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**The ‘Marks of God’s Wisdom’ in
 Comenius’s *Panorthosia*: A Biblical
 Commonplace at the Foundations of
 Modern Science¹**

Comenius was one of the early founders of modern scientific enterprise in that he, like Francis Bacon and Samuel Hartlib, facilitated the kinds of networks that are characteristic of modern science, particularly in Great Britain. His projects for pansophic science and public education inspired a generation of aspiring scientists to pursue various projects in a time when public support for science was minimal. Little known is the fact that Comenius’s confidence in the possibility of scientific endeavour was based on a long-standing theological tradition that combined Platonic philosophy with Old Testament wisdom (centred in a verse from the Wisdom of Solomon). I shall briefly survey the history of that tradition and show how it inspired a generation of early modern scientists and how it continues to inform the scientific enterprise even today.

Keywords: Comenius, creational theology, comprehensibility, Paul Davies, Albert Einstein, Wisdom of Solomon, Augustine, Gregory of Nazianzus, Johannes Kepler, James Clerk Maxwell

An appendix containing the word orders in Wisdom 11:21b in the Latin texts is available online at www.scienceandchristianbelief.org

Introduction

Johannes Amos Comenius (Czech, Jan Komenský) has been described as an ‘incomparable Moravian’.² He was one of the most widely known and best-connected scholars of his time. Although he was born in a small corner of the Moravian Margraviate, in the Uherské Hradiště District in 1592 – he took his surname from the village of Komňa – he travelled and taught and published widely on the European continent. Almost everywhere I go in East Central Europe, as far east as Sárospatak in north-eastern Hungary (then part of Transylvania), I find monuments, schools and museums erected in his honour.

1 An earlier version of this paper was read at a Comenius seminar at Sárospatak Reformed Theological Academy and published in *Sárospataki Fuzetek* 2010, No. 1, pp. 21-30.

2 The epithet goes back to Cotton Mather and was adopted by Spinka, M. *John Amos Comenius: That Incomparable Moravian*, Chicago: University of Chicago Press (1943), pp. 84-86.

Comenius was equally well known in Western Europe and even in Colonial America. According to one report, he was recruited – albeit unofficially – to become the president of Harvard College in colonial America.³ He had studied at Herborn in Nassau (now Hesse) and at Heidelberg in Germany, and he spent major parts of his life in Hesse, Poland, England, Sweden, Prussia, Hungary and Holland.

The current expansion of the European Community would no doubt have pleased Comenius very much. Optimist that he was, he might well have viewed it as a partial realisation of his prophetic, utopian vision of a unified Europe – albeit in a more secularised form than the Christian Europe that he envisaged. I shall return to Comenius's possible evaluation of the present-day situation at the end of my paper.

Comenius as a Janus-like figure

I see Comenius as representative of his 'Janus-faced' generation. Like the ancient Roman god of gateways, Comenius faced both forward and backward in time. In order to appreciate the pivotal role that he and his generation played in the history of ideas, it is helpful to view him diachronically, looking back as far as the wisdom tradition of the Old Testament and looking forward to great scientists of the present time.

In this paper I shall focus on one particular way in which Comenius mediated between these two temporal poles: the ancient Judeo-Christian wisdom tradition and modern scientific endeavour.⁴ In order to view Comenius's role diachronically, I will begin the discussion with the work of some modern scientists and work my way backward.

Looking forward beyond Comenius: modern scientists on the comprehensibility of the natural world

Let us begin with a brief look at the ideas of some representative modern-day physical scientists. I will focus on the ideas of two physicists who have reflected on their work and can help us to see the significance of Comenius's work.

3 Matthew Spinka tentatively locates this contact with John Winthrop, Jr., in 1642; Spinka *op. cit.*, (2), vi, pp. 84-86. On Comenius's ideal of a university education, see Murphy, D. Comenius: *A Critical Reassessment of His Life and Work*, Dublin: Irish Academic Press (1995), pp. 224-239.

4 Comenius's mediation stands as a witness against any programmatic attempt to project modern demarcations between faith and reason, or among theology, philosophy and natural science back into pre-modern history – as was done e.g. by John W. Draper & Andrew Dickson White; Draper, *History of the Conflict between Religion and Science* (1874); White, *A History of the Warfare of Science with Theology in Christendom* (1896).

