exquisitione interdum etiam rixabar cum optimo et maximo viro Copernico. Sed ille cum quidem animi mei honesta cupiditate delectaretur, molli brachio obiugare me et hortari solebat, ut manum etiam de tabula tollere discerem. G.J. Rheticus, *Ephemerides novae... ad annum 1551... secundum doctrinam... D. Nicolai Copernici Toronensis... praeceptoris sui*. Lipsiae 1550. In: Prowe, *o.c.*, II, p. 391.

Melanchthon declared (1542) that he had been indulgent toward the age of "our Rheticus", hoping to move him away from a "certain Enthusiasm" to a "more Socratic philosophy". This may be conceived as that he wanted him to abandon his unconditional surrender to (Copernican) theory for a more relativizing conception of it.

82. K.H. Burmeister, *o.c.*, I, p. 73; II, p. 29. Luther's interest in the problem of the mobility of the earth was slight. He did not write a word about it; his notorious remark at dinner (1539) was reported in print only 27 years later from the memory of one of his guests. As to Melanchthon, he may have opposed the idea, but he favoured some of its protagonists: not only Rheticus, but also Caspar Cruciger († 1548), whose admiration for Copernicus he mentioned in an oration (1549). See H. Bornkamm, *l.c.*, pp. 173, 180.

Father. It is as if he, a Lutheran staying with a liberal-minded canon whose way of life and choice of friends were severely disapproved by his zealous bishop, wants to avoid arousing hostility against the beloved “praeceptor” and evoking his own expulsion from the master’s company.

His emphasis is therefore laid upon the church catholic and the Fathers, that is on *Tradition*; for it was precisely their (relative) neglect of the role of Tradition that made the Protestants blamable in the eyes of the Romish party.

It is mainly to the latter that his protestations of loyalty to the catholic faith and St. Augustine are directed, for it was among them that he was staying and Copernicus would go on to stay. As we will see below, Galileo who equally had to persuade in the first place distrustful roman-catholic clerics, used arguments similar to those of Rheticus, in particular citing St. Augustine as the touchstone of catholicity.

In the Wittenberg climate a somewhat different approach would have been more apt. However much St. Augustine was revered by the Reformers, and however much they claimed to be restoring the ancient catholic doctrine, they would hardly have appreciated such an emphasis on these “authorities”: to them not “Bible *and* Tradition”, but Holy Scripture alone was really authoritative. To them not conformity to St. Augustine but that to the Bible determined the limits of true catholicity.

On the other hand, the Wittenberg colleagues could not be offended by the mild way in which Rheticus made his “catholic” appeal, for they, too, claimed to remain within the bounds of catholic faith, and they, too, highly respected Augustine, whom they frequently quoted as a secondary support.

Finally, Rheticus’ approach was precisely in the spirit of the Erasmianist Catholics with whom he was closely connected at that time and that place. With an eye on Rheticus’ capacity of adapting himself to other people, it may be said that he tried to appease both antagonistic parties, but particularly the Roman one; and that he fully pleased the third one, the middle-of-the-road Catholics. All this makes it probable that the treatise was written in Frauenburg before September 1541.

The work reveals not only the difficulties inherent to the subject, but it also reflects the character of its author and his attitude towards the ambiguities of the theological and ecclesiastical situation in which he found himself at the time it was written.

Why then did he not publish the tract then and there? It seems probable that he never made it ready for the press, for the text as we have it now has been carelessly written; it contains too many errors and inconsistencies, and it is rather loosely composed. It seems to have been written in haste: it probably was a version that was intended to be revised before being put to the press.

It does not seem probable that it was fear of Melancthon that prevented the printing. This colleague, who was Rheticus’ former teacher, wanted him back in Wittenberg in spite of his patent Copernicanism; and he certainly did not encourage him to accept the call he received from the Lutheran university of Leipzig to occupy a chair of astronomy there.

Most philosophers and theologians did not take the realistic claim of Copernicus very seriously, and among Roman-Catholics as well as Protestants the few people who became convinced Copernicans were for the time being left in peace. Why then start a defence before the attack had assumed a fierce character? We must suppose that in the end Rheticus deemed it wiser to let sleeping dogs lie.

III. THE AFTERMATH

Rheticus, Ramus and the Copernican hypotheses

The defeatist statement on the last page of Rheticus' treatise raises the question whether he was indeed a steadfast supporter of Copernicus. Yet, the statements of a firm belief in the truth of Copernicus' system are much more numerous and there remains the fact that in both early treatises – the *Narratio prima* and the tract on *Holy Scripture and the motion of the earth* – he urged his readers to accept his teacher's theory as conformable to nature.

His later activities, however, give rise to new doubts, so much so that some historians have accused him of disloyalty to the Copernican cause¹.

Rheticus' instability and his desire to please other people could easily lead to such a suspicion. Moreover, Copernicus' book hardly could fully satisfy a dedicated advocate of an astronomical theory that should be wholly conformable to physical reality. As soon as Copernicus tackled the task of exactly constructing and calculating the paths of the heavenly bodies, the simplicity and symmetry of the diagram of the universe as given in the first book, are lost, and the claim of absolute conformity with physical reality is no longer strictly maintained. To a zealous disciple of Copernicus this was a difficult situation: should he try to reduce the cumbersome apparatus of excenters and epicycles of the larger part of Copernicus' work to the simplicity of the first book, – and thus bring Copernicus' restoration of astronomy to its perfection –, or should he look for a totally different solution?

In this chapter we will consider some aspects of Rheticus' further development in order to discover how he hoped to find a positive solution without becoming disloyal to his revered teacher.

1. *Egyptian astronomy*

In spite of the praise Copernicus had bestowed on Ptolemy, he had realized that the measurements of the Greeks as well as the observations he had made himself should be extended and that a more precise determination of the positions of the fixed stars was necessary to complete the enterprise. In the prooemium to Werner's treatises (1557), Rheticus relates that Copernicus, "the never

1. E. Zinner, *Entstehung und Ausbreitung der Copernicanischen Lehre* (Sitzungsberichte der Phys.-Mediz. Sozietät zu Erlangen, 74), Erlangen 1943, pp. 276 and 262.

Burmeister, *o.c.* (vol. I, pp. 57, 58, 64, 160) deems this a false accusation.

sufficiently praised Hipparch of our time... whom I have revered not only as a teacher but also as a father”, had found the theory of the anomaly of the motion of the fixed stars, and how his teacher had enjoined him to complete what he himself could not finish. Rheticus took this wish to heart, the more so as he had now a much less favourable opinion about the Greeks and Ptolemy, “whose measurements of the fixed stars are full of errors”².

He made further studies of arithmetic and geometry and wrote an important trigonometric work, *Canon doctrinae triangulorum* (1551¹; 1565²), which was intended to help in astronomical and geographical calculations. After many vicissitudes he finally settled in Cracow (where he stayed from 1554 to 1574), practicing medicine in order to finance his expensive astronomical and mathematical research. The time to carry through what Copernicus had had to leave undone, had now come.

But Rheticus had higher ambitions than just to finish the work of his teacher: he wanted to surpass it. And this he would do by a restoration of the astronomy of the Egyptians, with which, in his opinion, Copernicus had made a beginning. He was firmly convinced that the Egyptians had possessed a perfect astronomy, and he hoped to be able to re-discover it with the help of the instrument he believed they had used as a gnomon, namely the obelisk. He spoke about it in terms of the highest praise and with an almost religious respect.

He must have had something like this in mind long before he started to use an obelisk (1554), for on the title pages of his edition of Euclid’s *Elementa* (Leipzig 1549), his *Ephemerides novae ad annum 1551*, (Leipzig 1550), and his *Canon doctrinae triangulorum* (Leipzig 1551) pictures of the obelisk already figure³.

According to his own testimony, he wanted to obey Copernicus’ injunction to register as exactly as possible the motions of the stars. Copernicus had made his observations in Frauenburg (Frombork), and in order to follow as much as possible in his teacher’s footsteps, (so he says), Rheticus had settled in Cracow, which lies on the same meridian. There he erected, with the liberal support of a rich citizen, Johann Boner, an obelisk: “for, in my opinion, no astronomical instrument would be better than the obelisk”. It was about 16 meter high and crowned by a golden ball on which was placed a sharp peak. This obelisk was depicted for the first time in 1557 on the title page of Rheticus’ unfinished edition of Johann Werner’s *De triangulis sphaericis*, of which only the preface to king Ferdinand of Bohemia and Hungary has been printed. It figures also on the title page of the posthumous *Opus Palatinum de triangulis*, edited by Rheticus’ pupil Valentin Otho (Neustadt 1596).

In the preface of 1557 Rheticus tells how, according to Pliny, the Egyptian king Mitres was the first to erect obelisks, thus obeying a divine command

2. ...hanc provinciam dominus Copernicus nobis iniunxerit, quem non solum tanquam praecceptorem, sed ut patrem colui, observari, ac ei semper gratificari studui. Ed. Georgius Joachimus Rheticus, *Ioannis Werneri... De Triangulis Sphaericis libri quatuor...*, Cracoviae 1557. Prooemium, fol. V vs. (Only Rheticus’ Prooemium was printed.)

3. Facsimile prints of these three title pages in: Burmeister, *o.c.*, vol. II, pp. 73, 76, 77.

IOANNIS WERNER

NERI MATHEMATICI NORIMBERGENSIS,

DE TRIANGVLIS SPHOERICIS

LIBRI QVATVOR.

DE METEOROSCOPIIS

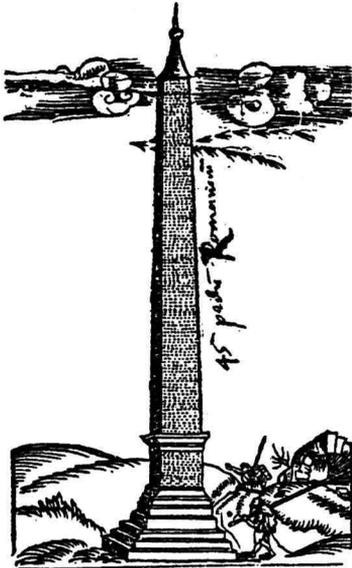
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Nunc primum Studio & Diligentia
GEORGII IOACHIMI RHETICI
in lucem editi.

OBELISCI INSCRIPTIO.

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RERVM NATVRÆ INTERPRETATIONEM,
ÆGIPTIORVM OPERA PHILOSOPHIÆ CONTINENT.



VIRGILIVS.

FELIX, QUI POTVIT RERVM COGNOSCERE CAVSAS.

CRACOVIAE,

LAZARVS ANDREAE EXCVDEBAT.

ANNO M. D. L. VII

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*Kopieho solo sola faceret impressa,
religuum opus mittere in Germania
proposuerunt, et ego intellaxi ex qua
da epistola manu ipsius Rhetici ad
Wolffum Gynther. an missum et in
pressum sit, aridum. scis.*

9. Title page of Rheticus' preface to Werner's "De triangulis sphoericis" and "De meteoroscopiis" (1557) with the Cracow obelisk.

received in a dream. The obelisk was, as Pliny says, sacred to the sun-god⁴. The sun is the king of the heavenly realm, the eye of the world, illuminating all things⁵. Consequently, the obelisk opens the eyes of the artificers, so that the laws of that kingdom can be observed and described exactly. The obelisk, then, is not a *human* invention, but it has been instituted by God himself, not to satisfy human curiosity but to teach God's geometry in heaven and on earth. Whereas armillary spheres, astrolabes and quadrants are but *human* inventions, the obelisk, erected by God's command, surpasses all other instruments. Pliny says that there were *two* obelisks, which bore the inscription: "The works of the philosophy of the Egyptians contain the interpretation of nature"⁶. This

4. Trabes ex eo fecere reges quodam certamine, obeliscos vocatos Solis numini sacros. radorum eius argumentum in effigie est, et ita significatur nomine Aegyptio. primus omnium id instituit Meophres [Tuthmoses III], qui regnabat in Solis urbe [Heliopolis], somnio iussu...; Plinius, *Historia naturalis*, XXXVI, 14, 64. ...inscripti ambo rerum naturae interpretationem Aegyptiorum philosophis continent. Plinius, *o.c.*, XXXVI, 14, 71.

5. Sol, rex et Monarcha est Politis coeli, ... totius mundi oculus cuius luce illustrantur omnia. G.J. Rheticus, Prooemium to Werner's *De Triangulis Sphaericis* (1557), fol. VIr. Pliny said the same: ...eorum medius Sol fertur amplissima magnitudine ac potestate, nec temporum modo terrarumque sed sidera etiam ipsorum caelique rector. Hunc esse mundi totius animum ac planius mentem, hunc principale naturae regimen ac numen credere decet opera eius aestimantes... praeclarus, eximius, omnia intuens, omnia etiam exaudiens, ut principi litterarum Homero placuisse in uno eo video. Plinius, *Historia Naturalis* II, 4, 12-13.