It is often supposed that scientists are arrogant about the success of their disciplines. In some cases that may be true – scientists are capable of arrogance like anyone else. But there are also many scientists who have been truly humbled, not just by their failures, but by the very success of their work. Even if science is still very far from reaching its goal of understanding the physical world in all of its depths and all of its dimensions, it has already progressed far beyond what anyone might have expected on strictly naturalistic grounds by themselves. I will document this idea with two examples.

My first example is the Australian astrophysicist, Paul Davies. In several important articles and most eloquently in his 1992 book, *The Mind of God: The Scientific Basis for a Rational World*, Davies has drawn attention to what he calls the ‘great miracle of science’:

The success of the scientific method at unlocking the secrets of nature is so dazzling [that] it can blind us to the greatest scientific miracle of all: *science works*. Scientists themselves normally take it for granted that we live in a rational ordered cosmos subject to precise laws that can be uncovered by human reasoning. Yet why this is so remains a tantalizing mystery. Why should human beings have the ability to discover and understand the principles on which the universe runs? . . . does it point to a deep and meaningful resonance between the human mind and the underlying organization of the natural world?⁵

What Davies points out here is that the pursuit of science, scientific endeavour, is based on specific beliefs. In fact, there are two (twin) beliefs stated here that lie at the foundation of scientific endeavour. First, scientists must believe that the cosmos is rationally ordered – that it is governed by rational principles of some sort, often expressed in the form of mathematical laws (‘we live in a rational ordered cosmos subject to precise laws’). This belief is an article of faith since it cannot be explained without appealing to some deeper principles or laws and because natural science cannot explain why that rational order exists in the first place.

Second, as Davies points out, scientists must believe that human minds are capable of understanding that order: humans can develop mathematical models and rational formalisms some of which will test positively in the laboratory and even in the farthest reaches of space-time (‘laws that can be uncovered by human reasoning’).⁶ This dual belief, rational order and human understanding,

5 Davies, P. *The Mind of God: The Scientific Basis for a Rational World*, New York: Simon & Schuster (1992), p. 20.

6 Paul Davies would be less optimistic fifteen years later. At a Fundamental Questions Institute (FQXI) conference on ‘Risks of Scientific Knowledge’ (2017), he stated that complete understanding of the order of the cosmos was probably an ‘unachievable goal’ for humans, largely because the quest might not continue to enjoy the popular support needed for the funding on which it depends (recorded PBS ‘Closer to Truth’, Series 17, Episode 13). There is no indication that Davies has

is a theme that we will find running all through the history of Western ideas,⁷ particularly in Comenius, whose role it was to publicise it across the educational landscape. What particularly interests me about Davies's formulation is the way he identified this coordination as a 'tantalizing mystery'. (He went on to explain why it is not accounted for by the theory of biological evolution.) As we shall see, there was no such disconnect in the pansophic world-view of Comenius and his contemporaries.

Paul Davies was not the first to realise that modern scientific endeavour is motivated and sustained by faith. In the early twentieth century, Albert Einstein recognised that the same twin beliefs lay at the foundation of his own work. Here is the way he put it in 1941 in an essay entitled, 'Science and Religion':

Science can only be created by those who are thoroughly imbued with the aspiration toward truth and understanding. This source of feeling, however, springs from the sphere of religion. To this [sphere of religion] there also belongs the faith in the possibility that the regulations valid for the world of existence are rational, that is, comprehensible to [human] reason.⁸

Here Einstein refers back to the ideas of Christian natural philosophers of the nineteenth century like James Clerk Maxwell.⁹ He was keenly aware of the faith dimension of all scientific work. Like Paul Davies and a number of other more recent philosophers and physicists, Einstein clearly identified the twin beliefs: (1) that the world is governed by regulations or laws; and (2) that those regulations are 'rational' in the sense that human reason is capable of grasping them.¹⁰

If Einstein and Davies are right, the emergence of modern science was made possible by a prior belief in the viability of scientific endeavour and we should be able to find actual examples of that belief in early modern writers like Comenius. Though Comenius's writings were not 'scientific' in the technical sense that the term is used today – and there are British historians who refuse to call anything 'scientific' prior to the nineteenth century and the work of William

slowed his own efforts towards that goal, however, so he continues to function as if continued progress is still possible.