Copernicus referred to this ancient sun-worshipping in a lyrical outburst, when expounding the virtues of this celestial body: "In the middle of all resides the Sun... He is rightly called the Lamp, the Mind, the Ruler of the universe; Trismegistus calls him the Visible God, Sophocles' Electra calls him the All-seeing. So the Sun sits as upon a royal throne, ruling his children the planets, which circle round him". Copernicus, *De revol.*, lib. I, c. 10, fol. 9vs.

Copernicus here deliberately used the ambiguity of "being in the middle". Undoubtedly the authors he referred to (Pliny, Cicero, Hermes) meant by it that, in the geocentric universe, there are planets below the Sun (Moon, Mercury, Venus) and planets beyond the Sun (Mars, Jupiter, Saturn), so that he is in the middle of them. Copernicus ignores this and uses their phrases as if they meant that the sun stands in a centre around which all planets are arranged.

It seems that his sun-"adoration" determined the choice of Copernicus' seal, which represents Apollo (the sun god) with a lyre (as was pointed out in an excellent study by S. Mossakowski, "The symbolic meaning of Copernicus' seal", *JHI* XXXIV, 3 (1973), 451-460.

Kepler, too, sang the praise of the sun in quasi-religious terms. It should be reminded that humanists often denoted God the Father by the name Jupiter, and the Son by the name Apollo (or Phoebus). This latter custom may have found support in the usual interpretation of the "Sun of Righteousness" (Sol Iustitiae; *Malachi* 4:2; "But unto you that fear my name shall the Sun of righteousness arise") as referring to Jesus Christ, the Light of the World ("the true light, which lighteth every man that cometh into the world", John 1:9. Cf below p. 172, Kepler's interpreting the sun's coming out of his chamber as the spreading of the Gospel.

Cicero's "Somnium Scipionis" had also a well-known reference to the sun; "in the middle region [between heaven and earth] is the Sun, the leader, chief and ruler of the other lights, the mind of the world... of such magnitude that he enlightens all and fills all with his light. Cicero, *De Re Publica*, VI, c. 17 (Somnium Scipionis).

6. For the title page see fig. 9. The gnomon was destroyed during Counter-Reformation riots in the year of Rheticus' death, that is shortly after he left Cracow. Afterwards a picture of it served as a printer's mark to several printing offices in Cracow.

Cf Th. Przypkowski, *La gnomonique de Nicholas Copernic et de Georges Joachim Rheticus*

means, so Rheticus goes on, that the “philosophical” (= scientific) works of the Egyptians, and not those of the Greeks and Romans, brought forth arithmetic and astronomy since the patriarchs and Abraham, and it is from them that Plato brought these disciplines to Greece, and Pythagoras to Italy. Pythagoras (according to Pliny) was in Egypt when the great 126 foot obelisk was erected, which Augustus afterwards placed in the circus in Rome. What the Rhine, the most beautiful river, is in comparison with the ocean, and the earth as compared to the heaven, gnomonics is in comparison with the totality of the useful applications of the obelisk⁷.

Rheticus then expresses the remarkable desire that the Roman obelisk, which has been standing mute for so many centuries, may be used by the Italian scholars, “so that astronomy be restored for us”, and that to those who desire and want to perform this – and amongst them, I, too – God may give life, so that they may show how great a treasure the obelisk is.

From the above⁸ it appears that Rheticus, though fully recognizing that Copernicus had begun to restore the true and most ancient astronomy, believed that his teacher had left to him the task of bringing it closer to the perfection it had had among the ancient Egyptians.

Rheticus was not alone in his belief in the perfection of Egyptian science. Before and after him, renowned scholars had fostered the same idea. As a physician and chemist Rheticus showed a great admiration for Paracelsus (1493–1541), whose works he had studied and whom he had met personally in 1532⁹. The Swiss physician had turned himself not only – like many other Renaissance scholars – against *Arab* medical science but also against *Greek* authorities, in particular Galen. This brought him into conflict with the adherents of the medieval (“Arab”) tradition as well as with the “pure” Greek tradition, which many Renaissance physicians claimed to have restored. Paracelsus wanted to go back to Nature herself, but he believed that, long before him, the Egyptian “Hermetic” writings had already done so. He shared the belief, widespread in his time, that the more ancient a literary source, the closer to original “natural” wisdom it was. Whereas most humanist physicians abandoned the “corrupt” Arab authorities and went back to classical Antiquity, many of

(*Actes du VIIIe Congrès International d'Histoire des Sciences, Florence-Milan 3-9 sept. 1956*. Firenze-Paris 1958, 400–409).

Also: Ewa Chojecka, *Astronomische und astrologische Darstellungen und Deutungen bei kunsthistorischen Betrachtungen alter wissenschaftlicher Illustrationen des XV. bis XVIII. Jahrhunderts* (*Veröffentlichungen des Staatlichen Mathematisch-Physikalischen Salons – Forschungsstelle Dresden-Zwinger*. Bd. 4, Berlin 1967, pp. 112 and 125).

7. Sed quae est Rheni, pulcherrimi fluminis, comparatio ad totum mare, Terrae ad coelum, ea est Gnomonics ad totum Obelisci usum. Rheticus, Prooemium in Werner's *De Triangulis Sphaericis*, fol. VI vs.

8. Utinam Romanus Obeliscus, non etiam tot iam seculis mutus staret, sed cum doctrina et ingenijs excellat Italia, inde nobis astronomiam instauraret, in sui celebritatem et omnium nostrum utilitatem. Rheticus' Prooemium in Werner's *De Triangulis Sphaericis*, fol. VI vs.

9. Rheticus from Cracow to Joachim Camerarius in Nuremberg, 29th May, 1569. Burmeister, *o.c.*, III, 191. Also III, 156, 169, 186.

Almost a century later, Isaac Newton stated that not only Aristarchus and Pythagoras, but “not a few in the earliest ages of philosophy had held that the earth and the planets are carried round the sun. From the Egyptians the Greeks derived “their first as well as soundest notions of philosophy”.

Newton went so far as to trace “the ancient spirit of the Egyptians” in the Vestal ceremonies, for it was their way to deliver their mysteries, “that is, their philosophy of things above the common way of thinking” –, under the veil of religious rites and hieroglyphic symbols”¹¹.

Since Copernicus wrote his great work, however, Kepler had introduced the elliptic planetary orbits, and Newton himself had discovered the law of gravitation (general attraction). Though without any doubt both these discoveries were novelties, Newton believed that the Pythagoreans (and their Egyptian teachers) already possessed this knowledge¹². Here again, though there was no immediate proof, it was not easy to *disprove* this opinion. It could always be said that the knowledge had got lost or could be found back in some allegorical tale in which, allegedly, the ancients had laid it down in disguise.

2. *Astronomy without hypotheses*

Because of its ambiguity the term “hypothesis” could sometimes cover up a deliberate vagueness. Does it mean just a supposition, a mental tool, a scaffolding for obtaining solid knowledge of the motions of the heavenly bodies, – or does it mean a *sub*-position, a foundation and essential part of the whole fabric of astronomy? It is certain that the anonymous preface of Copernicus’ *De revolutionibus* propounds the former meaning; Copernicus himself, however, in Book I, tries to demonstrate that in broad outline his theory corresponds with physical reality, and that the “three motions” of the earth are conformable to the principles of a sound physical science. But when elaborating the theory in the following Books, he introduces a multitude of devices similar to those of the old school. Occasionally he even leaves open the choice between alternative hypotheses. The irregular movements of four planets are explained by motions along an excentric circle bearing an epicycle, but it is recognized that a homocentric deferent carrying an epicycle which is itself the deferent of another epicycle is also a hypothesis “sufficient for the appearances”¹³. Such phrases, and

11. I. Newton, *De systemate mundi*, par. 1 (Engl. transl. of Newton’s *Principia*, by Motte and Cajori, Berkeley 1947, p. 549).

12. Fatio de Duiller to Chr. Huygens, 5 Febr. 1691/92. In: Christiaan Huygens, *Oeuvres complètes*, T. X, 257; cf XXI, 553-554. Isaac Newton, *The Correspondence*, ed. H.W. Turnbull, vol. III, Cambridge 1961, p. 193. Huygens (to Fatio de Duiller, 29 Febr. 1692) did not believe this (*Correspondence* III, p. 196). David Gregory wrote (1694) in Memoranda about a new edition of Newton’s *Principia*: “He will show that the most ancient philosophy is in agreement with this hypothesis of his as much because the Egyptians and others taught the Copernican system, as he shows from their religion and hieroglyphs and images of the gods, as because Plato and others – Plutarch and Galileo refer to it – observed gravitation of all bodies towards all”. (*Correspondence* III, 384).

13. Similarly, according to Copernicus the irregular apparent movement of the sun can be explained by the fact that the earth’s annual revolution is not precisely around the centre of the sun: “That can be understood in two ways, either through an eccentric circle (i.e. one whose centre is not the centre of the sun), or through an epicycle on a homocentric circle” (Copernicus, *De revol.* I. III, c. 15, fol. 85r). The conclusion is: “... Therefore, it is not easy to determine which of these exists in the heaven” (Copernicus, *o.c.* lib. III, c. 15, fol. 86r; cf I. III, c. 25). – In c. 20

similar ones, might suggest that no conformity to physical reality is sought for, but only probable “mathematical” hypotheses are put forward. Nevertheless, however much Copernicus in such cases acknowledged that he had not attained certainty (so that the chosen hypothesis became practically a “mathematical”, fictitious one), he wanted his hypotheses to be physically true in the end¹⁴.

Rheticus, in his *Narratio prima*, freely introduced similar devices (epicycles, excenters). Like most of his contemporaries he admired the way in which Copernicus managed to reduce all “anomalies” of the planetary motions to combinations of uniform circular motions, so avoiding Ptolemy’s non-uniform motions (which showed “uniformity” not with regard to the centre of the circle but with regard to the “punctum aequans”). He must also have admired how Copernicus managed to deduce the “librations” of the earth (oscillatory motions which seemed to be at variance with the rule that only *circular* motions can take place in the heavens) to combinations of two uniform circular motions in opposite directions¹⁵.

Yet, after the beautiful simplicity of the general picture of the structure of the universe in Book I, it was disappointing that the old game of excenters and epicycles (circles upon circles), with its implicit ambiguities, had to be taken up again in the following Books. This the more so, as the choice between alternative devices bore a somewhat arbitrary character. Even the glorious heliocentricity of the first Book was not fully maintained: the centres of the orbits of the earth and the other planets do not coincide with the sun and doubt remains whether the sun himself or the centre of the earth’s orbit is the centre of the world¹⁶.

On the other hand there was greater “simplicity” than in the Ptolemaic sys-

he explains certain events by means of a circle eccentric to an eccentric, *or* by means of an epicycle on an epicycle, *or* by means of an epicycle on an eccentric, and he concludes: “And since so many ways lead to the same calculation, I could not easily say which really takes place but only that that perpetual harmony of numbers and appearances compels us to believe that it is one of them” (lib. III, c. 20, fol. 92r).

14. It seems that Copernicus supposed the epicyclic and eccentric motions to take place within concrete “orbs”, spherical shells of a constant thickness: “...necesse est id quod inter convexum orbem Veneris et concavum Martis relinquatur spacium, orbem quoque sive sphaeram cum illis homocentrum secundum utrumque superficiem, quae terram cum pedissequa eius Luna, et quicquid sub lunari globo continetur, recipiat” Copernicus, *De revol.*, lib. I, c. 10, fol. 9r).

15. On the librations of the earth, *De revol.*, lib. III, c. 4, fol. 67 r-vs. On the libration of Mercury, *o.c.*, lib. V, c. 32, fol. 172 r-vs; under the heading: “On another explanation of approach and withdrawal” he gives “another method no less credible than the former, by which that approach and withdrawal can take place and be understood” (fol. 172r). The equivocality does not disturb Copernicus’ realistic conception of hypotheses; for with regard to the latter (alternative!) solution he states that in the case of this planet “Nature has played in a wonderful variety, which, however, she has confirmed by a perpetual, certain, and unchanging order” (*ibid.*, fol. 172vs).

16. “. . . there will remain some doubt as to which of these centres is the centre of the world, as we have said ambiguously in the beginning that the centre of the world was at the sun or near (circa) the sun” (Copernicus, *De revol.*, lib. III, c. 25, fol. 96r.) The reference to “the beginning” is to lib. I, c. 10, fol. 9r: “. . . centrum terrae . . . annua revolutione circa Solem transire, et circa ipsum esse centrum mundi”.

tem, in that the 9th, 10th and 11th heavenly orbs were disposed of, and the inconsistency that the outermost heaven, instead of being the slowest was the fastest of all, was removed. But the number of circles necessary for astronomical calculations had not diminished¹⁷.