7 I have documented the history of these beliefs from the ancient Near East to Paul Davies in *Toward a Theology of Scientific Endeavour*, London: Ashgate (2007), chap.3.

8 Einstein, A. 'Science and Religion II' (1941), in idem *Out of My Later Years*, New York: Philosophical Library (1950), p. 26; also in idem *Ideas and Opinions*, London: Alvin Redman (1954), p. 46. Note that Einstein used the term 'rational' to refer to the human pole of the coordination, whereas Davies would use it to refer to the natural pole.

9 On Maxwell's creational faith and its impact on Einstein, see my *Creational Theology and the History of Physical Science: The Creationist Tradition from Basil to Bohr*, Studies in the History of Christian Thought 78, Leiden: Brill (1997), pp. 379-399.

10 Interestingly, Einstein did not view the new science of quantum theory as 'rational' due to the seemingly contradictory properties of photons; see Chown, M. 'Einstein's Rio Requiem', *New Scientist* (6 March 2004) 121, 50-51.

Whewell – they thoroughly explored the ideological and pedagogical underpinnings of science that we have noted, and they anticipated the work of architects of the ‘scientific revolution’ like Robert Hooke, Robert Boyle (Comenius anticipated his famous image of the cosmos as clockwork),¹¹ and Isaac Newton. They exemplify the dual beliefs that subsequent generations of physicists inherited and on which they built what Einstein and Davies called the ‘miracle’ of modern science. My interest, however, is not so much in the influence of this treatise, as in what it tells us about the meaning of biblical texts and theological ideas in the minds of writers not generally classified as theologians.¹²

The ‘marks of God’s wisdom’ in Comenius’s *Panorthosia*

In order illustrate this twofold belief and explore its ultimate sources, I shall focus on Comenius’s *Panorthosia*, or ‘Treatise on Universal Reform’. The *Panorthosia* was just one part (one of seven) of Comenius’s magnum opus, *De rerum humanarum emendatione consultatio catholica* (‘A Deliberation about the Universal Improvement of Human Affairs’),¹³ referred to as the *Consultatio*, which has been described as ‘the climax of his whole philosophy’.¹⁴ It was written in the late 1640s and 50s – hence largely in the aftermath of the Thirty Years’ War.¹⁵

11 Comenius ‘The Labyrinth of the World and the Paradise of the Heart’ (1631, 1663), 42.4, Louthan, H. & Sterk, A. (trans.) *Classics of Western Spirituality*, Paulist Press (1998), p. 200. In the same passage Comenius attributed all the planetary motions to a ‘spirit’ emanating from the sun at the centre, thereby anticipating Newton’s idea of gravitation as a supra-mechanical principle in nature; Kaiser *op. cit.*, (9), pp. 243-245.

12 My aim in this paper is not to include theology in our understanding of the origins of modern science. Many historians of science have done that, e.g. Peter Harrison, who calls attention to the important role of the doctrine of the fall in the development of experimental science. My own aim is call attention to the persistence of historically conditioned beliefs in modern, secular scientific endeavour. In other words, I wish to stretch our understanding of historical creational theology to include the writings and reflections of modern scientists like Einstein and Davies. Here the focus is on Comenius as one link in that tradition.

13 Dobbie, A.M.O. ‘Translator’s Preface’ to *John Amos Comenius: Panorthosia, or Universal Reform, Chapters 1-18 and 27*, Sheffield: Sheffield Academic Press (1995), p. 11. The form of Comenius’s title is given as *De emendatione rerum humanarum consultationis catholicae* in Tschizewskij, D. & Schaller, K. (eds.) *Johann Amos Comenius: Ausgewählte Werke*, 3 vols., Hildesheim (1973).

14 Dobbie *op. cit.*, (13), p. 16. The earliest published mention of the *Consultatio* was in Comenius’s Dedicatory preface to the 1668 edition of his *Via lucis vestigata et vestiganda* (‘The way of light traced and to be traced’), para. 4 (followed by an outline of the seven treatises in paras. 5-11); cf. Dobbie *op. cit.*, (13), pp. 13-14. For an outline of all seven treatises see Spinka, M. ‘Comenian Pansophic Principles’, *Church History* (1953) 22, 155-165 (160-164).

15 Hence the *Consultatio* was written during Comenius’s residence in Elbing/Elbląg (on the Baltic Coast of Prussia/Poland) and Leszno (just south of Posen/Poznań). I mention the historical context in order to understand the greater (but still measured) optimism Comenius expressed than in his classic *Labyrint světa a ráj srdce* (‘The labyrinth of the world and paradise of the heart’) which was written in 1623.

The part of the *Panorthosia* that concerns us here is chapter XI, which has the title, 'Concerning the new Universal Philosophy [Philosophia catholica] which will guide the human mind toward a state of perfection'.¹⁶ It is the first of four pivotal chapters in Comenius's effort towards 'universal reform', the other three chapters advocating:

- A universal political system
- A truly universal new religion
- A universal language (something like modern Esperanto)¹⁷

Comenius defined this Universal Philosophy as the 'full, orderly, and true insight into everything that exists in the world'. In the tradition of the encyclopedists like his mentor Heinrich Alsted,¹⁸ he believed that a good education would make the totality of this knowledge accessible to the average person.¹⁹ It would be truly universal, not fragmented into different sciences and arts and faculties (*Panorthosia* XI.1).²⁰

Although this particular part of the treatise did not appear in print during Comenius's lifetime, it was known in manuscript (prior to being lost and not rediscovered until 1934) and the ideas were an integral part of his teaching, conversation and correspondence (esp. with Samuel Hartlib).

What Comenius had in mind when he spoke of a 'Universal Philosophy' (*Philosophia catholica*) was a set of basic principles that would lead to a new natural

16 Comenius's eschatology, like that of many seventeenth-century Protestants, was what is today termed 'post-millennial' (or perhaps 'mid-millennial'); cf. Lochman, J.M. 'Chiliasmus verus: Exchatologie und Weltgestaltung in der Perspektive des Comenius', *Theologische Zeitschrift*, (1979) 35, 275-282. As he stated in *Panorthosia* XIX. 4: 'sooner or later, if all the preliminary arrangements are properly made, all the kingdoms of the world shall suddenly become the kingdoms of our Lord and of His Christ (Rev. 11:15)', Dobbie (trans.) *John Amos Comenius: Panorthosia, or Universal Reform*, Chapters 19-26, Sheffield: Sheffield Academic Press (1993), p. 13. In *Panorthosia* II,25-28, Dobbie (trans.), pp. 62-64, Comenius gathered scriptural support for the promise of Ages of Enlightenment (i.e., Universal Philosophy), Universal Religion and Peace, all coming before the end of this world. In his *Via lucis*, chap. XX, he specified the preconditions for the final triumph of the Lord Christ as a true Pansophia, Universal Schools, a Universal 'alliance/college of the wise', a Universal Language, and the regathering of the children of Israel (XX.3-9, p. 18).

17 Comenius had already advocated a universal language in his *Via Lucis*, (written in 1641-42), where he cited Luis Vives, *De tradendis disciplinis* ('On the teaching disciplines'), (1531), Book III, as precedent (XIX.8).

18 Heinrich Alsted was Comenius's mentor at the Reformed Gymnasium (Hohe Schule) in Herborn in 1611-12. Comenius compiled a 16-volume Czech encyclopedia, *A Theater of All Things* (*Theatrum universitatis rerum*) in Czech, which was modelled on Alsted's *Encyclopedia* (pub. 1630). All the manuscripts were destroyed when his home in Leszno was burned in 1656.

19 The ideal of universal education in pansophy would be restated in the Dedicatory preface (1668) to Comenius's *Via Lucis*, para. 8, Campagnac, E.T. (trans.) *The Way of Light*, Liverpool: Liverpool University Press (1938), Dedication, p. 8.