Ramus and Copernicanism

In expecting a final improvement of astronomy from the cultivation of the nebulous “Egyptian” astronomy, Rheticus found encouragement from Pierre de la Ramée (1515–1572), a royal professor at the university of Paris, who occupied himself with the reform of the liberal arts¹⁸. Ramus was not unfavourably inclined towards Copernicus whom he considered “the greatest astronomer of our time”. Yet he could hardly be called a Copernican, as he had a prejudice against the motion of the earth. It is true that in 1562 he praised Copernicus for measuring time more exactly than any astronomer before him, and this by the motion of the earth alone¹⁹. But, however much he admired this artifice, he had wanted something more, namely the total elimination of “hypotheses” from astronomy.

This hangs together with his peculiar conception of the liberal arts: he demanded that they should be founded on practice (*usus*), for, in his opinion, the not too sophisticated practice of skilful people is closest to *nature*, whereas the current artificial systems in logic, rhetoric, geometry, etc. are founded upon arbitrary conventions. This explains why he wanted astronomy (one of the liberal arts) to be based on the principles of arithmetic and geometry, without “hypotheses”, for in astronomical practice all movements are measured with geometrical instruments, so that astronomy is based on “measurement alone”. Ramus considered *all* hypotheses as human artifices which could not be conformable to nature as immediately observed by the mathematical practitioner and as it is in itself. He fully agreed with the anonymous address “To the reader” prefixed to *De revolutionibus* that all hypotheses are arbitrary, and that for the “explanation” of one and the same phenomenon various hypotheses could be excogitated. As he believed Rheticus to be the author of that pre-

17. According to O. Neugebauer (*The Exact Sciences in Antiquity* [1952], New York 1962, p. 204), “the Copernican models themselves require about twice as many circles as the Ptolemaic models...”.

18. The liberal arts: grammatica, logica, rhetorica, and arithmetica, geometria, astronomia, musica. – Optica, mechanica, etc. were considered as “more physical” mathematical arts.

On Ramus: R. Hooykaas, *Humanisme, Science et Réforme, Pierre de la Ramée*, Leyden 1959; in particular ch. IX, “Astronomie sans hypothèses”, pp. 64–74. On his logic: W.J. Ong S.J., *Ramus, Method and the Decay of Dialogue*, Cambridge Mass., 1958. Further, the critical edition of Ramus’ *Dialectique* [1555] by M. Dassonville (Genève 1964), and the thoroughgoing work on Ramus’ mathematics by J.J. Verdonk: *Petrus Ramus en de Wiskunde* (Assen 1966), which also contains the most satisfactory bibliography of his mathematical publications.

19. Etenim Copernicus astrologus aetatis nostrae summus, caelo detraxit omnem motum; tempusque, solo terrae motu longe exactius metitur, quam Astrologus adhuc ullus dimensus est. Petrus Ramus, *Scholae physicae* [1562], lib. IV, c. 14. (P. Ramus, *Scholarum physicarum libri octo*, ed. J. Piscator, Francofurti 1583, p. 123; also in: *Scholae in liberales artes*, Basileae 1569, col. 738).

face²⁰, he tried to persuade him to make the next step: in order to bring back astronomy from artificial systems to the only natural one such superfluous hypotheses (whether Ptolemaic or Copernican) should be wholly discarded.

In a letter from Paris (Aug. 25th, 1563) to Rheticus in Cracow, Ramus wrote about his planned reform of the liberal arts, and he told him that in the case of astronomy this task was beyond his own capacities. Rheticus' *Canon doctrinae triangulorum* (1551) had given him hope that such an astronomy, free from the tenets of the new and the old schools, could be attained²¹. (He literally says: "free from the doctrine of Pythagoras and Geber", i.e. from Copernican theory as well as "the vulgar" theory delivered via the Arabs). He warmly invited Rheticus to come to Paris and to discuss these problems with him. Rheticus' design to re-work astronomy could be wholly realized if, by leaving aside hypotheses, he would create an astronomy as simple as Nature made the essence of the stars.

It is said by Proclus that it goes against reason for such divine beings as the stars to have non-uniform motions, and this was the justification for inventing hypotheses²². This, however, in Ramus' opinion, is completely wrong, for the so-called inequality is the highest equality, as the progressions and retrogradations occur according to strictly determined periods, and this is not due to chance but it is a most wonderful *order*. Moreover, when the sequence of the heavenly motions has been mathematically ascertained, all future motions can be computed without hypotheses. Before Plato, so Ramus goes on, astronomy managed without hypotheses. Rheticus is therefore asked to consider whether Chaldeans, ancient Egyptians and Greeks before Plato had any hypotheses²³. It is illogical and profane, Ramus goes on, to mix evidently false and absurd figments with the sacred and celestial doctrine. If people say that astronomy without hypotheses would be deprived of the most beautiful demonstrations, the

20. At hypotheses epicyclorum et eccentricorum commenta falsa et absurda esse, epistola tua, ni fallor, Copernico praeposita manifeste ex epicyclo Veneris ostendit" (Ramus in Paris to Rheticus in Cracow, August 25th, 1563; cf Burmeister, *o.c.*, III, 173 ff). ("That the hypotheses of epicycles and excenters are false and absurd excogitations, the letter, which is yours if I am not mistaken, prefixed to the work of Copernicus, clearly shows by the epicycle of Venus").

Burmeister, *o.c.*, III, 180, however, translates: "... das sagt dein Brief, ich glaube an Kopernikus" ("this shows your letter, to Copernicus, I believe"). But the statement would fit well Osiander's preface to *De revolutionibus*, in which Venus' epicycle is adduced as an example that "hypotheses" may serve computation and yet be physically absurd. Moreover, it seems improbable that Ramus would have read a letter from Rheticus to Copernicus.

It has been suggested that Ramus was attracted by the fictionalist opinions expressed in the anonymous preface to "De revolutionibus" (E. Rosen in: *J. Hist. Ideas I* (1940), p. 367). On the contrary, Ramus repudiated them even more strongly than "realistically" meant hypotheses. Cf R. Hooykaas, Pierre de la Ramée et l'empirisme scientifique au XVI^e siècle. In: *La science au seizième siècle*, Colloque de Royaumont 1957, Paris 1960, p. 304.

21. Ramus to Rheticus, Aug. 25th, 1563; Burmeister, *o.c.*, III, 173.

22. *O.c.*, III, 174.

23. At hypotheses... recordare quaeso, si quae Chaldaeorum, veterumque tum Aegyptiorum, tum ad Platonem usque Graecorum numerentur. *O.c.*, III, 175.



11. Pierre de la Ramée. (Courtesy Bibliothèque Nationale, Paris).

answer is that a beauty obtained by false colours cannot enhance the true face of nature but rather spoils it²⁴.

Ramus, then, seems to conceive hypotheses as pure fictions, and he wants Rheticus to build an astronomy without hypotheses, which gives the mathematical description of the phenomena as they are directly observed, so that “astronomy liberated from the chimaera of hypotheses” may show to the human *mind* the lights of the stars in a splendour equal to that which nature offers for contemplation to the *eyes*²⁵.

In the same year 1563 Ramus held a discourse in which he expounded his programme. He says that astronomy is founded upon observation and experience: it has no need of imaginary hypotheses. True astronomy consists of measuring the motions of the heavenly bodies as to their place (geometry) and time (arithmetic); it is a “historia” (description) in mathematical terms. Astronomical observation and computation existed before there were hypotheses, and, therefore, astronomy should revert to them and abandon the hypothetical epicycles²⁶.

Some years later (1567), in his *Prooemium mathematicum*²⁷, Ramus urged mathematicians and logicians to find out what is constant in the phenomena of heaven, and this with the help of modern and ancient observations, without hypotheses and chimaera²⁸. Since Aristotle, however, astronomy is not satisfied with immediate observations, but it looks for more “profound” causes of the retrogressions and retardations in heaven (like the homocentric spheres of Eudoxus and, afterwards, the epicycles and excenters). Finally, Copernicus has rejected all these hypotheses and deduced the movements of the heavenly bodies, starting from the motion of the earth. It is certain that the Babylonians, Egyptians, and Greeks before Eudoxus had no hypotheses, yet, nevertheless could predict eclipses. This proves that hypotheses are not indispensable for computation of celestial motions²⁹.

Ramus was fully aware of the two conceptions of “hypothesis” (the “mathematical” and the “physical” one), but he deemed *all* hypotheses absurd fictions: “But the absurdity is less in the case of Eudoxus and Aristotle, because they held their hypotheses to be true... The more recent fable, according to which the *truth* about natural things can be demonstrated by *false* causes, is much more ab-

24. Neque porro verendum est, ne quis dicat sublati hypothesis magnam pulcherrimarum demonstrationum copiam perituram esse. Pulchritudo enim e falsis coloribus inducta veram naturae speciem ac venustatem nihil exornat, sed omnino deformat et corrumpit. *O.c.*, p. 176.

25. ...ut astrologia figmentis hypothesis per te liberata, astrorum suorum lumina pari splendore animis hominum ostendat atque natura oculis contemplanda proposuit. *O.c.*, p. 176.

26. P. Ramus, *Oratio de sua professione*, 1563. In: *Collectanae, praefationes, epistolae, orationes*. 1577.

27. It was published separately as *Prooemium Mathematicum, Ad Catharinam Medicaeam, matrem regis*, and afterwards inserted in Ramus' *Scholae Mathematicae*, of which it forms the first three books. We quote from: P. Ramus, *Scholarum mathematicarum libri XXXI*, a Lazaro Schoneri recogniti et emendati, Francofurti 1599.

28. P. Ramus, *Scholae Mathematicae*, 1. II, p. 67.

29. Ramus, *Scholae Mathematicae*, 1. II, p. 47.

surd”³⁰. Ramus then makes a statement that would become famous in the history of astronomy: “And I would that Copernicus had rather directed his thoughts to the necessary building up of an astronomy without hypotheses, for it would have been much easier for him to set forth an astronomy of his stars, corresponding with the truth, than to move the earth as if by some gigantic labour, so that we could look at the motion of the earth and quiet stars”³¹.

Ramus then expresses the hope that from Germany will arise a philosopher who is also a mathematician equipped to perform such a task, and he promises him in return for an astronomy without hypotheses a royal professorship in Paris: for the fulfilment of this promise “I would readily cede even my own professorship”³².

When writing about a philosopher and astronomer from one of the German schools, Ramus made an allusion to Rheticus, who evidently had given a rather positive answer to the letter of 1563. He says that Rheticus had shown himself willing to come to the Paris Academy and that, if financial reasons had not compelled him to study and practise medicine, Mathematics would already have celebrated a second Copernicus³³.

At the same time Ramus made an appeal to the Elector August of Saxony, that he might charge some astronomer to elaborate an astronomy built not upon fictitious hypotheses but upon truth and the nature of the heavenly bodies, and founded on arithmetic and geometry, like that of the Chaldaeans, Egyptians, and the Greeks before Aristotle³⁴.

In 1568 Rheticus wrote a letter to Ramus in which he gave information about the books he was writing. He announced that he would now start what Ramus, too, had in mind, viz. a work in which astronomy would rid itself of hypotheses and be satisfied with observations alone. He tells him also that in these matters he has a much greater aversion for Ptolemy than Ramus has for Euclid, for the difference between the great construction of Ptolemy [the *Almagest!*] – which should rather be called the greatest destruction – and the true doctrine of the motions of the heavenly bodies, – which also could be called the astronomy of the Egyptians – is as the difference between the little

30. Ramus, *Schol. math.*, lib. II, p. 47.

31. Atque utinam Copernicus in istam Astrologiae absque hypothesibus constituendae cogitationem potius incubisset. Longe enim facilius ei fuisset, astrologiam astrorum suorum veritati respondentem describere, quam gigantei cuiusdam laboris instar, terram movere, ut ad terrae motum quietas stellas speculareretur. Ramus, *Schol. math.*, lib. II, p. 47.

32. Quin potius e tot nobilibus Germaniae scholis exoriare philosophus idem et mathematicus aliquis, qui positam in medio sempiternae laudis palmam assequare. Ac si quis caducae utilitatis fructus tantae virtutis praemio proponi possit, regiam Lutetiae professionem praemium conformatae absque hypothesibus astrologiae tibi spondebo; sponsonem hanc equidem lubentissime, vel nostrae professionis cessione, praestabo. Ramus, *Schol. math.*, lib. II, p. 47. The quotations in this note and the previous one are cited by Kepler at the beginning of his *Astronomia nova* (Prague 1609). Kepler then answers that, if Ramus were still alive, he, Kepler, would now claim the right to take his chair.

33. P. Ramus, *Scholae mathematicae*, lib. II, p. 63.

34. Ramus, *o.c.*, lib. II, p. 67.

houses children make of sand and mud, and the buildings of Vitruvius, the palaces of Rome when it was at its peak. For the Egyptians with their obelisks have cultivated these sciences with a divine insight³⁵.

It is evident that Rheticus, when promising to make astronomy free from hypotheses, considered that this had not been the case hitherto, either in the Ptolemaic system (which he now wholly depreciates), or in that of Copernicus. It is strange, however, that he did not make the usual distinction between true hypotheses and hypotheses that are claimed to be merely useful fictions. In contradistinction to Copernicus and to his own *Narratio prima*, he now seems to use the term ‘hypothesis’ not for the true foundations of astronomy, but rather to accept Oslander’s and Ramus’ conception that *all* hypotheses are but fictions. Why did he not say that Copernicus’ system, being fundamentally the system of nature herself, needed only the elimination of some artificial additions to its natural and true core? Instead of doing this, he only says, with Ramus, that the desired end will be reached when the astronomy of the Egyptians is restored. Stevin, at the beginning of the 17th century, and Newton at its end, were to maintain that the Egyptian and the Copernican systems are essentially the same; and though it is probable that Rheticus, too, believed this, yet he was now silent about the Copernican system. Did he want to please his correspondent? Did he deliberately speak ambiguously, while thinking that Copernicus’ fundamental tenets were no hypotheses at all, but truths firmly based on observations? Or had he abandoned his Copernican beliefs and accepted Ramus’ opinion that Egyptian astronomy was just a description in mathematical language of the heavenly phenomena as we see them? The latter seems hardly believable, for he never disclaimed his Copernican conviction. His further use of the term “hypothesis” does not disprove this, for he had often spoken of Copernicus’ “hypotheses”, even when referring to those which were certainly considered by him to be true in nature, like the annual motion of the earth.

On the other hand, it seems that Ramus, though he was no violent opponent of the motion of the earth, and though he fully recognized Copernicus’ greatness, had not in mind a restoration in the Copernican sense, but an astronomy without hypotheses, whether they were claimed to be true or only convenient fictions. The fact that he emphasized that all “anomalies” in the heavenly motions are constant [= come back periodically] supports this view, for otherwise he would surely have said that he – like all astronomers of that time, Ptolemaic as well as Copernican – wanted to bring these anomalies back to perfectly circular and uniform motions.

Ramus must have felt that Rheticus’ promise was an empty one, and that his correspondent was rather quick in making grand plans. Rheticus was always eager to please his correspondents, and he was liable to adapt or to change his opinions. In the *Narratio prima*, wanting to entice Johannes Schöner from geo-

35. Rheticus from Cracow to Ramus in Paris, 1568 (Burmeister, *o.c.*, III, pp. 187 ff). At the same time Rheticus, who had become more and more interested in Paracelsus’ writings, planned to publish a book on chemistry (*l.c.*, p. 188).

centric astronomy into Copernicanism, he stressed Copernicus' high appreciation of his Greek predecessors and he related how Copernicus told him that he would be so glad as Pythagoras when he had found his axiom, if he could attain the same degree of precision of measurement as the Ancients had reached³⁶. At that time and on that occasion Rheticus fully shared Copernicus' feelings of respect for Ptolemy, and he repeatedly pointed out how his teacher's critique did not diminish his admiration of the achievements of the Alexandrian astronomer. With his usual exaggeration Rheticus spoke of "the almost superhuman accuracy of his [Ptolemy's] observations, and his truly divine method of examining and describing all the motions and appearances"; "his completely consistent method of statement and demonstration cannot be sufficiently admired and commended by anyone to whom Urania is well-disposed"³⁷. This praise of Ptolemy obliged him to express his loyalty to Copernicus in a rather moderate way: "I love Ptolemy as well as my praeceptor... though I am more inclined to my praeceptor's hypotheses"³⁸.

Shortly afterwards (1542), when dedicating his pre-publication of the trigonometrical part of *De revolutionibus* to another Nuremberg scholar, Georg Hartmann, he even gave the impression that Copernicus in his book was merely explaining and elaborating "Ptolemy"³⁹.

Such statements were intended to soften the adherents of Ptolemaic astronomy. But in the same way he may have tried to please Ramus by depreciating Ptolemy and calling his work a "destruction" of true astronomy, while keeping silent about his lasting devotion to Copernicus, – a silence made easier by his feeling that Copernicus' book was still a long way from his ideal of an "astronomy without hypotheses".

Shortly after Rheticus' non-committing letter, when travelling through Germany (1570), Ramus met in Augsburg young Tycho Brahé (1546–1601), who had gone to that town and to Nuremberg to buy instruments made by the

36. Ego, inquit, si ad sextantes, quae sunt scrupula decem, veritatem adducere potero, non minus exultabo animis, quam ratione normae reperta Pythagoram accepimus. Rheticus, *Ephemerides novae, ... ad annum 1551 ... secundum doctrinam ... D. Nicolai Copernici Toronensis praeceptoris sui*. Lipsiae 1550. In: Prowe, *o.c.*, II, 391.

37. Siquidem Ptolemaei indefatigabilem calculandi diligentiam, quasi supra vires humanas observationum certitudinem, et vere divinam rationem omnes motus et apparentias perscrutandi... Methodum nullus, cui quidem Urania est propitia, satis admirari et praedicare potest. Rheticus, *Narratio prima*, fol. C 1 r-vs.

38. Ptolemaeum equidem, et qui eum sequuntur, aequae atque D. praeceptorem ex animo amo... Etsi nescio, quomodo: me tamen magis ad D. praeceptoris hypotheses inclinari sentio. Rheticus, *o.c.*, F IIIr.

39. ... Dominus Nicolaus Copernicus, dum et in Ptolemaeo illustrando et in doctrina motuum tradenda elaborat, de triangulis eruditissime scripsit. (Rheticus, in the dedicatory letter to Georg Hartmann, prefixed to his edition of N. Copernicus, *De lateribus et angulis triangulorum ... utilissimus ... ad plerasque Ptolemaei demonstrationes intelligendas...*, Wittebergae 1542. – This is a pre-publication of lib. I, c. 12–14 of Copernicus' *De revolutionibus*.) In: Prowe, *o.c.* II, 378–381. Georg Hartmann, while in Rome, had been a friend of Copernicus' brother Andreas, as Rheticus reminded him (p. 380).

best workmen of that time. On that occasion he tried to persuade the Danish astronomer to work out an “astronomy without hypotheses”⁴⁰. He referred again to the Egyptians, whose astronomy was easier than that which uses hypotheses (an argument typical for Ramus’ didactic purpose of teaching practical things without too much theory). But Tycho was of the opinion that the phenomena could not be treated successfully and could not be rightly understood without hypotheses. In his opinion understanding the motions of the heavenly bodies without using hypotheses would require a superhuman intelligence⁴¹. That is, Tycho deemed it impossible to reduce the motions of the planets to a precise mathematical description that would give a certain insight, without analyzing them into simple geometrical components, and he (rightly) thought that Ramus knew little about astronomy. An opinion, it should be said, which Ramus himself would have deemed correct, as this was precisely the reason why he looked out for some astronomer to help him.

It is probable that Rheticus in his letter of 1568, when making his ambiguous statement about his planned “astronomy without hypotheses”, had at the back of his mind the conviction that at least the fundamental tenets of Copernicus (as expounded in the first book of *De revolutionibus*) represented facts and were based on observation and sound physical principles. But he never put forward an improved “Copernican” system in which the planets performed “simple” motions instead of the “circles upon circles” that Ramus disliked so much, and which even Copernicus had not been able to dispense with in the other books of his *De revolutionibus*.

3. Kepler and Ramus

The man who did what Rheticus could not – viz. keeping to the Copernican system while freeing it from “mathematical” hypotheses – was Johannes Kepler (1571–1630). In 1597, having finished his first work, *Mysterium cosmographicum*, he wrote to his former teacher Michael Mästlin that Ramus had promised to cede his professorial chair to anyone who could construct an astronomy without hypotheses. If Ramus desired an astronomy without hypotheses that are *postulated* instead of *demonstrated*, – an astronomy that is satisfied only when the *natural* orbits have been found, – then Ramus’s chair belongs to Kepler, or to Copernicus, or to both of them. If, on the contrary, Ramus rejected all hypotheses, the true as well as the false, he was stupid. But, Kepler adds, “I would rather call myself a royal professor than call Ramus stupid”⁴². As Mästlin was not quick to understand the jest, Kepler had to explain that he had indeed succeeded in constructing an “astronomy without hypotheses”, and so had a right to such a chair⁴³.

40. Tycho Brahé to Chr. Rothmann, 1587. In: Tycho Brahé, *Opera omnia*, ed. J.L.E. Dreyer, T. VI, pp. 88–89. Cf R. Hooykaas, *Humanisme, Science et Réforme, – Pierre de la Ramée*, p. 70.

41. Tycho Brahé, *l.c.*, p. 89.

42. J. Kepler in Graz to Michael Mästlin in Tübingen, Oct. 1597; J. Kepler, *Gesammelte Werke*, ed. M. Caspar, vol. XIII, München 1945, p. 141.

43. Kepler in Graz to Mästlin in Tübingen, 6 Jan. 1598; *Gesammelte Werke* XIII, p. 165.

To Kepler (who, no less than Ramus, wanted an astronomy reflecting the reality of nature), an “astronomical hypothesis” must be conformable to physical truth. In 1602 he wrote to David Fabricius that he did not enunciate “hypotheses” (or what Ramus called “figments”), but truth itself; “besides that, I do not suppose anything... Judge whether I have not made a step towards the constitution of a physical astronomy without hypotheses, that is: without fictitious hypotheses”⁴⁴.

Kepler had to recognize soon that he had claimed victory too early. But the precise observations of Tycho Brahé put him on the right track and he discovered (1605) that he could rid astronomy of all “hypotheses” by attributing elliptic orbits to the planets. It was only in his *Astronomia nova* (1609) that he ventured to announce *publicly* that he had solved Ramus’s problem. He rightly claimed that in this work he “opened the way to the reformation of the whole of astronomy”. The text of the book was preceded by the quotation from Ramus’ *Scholae mathematicae* containing his famous challenge, and by Kepler’s rejoinder in this imaginary discussion: “...If you were still occupying your professorial chair, I could now rightly claim it for myself. By the present work I incontrovertibly prove this, even according to your own logic. Though you ask support for this most lofty science from logic and mathematics only, I beg you not to exclude the expedients of physics, without which it cannot be. And, if I am not mistaken, you will readily admit them. For, besides mathematics you put also philosophy at the disposal of your reformer... I recognize that it is an absurd fable that things of Nature can be interpreted by false causes; but this false statement is not in Copernicus: he has held indeed his hypotheses to be true... And he has not only held them to be true, but also proves them to be true. As evidence of it I offer this work...”⁴⁵.

Kepler, as well as Ramus and practically all astronomers, believed in the simplicity of nature. But the old school felt this criterion to be satisfied if the complicated motions of a planet were reduced to a complicated combination of uniform and circular motions. Ramus found the condition of simplicity satisfied if the complicated course of a planet, as seen by immediate observation, could be described in a no less complicated mathematical formula. Kepler, however, wanted to reduce the seemingly capricious movements of a planet to a simple orbit (as Copernicus only seemingly did in the simplified picture of the first Book). It was to the Platonist in him an enormous mental effort to abandon the “perfect” circles and to resort to the less simple ellipse. Possibly Ramus, who had no ingrained prejudice against the Copernican structure of the universe, would have recognized indeed that Kepler had solved the problem he had put to Rheticus and Tycho Brahé, for to a man who could be aesthetically satisfied by the tortuous (periodical) paths of the planets as registered

44. Kepler in Prague to D. Fabricius in East-Friesland, 1 Oct. 1602; *Gesammelte Werke*, XIV, München 1949, p. 280.

45. Johannes Kepler, *Astronomia nova* [1609]; *Gesammelte Werke*, III, München 1937, p. 6.

by immediate observation, there could be no aesthetic prejudice against the relatively simple elliptic orbits.

In spite of their incompatible epistemological standpoints, and in spite of the fact that Ramus was above all interested in practical applications and Rheticus, in the first place, in the discovery of the true system of the universe, they had one important point in common. Both wished for “natural” truth in astronomy. Ramus wanted to have a “natural” system in grammar, logic, and rhetoric, disciplines which should conform to “natural light” and “right reason”. When extending this to arithmetic and geometry, he had also to tackle the “more physical” mathematical disciplines, like astronomy and optics. Here the “natural” system was determined not only by *human* nature, but also by nature outside man. At any rate it is evident that the introduction of mathematical fictions (sometimes several competing ones describing the same phenomenon) had to be emphatically rejected in his peculiar empiric approach.

On the other hand Rheticus, however much he platonized and pythagorized, also demanded that astronomy give an objective, “natural” and nonfictitious image of phenomena, though, in contrast to Ramus, his underlying belief was that a special kind of simplicity and harmony would be the result. And as Kepler, who was perhaps a more pure Platonist than Rheticus, succeeded in finding such harmonious laws (precisely because he also religiously stuck to empirical observations), he fulfilled Ramus’ wish for an “astronomy without (fictitious) hypotheses”, as well as that of Copernicus and Rheticus.