20 *Panorthosia* XI.1, Dobbie (trans.), p. 175. The goal of teaching 'all men' to be wise appears in *Panorthosia* XI.6 (ibid., p. 177).

philosophy that had universal scope – in other words, science in the broad sense of the term, including social as well as natural sciences. For Comenius, this scientific endeavour was an integral part of his lifelong quest (going as far back as the 1630s) for a Christian Pansophy or ‘Universal Wisdom’ – the quest for a harmonic, encyclopedic system that would embrace politics and theology, as well as philosophy.²¹ Philosophy and politics were to be viewed as ‘trueborn sisters’ rather than handmaids of theology (as they had been in medieval scholasticism).²²

We will begin our discussion with paragraph 8 of chapter XI. Here Comenius states that the new Universal Philosophy must be based on what he calls ‘the perfect *threefold Book of God*’. Today, when we speak of the book or books of God, we generally think of the Jewish Torah/Tanakh, or the Christian Bible, or the Quran. But prior to the secularisation of modern science, Europeans also thought of nature and human reason as God’s books because they were both believed to be created by and illuminated by God just as Scripture was.²³

Carrying on this tradition, Comenius, stated that there were three books of God and he could assume that his readers would recognise the idea.²⁴

1. insights of the human mind, guided by the internal light of reason and divinely implanted ideas (not to be confused with Aristotelian dialectic);²⁵

21 Comenius developed his pansophic programme as early as 1630, when he began work on his first encyclopedia, *Janua rerum reserata* (‘The gate of things unlocked’), and continued it in 1637 in his *Connatum Comenianorum praeludia, sive Pansophiae prodromus* (‘Outline of the Comenian project, or an introduction to Universal Knowledge’, published by Samuel Hartlib), both written in Leszno, Poland. He also wrote an explanation of his version of pansophy in Leszno, in which he invoked the idea of three books of God; Murphy *op. cit.*, (2), p. 21. In 1641-42, while he was in London, Comenius wrote *Via lucis* (Czech title, *Cesta světla*), as a manifesto of Christian pansophy and world order.

22 *Panorthosia* XI.23, Dobbie (trans.), p. 185

23 On this vast topic, see e.g. Tanzella-Nitti, G. ‘The two books prior to the scientific revolution’, *Perspectives on Science and Christian Faith*, (Sept. 2005) 57, 235- 248.

24 The idea of God’s threefold book is also found elsewhere in Comenius’s writings, as in the Preface to his *Synopsis of Physicks: Naturall Philosophie Reformed by Divine Light* (1650) and in *Via lucis* I.9-13 (written in 1641-42). In the 1668 Dedicatory preface *Via lucis*, it is called God’s ‘threefold school’ (Dedication, paras. 19-21).

25 Following the Platonic tradition, Comenius sometimes indicated that these ideas were innate in the human mind and hence were universally applicable; e.g., *Panorthosia* XI.10, 11, Dobbie (trans.), pp. 178-179. The Latin text is found in *Iohannis Amos Comenii: De rerum humanarum emendatione consultatio catholica, Editio princeps*, moderante Otakar Chlup, textum ad editionem paraverunt Jaromír Červenka et Vlasta T. Miškovská-Kozáková, 2 vols., Prague: Academia Scientiarum Bohemoslovaca (1966), 2:502a; cf. the Dedicatory preface to *Via lucis* (paras. 6, 17), where Comenius described these innate ‘notions, instincts and faculties’ as marks of the image of God; Campagnac (trans.) *The Way of Light*, Dedication, 13. It is not clear (to me), however, whether these faculties are inborn or directly inspired during lifelong education (the ‘illumination of the mind’ by God the Son in the Dedicatory preface to *Via Lucis*, para. 20). Or, it might be both, as it was for Johannes Kepler, Letter to Johann Georg Brengger dated 5 April 1608; ET in

2. the external, natural world, which is governed by universal ideas and hence can be examined by the human senses assisted by the light of reason;
3. Divine revelation accessed primarily through the reading of God's written word (the Bible), but also through the divine judgments that are manifested in the history of the world and the inner feelings or intuitions God's Spirit grants us in response to fervent prayer.²⁶

The first two of these books correspond to the beliefs that were described by Einstein and Davies as the basis of scientific endeavour. Nothing is said in 'paragraph 8' about the way in which the human mind and the external, natural world are coordinated: it is simply stated as a fact. However, Comenius set them within the framework of the third book, Scripture (also world history and inspirations by God's Spirit), which are accessed through the spiritual disciplines of Bible-reading and prayer.²⁷ By the nineteenth century that third book was dropped by most natural philosophers as a guide to scientific knowledge. As a result, the coordination of mind and nature became what Paul Davies described as 'a tantalizing mystery' (not fully explained for him by biological evolution).