Our final conclusion then is, that Rheticus in his letter of 1568 to Ramus created ambiguity, whereas in his much earlier and less ambiguous defence of Copernicus’ “orthodoxy” he could not yet use the device of an “astronomy without hypotheses”, but tried to dodge responsibility by pointing out that, after all, hypotheses are not absolute truths. Afterwards, however, he hoped to purify and perfect Copernicus’ work, so that “mathematical” hypotheses could be dispensed with, an ideal that was realized by Kepler. Not until Newton succeeded in deriving Kepler’s laws of planetary motion from the laws of mechanics and gravitation, however, was the goal of integrating an “astronomy without hypotheses” into a general system of physics finally realized.

The publication of the treatise and its lack of impact

1. *The publication of the anonymous tract*

Giese mentioned only in general terms what Rheticus' treatise was about, so that Broscius knew no more than that¹. No new data were discovered afterwards.

Some manuscript of it evidently survived, however, and it came into the hands of the printer Johannes van Waesberge in Utrecht², who published it in 1651 together with another hitherto unpublished work, the *Idea Physicae* by David van Goorle (1591-1612). Gorlaeus belonged to a patrician family in Utrecht, and had studied theology at Leyden university³. Another posthumously published and more elaborate work by his hand, expounding his philosophical ideas, had been printed earlier under the title: *Exercitationes Philosophicae* (1620); the *Idea Physicae* is largely a summary of it. Probably these works were written in 1610 and 1611, during Gorlaeus' sojourn in Leiden⁴. Consequently, the printer knew that the *Idea Physicae* was of a rather recent date, and presumably he considered the anonymous manuscript which he had obtained at the same time, and perhaps from the same library, as equally recent. It seems that in van Waesberge's eyes Gorlaeus' work was the more important, for the anonymous tract is just "added" to it⁵.

1. See above p. 14.

2. Cf A.M. Ledeboer, *Het geslacht van Waesberghe. Eene bijdrage tot de geschiedenis der boekdrukkunst en van den boekhandel in Nederland*. 2e uitgave, 's-Gravenhage-Utrecht 1869, p. 38, 104-113.

3. About the Gorlaeus (van Goorle) family see F.M. Jaeger, *Historische Studiën*, Groningen-den Haag 1919, pp. 50-98. David Gorlaeus' two works have been published posthumously (1620 and 1651).

4. Jaeger, *o.c.*, p. 73.

5. The 12° copy I used is identical with that of the British Library, as is evident from the information, kindly given by the Bibliographical Information Service of the Dept. of Printed Books of the B.L., London.

I. Titlepage "Idea Physicae" [see fig 12]; "Typographus Lect. Benevolo S." [introduction to both treatises], 3 pp.; Index Caputum [of "Idea Physicae" only], 2. pp.; A-C¹² D² (=text), paginated 1-77 [i.e. 76, as pp. 73-76 are misnumbered 74-77].

II. Titlepage "Epistola de Terrae Motu" [see fig. 13]; A-B¹² C⁸ (text), paginated 1-64.

The title of Gorlaeus' work published in 1620 runs as follows: Davidus Gorlaeus, *Exercitationes Philosophicae, quibus universa fere discutitur Philosophia Theoretica et plurima ac praecipua Peripateticorum dogmata evertuntur*. Johannes Commelinus. 1620. [no place indicated].

DAVIDIS GORLÆI
Ultrajectini,
 I D E A
 P H Y S I C Æ.
Cui adjuncta est
 E P I S T O L A,
 Cujusdam Anonymi
De
 T E R R Æ M O T U.



ULTRAJECTI,
Ex officina Johannis à Waelberge,

Anno M. DC. LI.

CUJUSDAM
 ANONYMI,
 EPISTOLA,
De
 T E R R Æ
 M O T U.



ULTRAJECTI,
Ex Officina
 Johannis à Waelberge,

 Anno M. DC. LI.

12. Title page of David van Goorle's "Idea Physicae" (Courtesy University Library Greifswald).

13. Title page of the "Letter of a certain anonymous author On the Motion of the Earth" (Utrecht 1651).

Though the two treatises were published together, they deal with widely different subjects: the one considers the general principles of "physica", the other is a defence of the religious orthodoxy of the Copernican theory. But they had in common a concern with topics that were very controversial in 1651, particularly in Utrecht. At its university Descartes had found his first adherents, but also his most vigorous opponent (Gisbertus Voetius), so that the problems of mechanistic philosophy and the motion of the earth had been topics of discussion there for many years.

In the letter of "The Printer to the benevolent Reader", the publisher says that there are several reasons why he brought the two tracts to light jointly, though they deal with different subjects and have a different style of writing; neither has been published before; each tries to win the reader over to an unusual standpoint, which deviates from the vulgar philosophy.

It should be realized that at that time (1650) the official philosophy taught at

the universities in the Netherlands was that of Aristotle, so that the atomistic philosophy of the first treatise and the Copernican world picture of the second one deviated strongly from the “vulgar” philosophy. On the other hand, though in the official *teaching* of philosophy the systematic exposition started from the Aristotelian philosophy, this did not forbid the professors to confront it with the rivalling Ramist, Copernican and Cartesian ideas. In many cases, they could even show thus their preference for these newcomers.

The printer then says that “in order that such writings, which show what may be said on behalf of heterodox dogmas, should not have to combat only worms and moths”, he went to the expense of editing and publishing them, even though he knew that troublesome and deviating opinions give offense. Some people will say that these ideas are not wholly new, whereas others thoroughly enjoy studying such new things. For new things are most appreciated, whereas old things are depreciated; new, rare things provoke enjoyment, and unusual opinions whet the appetite. –

The publisher’s predilection for “new” things shows the great change that had taken place in the climate of opinion since the 1540’s. Whereas Rheticus did his best to demonstrate that the “new” things propounded by Copernicus were indeed very ancient, in the 1650’s novelty was to many people no longer a defect but an asset. The scholars’ world in the Netherlands had become avid for new ideas and new inventions. Cartesianism was the “latest thing” in Utrecht, where Descartes had lived in 1635; in the university of that town a battle was raging between the Cartesians or semi-Cartesians on one side and the scholastic philosophers on the other. The “theologus primarius” of the university, Gisbertus Voetius (1588–1676), was the leader of the conservatives. In his *Assertiones theologicae de praejudiciis verae religionis*⁶, this erudite scholar had posited the thesis “That the heaven rests and the earth is rotating in a diurnal motion, can not at all be proved from Scripture, and, duly considered, it is even clearly rejected by it (Ps 19:6-7; and 104:5; Eccles. 1:4-5).

Moreover, in 1641 Voetius had refuted a thesis from the *Exercitationes Philosophicae* of “David Gorlaeus, our compatriot” in which the latter “in youthful impudence” had maintained that “man, composed of soul and body, is a being and a unity *per accidens* and not *per se*”. Voet’s opinion was that this not only offends against the physical truth, but also against metaphysical, psychological and theological truth. The rejection of the substantial Forms of things, which Taurellus, Gorlaeus and Basso in our time have tried to revive cannot be reconciled with “Mosaic and sacred physics”. The students, so he goes on, should consult the commentaries on Genesis of “our” Danaeus and Zanchius and the scholastic writers on Lombardus and Thomas⁷.

6. Gisbertus Voetius, *Assertiones theologicae de praejudiciis verae religionis quas ... in illustri gymnasio Ultrajectino ... ventilandas proposuit ...* Ultrajecti, ex officina Abrahami ab Herwyck et Hermanni Ribbii, 1634. The *Assertiones* were reprinted next year, when they were inserted into Voetius’ *Thersites heautontimorumenos ...*, Ultrajecti 1635, printed also by van Herwijck and Ribbiius.

7. G. Voetius, *Disputationes selectae*, vol. I (1648), pp. 869-870; on p. 552 the recommendation of the commentary on Genesis by B. Pereira S.J.

Voetius' rejection of the motion of the earth was now more elaborate than in 1635: "The daily and yearly rotation of the earth (which in our time Kepler and some other mathematicians have drawn out of the darkness of oblivion) is in direct and evident contradiction to the divine truth revealed in the Holy Scriptures". It is against the arguments of natural light which sound and sober-minded philosophy has put forward up till now: reverence for Scripture, the verdict of reason, and the light of nature have led us to the immobility of the earth⁸.

The disputation of 1641 was also inserted into the first volume of Voet's *Disputationes selectae*, which our Johannes van Waesberge published in 1648⁹. Consequently, van Waesberge must have known that Voetius was against the motion of the earth (and against Gorlaeus' atomism). Moreover, he was personally well acquainted with the "first theological professor" of the university, for he was a member of the church council of the Reformed church of Utrecht in which Voetius had a prominent place, and he was the publisher of a great many works of Voetius and his followers. The modern reader, inclined to simplify the situation in that time of violent party struggles (political and theological), wonders perhaps how a man who was evidently on good terms with Voetius, and who earned a considerable part of his living by printing and selling his books, could openly enjoy bringing to the light two essays which must have annoyed the influential theologian. Nevertheless, Voetius, – to whom (duly corrected) Aristotelian philosophy was indissolubly linked with theological orthodoxy, – continued to have his works printed by van Waesberge¹⁰.

One wonders also why, if these two treatises did contain as many novelties in 1651 as van Waesberge claimed –, they had so little impact on the contemporaries. One might suspect beforehand that this could be because their novelty at that time was not very great. After the appearance of Gorlaeus' *Exercitationes* the publication of his *Idea Physicae* added little news to it. Both his works are of interest mainly because they show how a youth, who (as Voetius remarked) had hardly started his theological studies, tried to be independent of the current philosophy of the Schools.

8. *Ibidem*. Cf A.C. Duker, *Gisbertus Voetius*, vol. II, Leiden 1910, pp. 152 and XLV.

9. Gisbertus Voetius, *Selectarum disputationum theologiarum*, pars prima, Ultrajecti, apud Joannem à Waesberge, anno 1648; P.II 1655; P.III 1659; P.IV 1667 (Johannes Janssonius van Waesberge en weduwe Eliseaeus Weyerstraat, Amsterdam); P.V 1669 (Antonius Smytegelt, Utrecht). The *Assertiones theologicae* are inserted in *Disp. selectae* II, pp. 539-551.

10. In 1660 van Waesberge printed an anonymous pamphlet violently attacking Voetius and those of his fellow-ministers who had opposed the usurpation of ecclesiastical rights and funds by the Utrecht oligarchy. A.C. Duker, *Gisbertus Voetius*, vol. II, p. 329, n. 2.

As to real innovation in the mechanistic and atomistic sense, Gorlaeus remained far behind his contemporary Isaac Beeckman (1588–1637)¹¹. The latter was more critical, less scholastic in his manner of demonstration, more modern in his theorizing (e.g. in his attitude towards Copernicanism) and far ahead of Gorlaeus in his appreciation of the role of experiments in physics. It is true that Gorlaeus said that experience is the basis of philosophical thought¹², but this has nothing to do with “experimental philosophy” in the 17th century sense: it is the purely Aristotelian tenet that not innate ideas, but gradually increasing sensual observations, are the bases of knowledge¹³.

Gorlaeus’ cosmography, moreover, was very conservative. On the relation of Scripture and natural philosophy his standpoint was quite different from that of our “anonymous” writer¹⁴. His opinion that “heaven” is “air” and not fire or water or a quinta essentia, he proved by Scripture as well as by “natural” arguments¹⁵. He implicitly rejected Copernicanism when referring to some people who say that each globular body moves circularly, either round a centre outside itself or by rotation¹⁶. Yet he knew about the work of Galileo, for in the *Exercitationes* he said that the Milky Way consists of small stars, “as has been observed by the recently invented telescope¹⁷, whereas the *Idea Physicae* adds that this is testified by a “Paduan mathematician”¹⁸. In the *Idea Physicae* the central position of the earth is maintained, and it is denied that the earth has a circular motion and that the stars are standing still: this tenet is said to be in conflict both with Holy Scripture – Psalm 104 – and with experience, for a stone, having been thrown upwards vertically, returns to the same spot¹⁹.

How poorly informed Gorlaeus was in science is shown by his assertion that comets are not stars, for stars are never below the moon, whereas many comets are. Moreover, stars are perpetual, whereas comets disappear²⁰.

11. [C. de Waard, ed.], *Journal tenu par Isaac Beeckman*, vol. I, 's-Gravenhage, 1939, p. 23. Beeckman accepted atomism already in 1613/14: Letter of Jeremy Laren to Isaac Beeckman 12 Oct. 1613 (*Journal tenu par Isaac Beeckman*, T.IV, den Haag 1953, p. 26; Beeckman to Laren, nov. 1613, *Journal*, T.IV, 30–31).

12. D. Gorlaeus, *Idea physicae*, cap. XIII, 5, p. 73.

13. There is no evidence that Gorlaeus ever made experiments, let alone *chemical* experiments. He was a purely speculative philosopher who used arguments without making experiments in order to confirm his theses. Cf R. Hooykaas, “Science and Religion in the 17th century. Isaac Beeckman”, *Free Univ. Qu.* 1 (1951), pp. 164–183.