It turns out that Comenius addresses this mystery a few paragraphs later (just one page in the Latin edition). Here is the key text from 'paragraph 16', which states the conditions needed for the viability of the proposed Universal Philosophy. In order for philosophers to demonstrate the truth, Comenius argues, they must avoid relying on ancient texts and the dialectical method (as in Scholasticism) and seek assistance elsewhere:

Baumgardt, *Johannes Kepler: Life and Letters*, New York: Philosophical Library (1951), p.79. e.g. Comenius's *Via lucis* I.11 attributes the book of human reason to humanity's 'being made in the likeness of God' (Gen. 1:26) and 'inspired with the breath of divine life' (Gen. 2:9); cf. *ibid.*, VII.7; Campagnac (trans.) *The Way of Light*, 5, 50. For Comenius's critique of the dialectical method as a human imposition on reality, rather than a divine illumination of the mind – it only allows the mind to crawl among probabilities, not to fly to the heights of certain demonstration, see *Panorthosia* XI.15-17, *Editio princeps*, 2: 505, Dobbie (trans.), 180-182.

26 *Panorthosia* XI.8-10, 16, *Editio princeps*, 2:501-502, 505, Dobbie (trans.), 177- 178, 181. In Comenius's 1650 Preface to the English translation of his *Physicae ad lumen divinum reformatae synopsis* (Synopsis of Physicks: Naturall Philosophie Reformed by Divine Light, London, 1651), the corresponding 'three principles of Philosophy' are briefly described as '[the Testimonie of] Sense, [the Light of] Reason and the Guidance of God'.

27 Compare the 1668 Dedicatory preface to *Via lucis* (para. 18), where Comenius would designate three areas of knowledge for which divine revelation is required: what was there before creation, what is now beyond the (physical) world and what will be when the world is no more. Notably absent here are the constituents of the physical world and the laws by which they operate (which are known from nature and human reason; Dedication, paras. 16-17).

English trans. ²⁸	Latin text ²⁹
Namely, from things in the World themselves, on which God has printed the marks of his Wisdom (numbers, measurements, weights),	<i>Nempe è rebus ipsis in Mundo, qvibus Deus Sapientiae suae characteres (numeros, mensuras, pondera) impressit,</i>
and from the dictates of one’s Mind , which, if carefully applied, is capable of finding all the numbers, measurements, and weights...	<i>et è propriae Mentis dictaminibus, qvae rebus accuraté applicata omnium rerum numeros, mensuras, ponderaqve invenire potest...</i>
better than the most ingenious individuals [dialecticians] could dictate.	<i>meliùs atqve ingeniosissimus quisque dictare posset.</i>

Comenius has three distinct ideas here, two stated explicitly and one implied:

1. the things in the external (natural) world, upon which God has imprinted numbers, measurements, and weights;³⁰
2. the dictates of the human mind, which, ‘if carefully applied’, enable it to discern those numbers, weights and measurements;³¹
3. some correspondence (or coordination) between the external world and the human mind which must be based on the ‘marks of [God’s] Wisdom’ (numbers, measurements, weights) that God had imprinted on both.³²

Comenius’s repeated use of triads would indicate that these three points correlate somehow to the three Books of God described in paragraph 8 (and again in par. 7 and 13). But how?

The first two points clearly correspond to the first two books: **the external, natural world and the human mind, guided by the God-given light of reason.** But what about the reference to the marks of God’s Wisdom that God has imprinted on the world? We might expect to find something here that is related to the third book of God, particularly God’s written word, which still meant the Latin Vulgate in learned, ecumenical circles like those in which Comenius moved.³³

The reference here was clear to those familiar with the Latin text of the Bible. The marks of his Wisdom are ‘numbers, measurements, weights’ (*numeros, mensuras, pondera*), which is a reference to the book of the Wisdom of Solomon, chapter 11, verse 20 (verse 21 in the Vulgate). The Wisdom of Solomon had been relegated to deutero-canonical status by the Protestant Reformers, but these books were still read and would be cited,³⁴ particularly by natural philosophers,

33 Comenius criticised the Vulgate for many mistakes of translation (*Panorthosia* XVIII.11.i, Dobbie (trans.), 241), but, when writing in Latin, he often cited or paraphrased it.