14. It should be noticed that Beeckman who – like van Goorle – had studied theology at Leiden university, ignored the whole problem of the relation between Bible and natural philosophy when discussing astronomical problems from the physical point of view. Beeckman’s Reformed orthodoxy went well together with his Copernican leanings.

15. Illud prius ex SS.litteris demonstrabimus, deinde ex rationibus naturalibus. (“This we will demonstrate first by Holy Scripture, next by ‘natural’ arguments”). D. Gorlaeus, *Exercitationes philosophicae* (1620), exerc. 16, sect. 1, p. 293. Cf Gorlaeus, *Idea physicae*, cap. VI, 1, p. 32: Caelum non est quinta essentia, sed est aër: Probatum hoc partim è sacris litteris partim ex ratione naturali.

16. D. Gorlaeus, *Exerc. phil.*, exerc. 17, sect. 2, p. 307.

17. Gorlaeus, *ibid.*: ... beneficio perspicilli noviter inventi observatum est...

18. Galaxia non est Meteorum, sed minutissimarum stellarum splendor, quae ob nimiam parvitatem videri nequeant: id quod se beneficio perspicilli nuper inventi observasse testatur Mathematicus quidam Patavinus. D. Gorlaeus, *Idea Physicae*, cap. VIII, 9, p. 47. This reference to Galileo demonstrates that the tract was written after 1610.

19. Duo ergo tantum elementa sunt, Terra et Aqua. Haec centrum mundi sunt et globum unum constituunt. Errant autem qui hunc globum circulariter moveri putant, stellas quiescere. Hoc enim praeterquam quod pugnat cum sacris literis, Psal. 104, etiam cum experientia pugnat. Lapis enim recte in altum projectus non in eundem caderet locum, unde projectus foret, si terra moveretur. Tum si huic ejusmodi foret motus, ab anima humana observari posset: non autem observatur. D. Gorlaeus, *Idea Physicae*, cap. VII, 10, pp. 41–42. Cf cap. VI, 3, p. 34.

20. D. Gorlaeus, *o.c.*, cap. VIII, 5, p. 46.

Gorlaeus' great merit was his independence of thought rather than the quality of his philosophy. But at the time of its publication – that is when the atomism of Gassend and the corpuscular philosophy of Descartes had been put forward and had made a great stir, in particular at the university of Utrecht – the *Idea Physicae* was not at all such a novelty as van Waesberge would make his readers believe. Moreover, the appeal to biblical texts, and the rejection of the motion of the earth, made this work a strange companion to the “Anonymous”'s defence of the Copernican system and rejection of the literalistic interpretation of Biblical passages on behalf of scientific theses.

2. *Why did the publication in 1651 remain unnoticed?*

The next question is whether in 1651 the claim that the anonymous treatise contained some new ideas was justified. This following paragraph does not purport to give an exposé of the development of the relations between Biblical exegesis and the Copernican theory between 1550 and 1650; it only adduces data sufficient to answer this question.

Johannes Kepler

In 1651 Kepler, Galileo and a host of theologians, philosophers and astronomers, Roman-Catholics as well as Protestants, had already tackled the problem.

On several occasions, Kepler in his astronomical publications (1609; 1619²¹) had tried to demonstrate that the Copernican system was not in conflict with a sound interpretation of Scripture. He then resorted to the principle of accommodation: “Holy Scriptures speak about common things... with men in a human way, so that they may be understood by man; they use what is generally acknowledged by men, in order to bring home to them other things, more lofty and divine”²².

To Kepler Ps 104 (which he regards as an elaboration of Genesis I) does not speculate on physics, but it is concerned with the greatness of God unfolded in a hymn singing about the world as it appears to our eyes²³.

De psalmist's saying that the sun like a bridegroom comes out of his chamber and runs his course like a giant (Ps 19) is allegorically interpreted by Kepler as the progress of the Gospel, – “the journey of Christ our Lord through the world” – and it is pointed out that the image is chosen in accommodation to naive vision.

Kepler emphasizes that both, the poetical allusion and the accommodation to direct observation, are *no false* statements: “The senses have their own truth”²⁴.

The story of Joshua is just an adaptation to the vulgar opinion: Kepler rejects

21. J. Kepler, *Astronomia nova*, Pragae 1609; *Gesammelte Werke*, ed. M. Caspar, vol. III, München 1937.

J. Kepler, *Epitome astronomiae Copernicanae*, Lentiis ad Danubium [Linz] 1618; *Gesammelte Werke* vol. VII, München 1953, lib. I, P.V, pp. 99–100.

22. J. Kepler, *Astronomia nova*, Introductio, fol. 5r; *Gesammelte Werke*, vol. III, p. 29.

23. J. Kepler, *Astronomia nova*; *Werke* vol. III, p. 31.

24. Neque falsus, hic vel illic dicere censeri debet; est enim et oculorum comprehensioni sua veritas. Kepler, *o.c.*, p. 29.

any effort to extract a scientific statement in one sense or the other, from it. Joshua, so he says, only wanted to have the day lengthened, howsoever this might happen²⁵. Texts on the stability of the earth just want to say that the world seems to us always the same; they do not proclaim a physical dogma; they have a moral message only²⁶.

It is remarkable that Kepler, who was well versed in theology, did not quote any Church Father or theologian, not even St. Augustine, to back up his use of the principle of accommodation; he applied it on his own responsibility. It must be added that, being a devout and tolerant Christian, he recognized other people's right to have different opinions, also on the relation between science and Holy Scripture.

But, like Copernicus, he attributed little value to the scientific opinions of non-scientists. He declared that the opponents of the mobility of the earth, like Lactantius, Augustine, may be holy, but that Truth was more sacred to him: "with all respect for the Doctors of the church, by science it is demonstrated that the earth moves"²⁷.

Galileo Galilei

The position of Galileo was rather different. As a Roman-Catholic he was bound to obey the decrees of the Council of Trent, which had decided that the interpretation of Scripture should be conformable to the common feeling of the Church Fathers. But there remained some uncertainty about the question how far this should go: did this prescript regard only matters of dogma and ethics or also matters of cosmology?

Galileo wrote several letters on the compatibility of the theory of the mobility of the earth with Holy Scripture and Tradition. In particular his long letter to the Grand Duchess Christina (1615)²⁸, which was spread by many handwritten copies, made a great stir. In this essay Galileo quoted St. Augustine frequently and extensively, but also St. Jerome and Dionysius Arcopagita were cited in support of the principle of accommodation.

Like Rheticus, Galileo distinguished between propositions about which human science cannot supply more than a plausible opinion (e.g. whether the stars are animate) and those of which we have positive proof through experiment, observation and demonstration (e.g. the mobility of the earth). As to the former we have to accept the strict sense of Scripture; as to the latter the reverse is the case, for they may reveal to us the true sense of Scripture.

In Galileo's opinion, with respect to the incapacity of the vulgar and the cur-

25. J. Kepler, *o.c.*, p. 30.

26. J. Kepler, *o.c.*, p. 31.

27. J. Kepler, *o.c.*, p. 34.

28. Galileo Galilei, *Letter to the Grand Duchess Christina* (*Le Opere di Galileo Galilei*, edizione nazionale 1890-1909; vol. V, pp. 307-348. English translation in: Thomas Salusbury, *Mathematical Collections and Translations*, T.I, London 1661, pp. 425-460. A latin translation by Elia Diodati was printed in 1636.

rent opinion of their time, the sacred writers accommodated themselves in matters not necessary for salvation to accepted usage instead of physical truth.

As to the text “He stretches out the north over the void, and hangs the earth above nothing”, Galileo reminds us that Thomas Aquinas had pointed out that the Bible calls “void” and “nothing” that space which we know to be filled with air and which the common people regard as empty. He mentions Paul of Burgos’ opinion that the miracle in Hezekiah’s time took place not in the sun but in the sundial and he refers to Didacus à Stunica’s conclusion that the mobility of the earth is not contrary to Scripture.

In his *Commentary on Job* (1579; first printed in 1584, Toledo) the Augustinian monk Diego de Zuñiga (1536–1597), when interpreting Job 9:6 (“Who shaketh the earth out of her place, and the pillars thereof tremble”), declared that it “might be greatly cleared by the opinion of the Pythagorians” and that Copernicus’ theory is preferable to that of Ptolemy. Ecclesiastes 1:4 (“...but the earth abideth for ever”) refers to the fact that the earth “continues without any sensible alteration” and, as is evident from the context, it has nothing to do with the earth’s immobility. When the same chapter mentions the motion of the sun, however, this means only that the motion of the earth “is by way of speech assigned to the sun”. The conclusion is that in no place Holy Scripture... so clearly speaks of the earth’s immobility, as this text from Job speaks of its mobility (p. 468–469)²⁹.

In Galileo’s own time the Carmelite P.A. Foscarini published a letter (Naples 1615) in which he stressed the accommodation of the Bible “to our manner of understanding, and according to that which appears in respect of us”, when speaking about the sun’s motion and the fixity of the earth (486): Scripture does not instruct us in the secrets of Nature, which are “remitted to human search and enquiry” (488). But, finally, Foscarini asks whether in that “admirable composure of the Candlestick” which was to be placed in the tabernacle (Exod. 25:32), God did not “shadow forth to us the system of the universe?” The shaft of the candlestick in the middle represents the sun, the six branches the six planetary spheres and the bowls perhaps may denote “those globes of late discovered by the help of the Optick Telescope” which participate with the planets (500–501), (i.e. their newly discovered satellites).

It must be recognized, however, that Foscarini at best interprets such “most abstruse significations” *with the help* of astronomy as “accidentally and... enigmatically” representing the “most wise structure of the world” (502), but does not use them as a source of astronomical information²⁹. It is emphasized that there are still truths hidden in Scripture which, “when once the true system of the universe is found out, then, and not till then, the meaning of these figures, and aenigma’s shall be made known to us” (502).

Evidently Foscarini, too, resorted to the principle of accommodation if this could help to discredit the “vulgar” astronomy, and to an allegorizing interpretation if this could be to the benefit of the Copernican (“Pythagorean”) astronomy.

In 1616 the cardinals of the Congregation of the Index decided that the works of Copernicus and Stunica should be expurgated and that of Foscarini wholly prohibited, whereas the “Pythagorean” doctrine of the motion of the earth and the immobility of the sun was condemned as being contrary to Holy Scripture. By this verdict the Congregation implicitly rejected Galileo’s

29. Stunica, Foscarini and Galileo’s Letter to the Grand Duchess Christina are quoted from: Thos. Salusbury, *Mathematical Collections and Translations*, T.I, London 1661.

The title of Foscarini’s pamphlet is another indication of the fact that Copernicus’ fame did not rest upon the new *system* in the first place (but rather on the astronomical technicalities of it): Lettera sopra l’ opinione dei Pittagorici e del Copernico della mobilità della terra e stabilità del sole, e il nuovo Pittagorico sistema del mondo, Napoli 1615. The system, then, is said to be borrowed from Pythagoras!

opinion that the Council of Trent only demanded that we agree with the Fathers about passages pertaining to faith and ethics (*Letter to the Grand Duchess Christina*; Salusbury, T. I, p. 450).

Towards the end of his letter to the Grand Duchess Christina Galileo tries to find positive support for the earth's motion and the sun's immobility from Holy Scripture. Even his own recent discovery (divulged in his "Letter on the Sunspots", 1611) that the sun makes a rotation upon his own axis in about a month, he now finds back in Scripture. In the light of this discovery we now understand, in his opinion, the *literal* sense of the biblical statement that the sun stood still in the midst of heaven (Joshua 10:13). If, in agreement with Copernicus, we place the sun "in the midst", – that is in the centre of the planetary revolutions and the spherical sky – and if, [in agreement with Galileo's own hypothesis], we consider that the sun by its rotation causes the motion of the earth and the other planets, the cessation (in the midst of the world) of the sun's rotation made the earth stop its motion, so that the day was lengthened. Galileo thus reads the text with an emphasis on "still" ("the sun stood *still* in the midst of heaven", in contrast to "the sun revolved on his axis in the midst of heaven").

In the same way, in another letter of that same year (1615)³⁰, Galileo interprets Ps 19:5-7 (the sun like a bridegroom comes out of his chamber) not as referring to the solar body but to the emitted rays of light of which the sun is the storeroom; a spirit spreading throughout the whole world and called "bridegroom" because of its fertilizing power. "He rejoices as a giant to run a race" refers to the emission of the rays, which takes place with as it were a bounding movement, and also to their great velocity and force and their capacity for penetrating all things. "The law of the Lord is perfect, converting the soul", means that God's spotless Law is as much more perfect than the sun (which is marked with stains: sunspots), as the power to guide souls is higher than the sun's power of moving the celestial bodies.

Galileo thus assumes that the psalmist alluded to the heliocentric system, and also to the sunspots and the solar rotation (not discovered before the 17th century) – as well as to the idea that the sun's rotation provides the moving force of the planets (a theory put forward by Kepler and Galileo shortly before this letter was written).

Like Rheticus, Galileo considered the Bible as authoritative in matters of doctrine and ethics but not as a source for science. And, like Rheticus, though holding that Holy Scripture accommodates itself to the vulgar opinion when speaking about things of nature, he entrusted the final exegesis of such texts to the enlightened scientists who, like himself, looked through the veil that covered the full truth about things of nature. In this way he made at least in a certain field the theologians dependent on the initiated scientists, which was against the spirit of the decisions of the Council of Trent.

Galileo as well as his opponents held that the Book of Scripture and the Book of Nature cannot contradict each other. This belief led the literalists to the con-

30. Galileo to Dini, 23-III-1615. Opere, ed. naz. V, pp. 301 seq. Galileo's exposition was based on the text of the Vulgate, Ps 18:6-8: In sole posuit tabernaculum suum: et ipse tanquam sponsus procedens de thalamo suo: Exultavit ut gigas ad currendam viam, A summo coelo egressio ejus: Et occursum ejus usque ad summum ejus; nec est qui se abscondat a calore ejus. Lex Domini immaculata convertens animas...

demnation of Copernicanism, and it supported Galileo in his confirmation of this same system. Though Galileo (like Rheticus) attacked literalism as long as this tactic offered a loophole for Copernicanism, he himself resorted to a more subtle form of literalism when he thought that this could prop up the Copernican theory.

We have noticed a similar inconsistency in Rheticus' defence of the mobility of the earth. But this does not imply that Galileo must have borrowed his ideas from Rheticus. The examples he chooses, the biblical passages he quotes and the authorities he refers to (St. Jerome, Dionysius, Thomas Aquinas) are not always the same; the coincidences demonstrate only that certain patterns of thought may come up as offshoots from the same root, independently of each other.

From the above it is evident that in 1651 even Rheticus' weak effort to trace the motion of the earth in the Bible, was no longer a novelty.

In general, however, those who used the principle of accommodation did not follow Galileo in his exegetical trick which, in principle, opened again the way for advocates of a "Mosaic" science. At least one of them did not let it pass unnoticed.

John Wilkins

The Puritan clergyman John Wilkins (a future founding father of the Royal Society), though a (moderate) advocate of Copernicanism, denied that biblical passages are of use either to support the immobility of the earth, or its mobility. "We must not be too bold with Divine Truth, or bring Scripture to patronize any Fancy of our own, though (perhaps) it be a Truth"³¹. This was directed against Mosaic science, but he applied it also to Galileo's theses (which he accepted himself). In a later work he pointed out that in his interpretation of "the sun stood still in the midst of Heaven", Galileo "maintains the literal sense of this place", whereas in his own opinion this is another example of a place of which may be said "likewise there are divers phrases wherein the Holy Ghost does not express things according to their true nature, and as they are in themselves; but according to their appearances, and as they are conceived in common opinion"³².

"The midst of heaven" must be interpreted "in reference to the opinion of the vulgar", as "such a place as was not very near to either of the ends, the East or West"³³.

Calvin's influence

In England and Holland the influence of Calvin favoured the theologians'

31. John Wilkins, *The Discovery of a New World* [1638], prop. IX; in: *The Mathematical and Philosophical Works of the Right Reverend John Wilkins*., London 1707–1708, p. 66.

32. John Wilkins, *A Discourse concerning a New Planet* [1640], prop. II; in *Works*, p. 163. On Wilkins: R. Hooykaas, *Religion and the Rise of Modern Science*, Edinburgh-London 1972, pp. 126-130.

33. J. Wilkins, *A Discourse concerning a New Planet*, prop. II; *Works*, p. 164.

acceptance of the new system. The main Reformed theologian showed a dislike of exegetical subtleties, while allotting an important role to “common sense”. The “waters above the earth” (Gen. I:7) are to him neither a real ocean (as the literalists would have it), nor angels (as allegorical exegesis conceived them), but clouds: “For it appears contrary to common sense, and quite incredible, that there should be certain waters above the heaven”, and therefore we should rather think of waters “such as the rude and unlearned also may perceive”³⁴.

In his commentary on Psalm 148 he considered this same text as a plain accommodation to a popular belief: those who “thence conclude that there is a sea in the heavens... too servilely tie themselves to the letter of the text”, as we know that Moses and the Prophet, to accommodate themselves to the capacity of ruder people, often use a vulgar expression, and “therefore it would be a preposterous cause, to reduce their phrases to the exact rules of philosophy”³⁵.

Though he fully accepted Aristotelian-Ptolemaic astronomy, he recognized perhaps more clearly than anybody before him, the discrepancy between the sophisticated “vulgar” astronomy of his time, and the world picture of the biblical writers. Yet, notwithstanding his reverence for Holy Scripture, – and thanks to his respect for the science of the Greeks and of his own contemporaries –, he did not reject the “vulgar” astronomy. He remarked that Genesis speaks of one expanse, whereas the astronomers make a distinction between several spheres. Genesis calls the sun and the moon “great lights”, whereas the astronomers prove by conclusive reasoning that the little star Saturn is greater than the moon³⁶. These differences arise because Moses wrote in a popular style; he only described what all ordinary persons endowed with common sense are able to follow, whereas the astronomers investigate whatever the ingenuity of the human mind can understand³⁷.

According to Calvin, the Holy Spirit opens a common school for the learned and the unlearned, and therefore chooses what is intelligible to all. If Moses had spoken in a scientific way, the uneducated might have pleaded in excuse that such subjects were beyond their capacity³⁸, and therefore he “rather adapted his writing to the common usage”. For the Bible is “a book for laymen”. “He who would learn astronomy and other recondite arts, let him go elsewhere”³⁹. The Holy Spirit “chose rather after a sort to stammer, than to shut up the way of learning from the vulgar and unlearned sort”⁴⁰.

If, then, the Ptolemaic system may be true without being conformable to the

34. J. Calvin, *Commentaries upon the first Book of Moses, called Genesis* [1554], trad. J. King, Edinburgh 1874; Gen. I:7.

35. J. Calvin, *Commentaries upon the Psalms of David and others*, ed. A. Golding, London 1571; Ps 148:6.

36. J. Calvin, *Comm. Genesis*, I:16.

37. J. Calvin, *Comm. Genesis*, I:16.

38. J. Calvin, *Comm. Genesis*, I:16; *Comm. Psalms*, 136:7.

39. J. Calvin, *Comm. Genesis*, I:15.

40. J. Calvin, *Comm. Psalms*. Ps 136:7.

letter of the Bible, it goes without saying that the Copernican system, too, may be true without being conformable to the letter of the Bible. Calvin himself never brings up the mobility of the earth when commenting on passages of Scripture touching the motion of the heavenly bodies. But he certainly was familiar with the medieval disputations about the question whether the heaven or the earth makes a daily revolution. He mentions this topic only once, and then in a quite unexpected context, viz. in a sermon on I Corinthians 19–24. There he rejects the rotation of the earth, not on Scriptural grounds but because it is “against common sense”⁴¹. It would have been inconsistent indeed, if he, who accepted the current system, though it was not conformable to some biblical statements, would have rejected the motion of the earth with the argument that it is against Scripture.

Small wonder, then, that in particular in countries where, as in England and Holland, Calvin exerted great influence, some astronomers who shared his theological principles made a different choice in the question of the motion of the earth. One of them, Edward Wright, the editor of Gilbert’s *De magnete*, (1600), when maintaining in the preface that the daily rotation of the earth is not contrary to Scripture, wrote: “Moses accommodated himself to the understanding and the way of speech of the common people, like nurses to little children”⁴².

Some decades later, an assiduous student of the works of Kepler and Galileo, John Wilkins (1614–1672), frequently approvingly quoted Calvin’s commentaries on Genesis and the Psalms⁴³; yet on one occasion he criticized him for falling into the trap of literalistic interpretation⁴⁴, – an error he on many occasions discovered also in the Fathers (Augustine included) and the scholastic theologians^{44b}. In the disputes after Galileo’s condemnation he chose the side of the new astronomy and of its protagonist Lansbergen, against the latter’s opponents Alexander Ross and Libertus Fromondus; yet the new system was to him only highly probable but not absolutely certain.

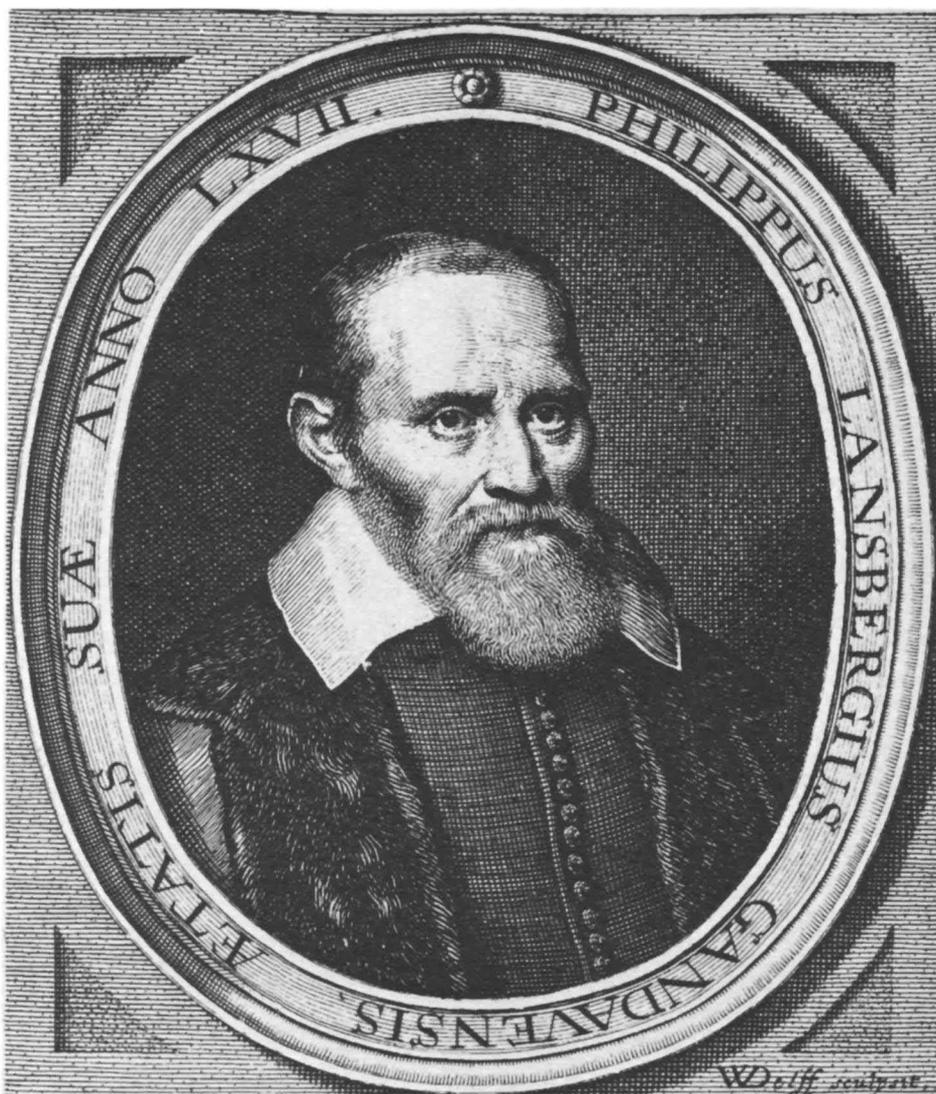
In the Netherlands the minister of the Reformed church, Philip van Lansbergen (1561–1632), was a fervent advocate of the Copernican cause and a competent astronomer and mathematician as well. In 1619 appeared his *Progymnasmatum astronomiae restitutae* and in 1629 the “*Bedenckingen op den dagelijcschen ende iaerlijcschen loop van den Aerdt-kloot*” (Reflections on the daily and yearly

41. Cf R. Hooykaas, Calvin and Copernicus, *Organon* 10 (1974), pp. 139–148. Only the current scholastic question whether a *daily rotation* should be attributed to the earth was at stake; as there is no proof that Calvin was thinking of Copernicus in particular, the title of the article is not correct.

42. Gul. Gilbertus, *De magnete*, Londini 1600. Praefatio [by Edward Wright], fol. Vr.

43. J. Wilkins, *Discourse*, pp. 169, 170, 171, 177.

44. J. Wilkins, *Discourse*, p. 163. 44^b: The Church Fathers, Aquinas, Luther and Calvin held, on arguments borrowed from Scripture, that the sea not overflowing the land is a miracle; according to Wilkins, however, it is “a necessary consequence of the nature of water” (*l.c.*, p. 188).