34 Theodore Beza translated the Apocrypha into French and they appeared in the French Genevan Bible in 1553; see Maag, K. ‘Theodore Beza’, *ExpTimes* (2015) 126, 261-269 (263-264).

as late as James Clerk Maxwell, in his essay on 'Molecules' (1873).³⁵

According to Wisdom 11:20/21, when God created the world he 'arranged all things by measure and number and weight' (*in mensura et numero et pondere*).³⁶

NRSV

Latin text

But you have arranged all things by measure and number and weight.	Sed omnia in mensura et numero et pondere disposuisti.
--------------------------------------------------------------------	-----------------------------------------------------------------------------

Aside from the order, these are the exact words that Comenius used (twice) in our passage. The exact order that Comenius used (number, measure, weight), only occurred four times in the Latin fathers (never in Augustine), but it occurred thirty-one times in the Latin Middle Ages (according to the Library of Latin Texts) and must have been common in oral usage as well. So, there can be little doubt as to the ultimate source of this idea.³⁷ But the Wisdom of Solomon used the idea to explain God's method of rescuing the Israelites from Egypt. So how did Comenius come by his interpretation of Wisdom 11:20 with respect to his Universal Philosophy? The best way to answer the question of Comenius's sources is to look backward at earlier citations of the text.

Looking backward from Comenius: the Patristic Tradition

This use of Wisdom 11:20 did not come to Comenius directly from the Old Testament, however. He benefited from a long, complex history of interpretation. In its original context, it supported a theodicy, countering various Hellenistic challenges to the descriptions of God in the Book of Exodus (Wis. 11 – 12; esp. 11:15-23)³⁸. As the text was cited in early Christian literature, it was exploited to address new challenges.

35 James Clerk Maxwell 'Molecules' (1873), *Scientific Papers of James Clerk Maxwell*, 2:377.

36 The context (Wis. 11:17, Vg. 11:18) indicates that the writer was thinking in terms of cosmogony, not just everyday affairs.

37 The order that Comenius used (**number, measure, weight**) is also found in Renaissance writers with pansophic interests like Agrippa of Nettesheim and John Dee; Agrippa of Nettesheim *De occulta philosophia* (publ. 1531-33), II.26 ('**number, measure and proportion**', here applied to Pythagorean music); John Dee, 'Mathematicall Preface' to Billingsley's *Euclid*, sig. ciii recto ('**Number, Measure, Waight**, figure, Situation and colour', here applied to 'the perfect body of man'), as well as elsewhere in Comenius's writings, e.g., in the 1668 Dedicatory preface to *Via lucis* (para. 22, where the fashioning in Wis. 11:21/21 is attributed to uncreated Wisdom). In fact, all six possible permutations of these three terms are cited in the Library of Latin Texts (see online Supplementary Material). I suppose the wide variation to be the result of citation from memory.

38 A similar answer to the same issue was made by Philo (roughly contemporary with Wis.) *De vita Mosis* 1.109-112. In contrast to Wis., Philo argues that God only wanted to admonish the Egyptians, not to destroy them (1.110), and that was the reason that God's omnipotence did not call for the use of big threats the way mortals do (1.111-112). On Egyptian critics who try to discredit the Exodus narrative (typified in the Pharaoh's magicians), see also *Migr.* 82.