*Sidera qui tereis, totumq; relinquit Olympum,
 Monstrator ætheris novi,
 Iam pridem cœli vetus incolæ, corporis ægei
 Pertæsus, et nostri satur,
 Umbra animi, cœlog; oculos quos fixit, amicis
 Z. Roman exc. Sic consecrat Lansbergius. D. Hemius.*

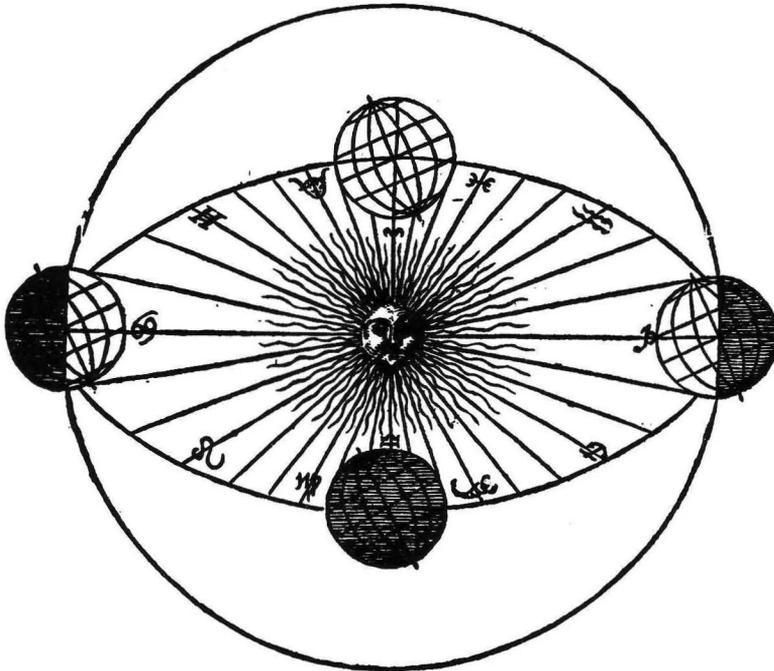
14. Philips van Lansbergen.

Bedenckingen/

Op den Dagelijckschen , ende Iaerlijck-
schen loop van den Aerdt-kloot.

Mitsgaders

Op de ware Af-beeldinge des sienelijcken Hemels ;
daer in de wonderbare wercken G O D T S worden ontdeckt,
Dooz PHILIPS LANSBERGEN.



En oordeek niet na den sinnen , meer oordeek een rechtveerdigh oordeel . Joen . 7 . 24 .

TOT MIDDELBURGH,
Dooz Zacharias Roman, Boeck-verkooper / op den Burcht/ in
den vergulden Spel . In't jaer 1650.

15. Title page of Lansbergen's defence of the Motions of the Earth [1629]. (From the second edition in the vernacular).

course of the terrestrial Globe), both of them in Middelburg, the capital of Zeeland. In his opinion Scripture does not speak about astronomical matters "according to the real situation, but according to appearances". The testimony of Scripture, says Lansbergen, is truth itself, but its authority is wrongly adduced to demonstrate the motion of the heavens. St. Paul is quoted as saying that

“Scripture is given by inspiration of God, and is profitable for doctrine, for reproof, for correction, for instruction in righteousness” (II Timothy 3:16), but, Lansbergen adds, “it is not meet for instruction in geometry and astronomy”. The method of calculating the circumference of a circle might be learned from Archimedes, but not from Scripture, which often makes an approximate rather than an exact use of numbers, as for example when the brazen sea is stated to be three cubits in diameter, but a line of ten cubits compassed it round about⁴⁵.

It should be emphasized that Lansbergen wrote his works when Calvinism was at its heydays in the Netherlands, viz. at the time of the Great Synod of Dordrecht (1618–’19) and the first decade afterwards. His activities were financially supported by the strongly Calvinistic States of Zeeland, and his books were adorned with laudatory poems by the Secretary to the Synod of Dordt (Daniel Heinsius), by the Pensionary Jacob Cats (who was the most popular poet in the Netherlands at that time), and by the poet Johan de Brune, who declared that he had deemed the motion of the earth contrary to Scripture, until the scales fell from his eyes on reading Lansbergen’s text. Moreover, the foremost Reformed theologian at that time, André Rivet, considered the motion of the earth as a tenet not conflicting with Holy Scripture.

The strongest opposition to Lansbergen came from Libertus Fromondus, a Roman-Catholic priest in the Spanish Netherlands, who attacked Lansbergen’s *Progymnasmatum* in his *Ant-Aristarchus* (1631). He spoke of the “ridiculous” “Copernico-Calvinistic system of Lansbergen” and expressed the opinion that Lansbergen had declared the Holy Spirit a liar, for his exegesis implied that the Spirit would have inspired Joshua to say “Sun, stand thou still”, though knowing that the sun was not moving⁴⁶.

Lansbergen’s son, dr. Jacob van Lansbergen, then took up the defence of his father’s view of biblical exegesis. He pointed out Fromondus’ errors in physics and he referred to “our Calvin” (Calvinus noster) in support of the exegetical principle of accommodation. He quoted the passage “the Spirit, as it were, stammers with us” from the Commentary on Genesis and he mentioned how

45. Philippus Lansbergen, *Bedenckingen op den dagelijckschen ende Iaerlijckschen loop van den Aardkloot* [1629], Middelburg 1650, pp. 17–22. Latin edition: *Commentationes in motum terrae diurnum et annum*, Middelburg 1660. About the Copernican debate in the Netherlands: R. Hooykaas, “Science and the Reformation”, *J. World History* 3 (1956), 109–139; 781–784. Also in: [ed. S.N. Eisenstadt], *The Protestant Ethic and Modernization*, New-York-London 1968, pp. 211–239. And: R. Hooykaas, “The Reception of Copernicanism in England and the Netherlands. In: *The Anglo-Dutch Contribution to the Civilization of Early Modern Society*, London 1976, pp. 33–44.

46. Libertus Fromondus, *Ant-Aristarchus sive Orbis Terrae Immobilis liber unus: In quo decretum S. Congregationis S.R.E. Cardinal. an. 1616 adversus Pythagorico-Copernicanos editum defenditur*. Antverpiae 1631. He wrote: “Ridicula theologia Copernicana Lansbergii”, “theologia istius Copernicano-Calvinistae...”, “consequentia illa Copernicano-Calvinistica Lansbergii” (cap. XIX, p. 99). “Itaque Philosophi Christiani non ita figere sibi in antecessum opiniones debent, ut deinde Spiritum sanctum, ubi repugnare videbitur, non tantum in balbutiem suam, sed in mendacium trahunt” (cap. VI, p. 35) i.e.; Lansbergen not so much makes the Holy Spirit “stammer” but rather makes him a liar (the expression “stammering of the Spirit” was used by Paul of Burgos, Calvin, Wright and Lansbergen).

in the Commentary on Psalm 58 the Reformer had said that the Holy Spirit accommodated Himself even to vulgar *error*⁴⁷.

Fromondus replied in *Vesta* (1634), which, according to the title page, defended “the decrees [against Galileo!] of the Index Congregation of 1616 and of the Holy Office of 1633”. He asked why the Hollanders and Zeelanders (and even the common people among them), but not the Spaniards and Portuguese, adhered to Copernicanism⁴⁸, – a rhetorical question to which the answer was given on his own title page. The general impression abroad was indeed that all Hollanders and Zeelanders were Copernicans. Gassend, who visited these provinces in 1629, believed this, and Galileo thought that “all the most distinguished heretics” (Calvinists) in the Republic accepted his theory⁴⁹.

Of course, this was an exaggeration. We have pointed out above how strongly, some years later, Voetius disputed the mobility of the earth. Already at the opening of the new university in Utrecht (1636) he preached a sermon in which he presented Holy Scripture as “the safest haven from which to launch into the sea of astronomical speculation”. “Holy Scripture”, so he said, “not only teaches what is necessary for salvation but also lays down the . . . principles of all other good sciences and arts”⁵⁰. Probably this was meant to refute Lansbergen’s appeal to II Timothy in favour of the opposite view.

Energetically rejecting the exegetical principle of accommodation, Voetius considered the Copernican system as being in flat contradiction to the letter and the intention of the Bible. He also argued in his *Thersites heautontimorumenos* (1635), that if the Holy Spirit inspired Joshua to say “Sun, stand thou still”, while the sun was already standing still, He would have told a lie for the benefit of the common people⁵¹, and He would have led many people into absurd errors.

In his extreme literalism Voet was closer to Fromondus than to Calvin. He must have been aware of it himself, when, in spite of his great respect for the

47. Jacobus Lansbergius, *Apologia pro Commentationibus Philippi Lansbergii*, Middelburgi-Zelandiae 1633, pp. 44–55.

48. L. Fromondus, *Vesta, sive Ant-Aristarchi Vindex*. Adversus Jac. Lansbergium Philippi F. Medicum Middelburgensem, In quo Decretum S. Congregationis S.R.E. Cardinalium anno MDCXVI et alterum anno MDCXXXIII adversus Copernicanos terrae motores editum, iterum defenditur. Antverpiae 1634.

Et tamen . . . [in spite of this ridiculousness] . . . vulgatis iam paene est apud vos, et non tantum intra eruditos, sed in turbam etiam nautarum aurigarumque se sparsit Copernicani motus persuasio . . . Quasi vero certiora ibi, quam in Oceano Belgico motus telluris indicia, et acutius alia in Orbe illo videant Hollandi Zelandique, quam Hispani et Lusitani, qui insanire putant qui iis disceret, Solem non oriri et occidere, sed terram revolutione sua diem et noctem circumducere. (Prooemium, pp. 12–13).

The answer to Fromondus’ question is to be found on the title pages of his books: the Hollanders and Zeelanders did not care for the two decrees of Rome (1616 and 1633) which he announced to defend.

49. Galileo (1624) to Francesco Ingoli (in answer to Ingoli’s *Disputatio de situ et quiete terrae contra Copernici systema* (1616).)

50. G. Voetius, *Sermo van de Nuttigheydt der Academien*, Utrecht 1636, pp. 35–36.

51. G. Voetius, *Thersites heautontimorumenos*, Ultrajecti 1635, pp. 266, 281, 283.

Reformer, he recommended to the theological students as a good commentary on Genesis that of Pereira S.J.⁵², completely ignoring that of Calvin. In Voet's unimaginative interpretation the Bible is read as if it were a statute of law. According to him Psalm 19 speaks "historically" about the motion of the sun⁵³, otherwise it would not be the speech of heaven but that of ignorant people who were passing wrong judgments on God's works⁵⁴.

In spite of his clinging to the letter, Voetius did not recognize that he himself projected Aristotelian tenets into the Bible. He went so far as to accuse of favouring atheism those who abandon the philosophical principles generally received in Christendom and who prefer their own theories on the universe to the "Mosaic science" dictated by the Holy Spirit⁵⁵.

From the above it is evident that the publication of the "Anonymus" epistle on the motion of the earth in 1651 came too late. Quite apart from the more outstanding writings quoted above, there was a continual flow of theological and astronomical pamphlets, anonymous or not, using the accommodation argument in defence of the orthodoxy of the Copernican theory. Especially after the process against Galileo the problem was a hot topic of discussion not only in Roman-Catholic circles but also among Protestants.

All the arguments put forward by Rheticus in favour of the earth's motion had already been put forward by others when the treatise was printed in 1651, and all the arguments against it, that had been advanced by imaginary opponents in Rheticus' tract, and duly refuted by him, could be found in the many anti-Copernican writings of the first half of the 17th century.

There is, however, one rather significant difference between Rheticus' argumentation and that of the later Protestant apologists of Copernicus. Whereas Rheticus strongly emphasized the "catholic" character of his standpoint and frequently quoted St. Augustine, the later interpreters (if they were no R.C. like Galileo!) needed only to stress the spiritual and historical, but non-scientific, character of the Bible, without feeling compelled to confirm their standpoint by an appeal to Tradition.

Summing up, we conclude that already long before the *publication* in 1651 of the anonymous treatise in defence of the orthodoxy of Copernicanism, nothing new could have been learned from it in spite of the claim made by its eventual publisher. Small wonder, then, that it remained practically unnoticed, as being the appendix to an almost forgotten, and – after Gassend and Descartes – superannuated work on atomism (which, moreover, had been preceded by the publication of a more elaborate work on the same subject by the same author).

That the anonymous treatise was practically forgotten, and that its contents

52. G. Voetius, *Thersites*, p. 256; *Disputationes selectae*, vol. I, p. 552.

53. G. Voetius, *Thersites*, p. 273.

54. G. Voetius, *Thersites*, p. 276.

55. G. Voetius, *Disputationes selectae*, vol. I, p. 577.

remained unknown, was in itself no great loss. Why then this present publication in the late 20th century?

The answer has not so much to do with its intrinsic merits as with its new significance as the long lost treatise of *Rheticus*, Copernicus' only pupil, who worked, probably under the same roof, with him for more than two years and who, more than anybody else, was instrumental in the publication of his great work. The identification of this tract allows us at long last to form a better picture of what Copernicus himself (and his close friend Giese) thought about the relation between his theory of the motions of the earth (and the structure of the universe) and the text of Holy Scripture.

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