The first place to look is the writings of Augustine of Hippo, the writer most frequently cited by Comenius in the *Consultatio*.³⁹ Augustine frequently cited Wisdom 11:20 – the *Brepols Library of Latin Texts* lists twenty-nine (29) citations of the Latin phrase, measure, number, and weight (in various permutations)⁴⁰ – particularly in order to uphold the rationality of God’s creation against detractors like the Manicheans. Let us look at just one of his better-known passages, found in the *Civitas Dei* (‘The City of God’). In Book XII, Augustine cited Wisdom 11 in association with Plato’s account of creation in the *Timaeus*:

Plato, their [the Origenists’] great authority, depicts God as constructing the world according to numbers [*mundum numeris fabricantem*]. And we read in our own [Scriptures] that it is said to God, *You have ordered all things in measure and number and weight* [*apud nos deo dictum legitur: omnia in mensura et numero et pondere disposuisti* = Wis. 11:21]. (*Civitas Dei* XII.19)⁴¹

Augustine uses Plato’s well-known idea about the formation of matter to get the attention of his Christian readers, but he used the biblical text to elaborate the idea and make it authoritative. Was he justified in making this association between Plato and the Bible?

The synthesis of biblical and Platonic ideas was hardly a new idea with Augustine, it was a commonplace in early Jewish and Christian thought. In fact, the Wisdom of Solomon had already incorporated popular ideas associated with Plato’s Dialogues. Compare our text from Wisdom 11 with the following passage from Plato’s *Timaeus* 53a-b, also concerning cosmogony:

Before that time, these [primordial elements] were all lacking logic and **measure**... God first fashioned them by forms and **numbers**.⁴²

39 According to Dobbie op. cit., (13), p. 21, the four most frequently cited are Augustine, Francis Bacon, Campanella and Plato, in that order.

40 The Library of Latin Texts online, Turnhout, Belgium: Brepols (2005) lists 29 citations in Augustine. It lists 404 citations in all: 78 in the ancient Latin fathers (AD200-235), 313 in the Latin Middle Ages (AD736-1500, including at least 5 by John Wycliffe), and 13 after the year 1500. (See online Supplementary Material for complete statistics. A chart of statistics is available from the author).

41 Augustine *City of God* XII.19; *Corpus Scriptorum ecclesiasticorum latinorum* 40/1:599, ET adapted from Dyson (trans.) *Augustine: The City of God against the Pagans*, Cambridge: Cambridge University Press (1998), p. 496, to match the Latin. Augustine appears to have been arguing against the Platonising followers of Origen here. Origen himself had argued that the material world was comprehended by God and so must have a beginning and an end (*Princ.* IV.4.8); cf. Kaiser, C.B. op. cit., (9), p. 25. Elsewhere, Origen cited Wis. 11:20 in *Princ.* II.9.1; IV.4.8, Butterfield (trans.), 129, 323), but left out weight because it did not match the dyad of mind and body he was developing (*Princ.* II.9.1).

42 Plato’s *Timaeus* 53a-b, ET adapted from R.G. Bury’s translation in the Loeb Classical Library (Harvard University Press, 1961), 7:127; cf. Hamilton, E. & Cairns, H. *The Collected Dialogues of Plato*, Bollingen Series 61, Princeton: Princeton University Press (1961), p. 1179.

The 'Marks of God's Wisdom' in Comenius's Panorthosia

Timaeus 53a

Wis. 11:20/21

<p>Before that time, these [primordial elements] were all lacking logic and measure.</p> <p>...God first fashioned them by forms and numbers.</p>	<p>you have arranged all things by measure and number and weight.</p>
<p>pro toutou panta taut' eichen alogōs kai ametrōs</p> <p>. . .theos. . . prōton dieschēmatisato eidesi te kai arithomois.</p>	<p>panta metrō kai arithmō kai stathmō dietaxas.</p>

The terms for measure and number are the same in both Plato and the Wisdom of Solomon. So, Augustine had good reason to associate the two. Plato said nothing about the weight of the elements in this context – probably because weightiness was associated with unformed matter (the source of its recalcitrance) and therefore quite unlike the more rational categories of measure and number. He did use all three terms, including weight, in other contexts where the terms are merely ways of human measurement (e.g., *Rep.* 602d; *Laws* 575b; *Philebus* 55e).⁴³

However, the idea of weight as a category of divine creation could be found in several Old Testament texts that antedated both Plato and the Wisdom of Solomon. Here are two examples:

Isa. 40:12 LXX Who has **measured** [*emetrēse*] the water in his hand and . . . **weighed** the mountains in scales [*estēse stathmō*] and the forests in a balance?

Job 28:24-26 LXX For he [God] surveys all that is under heaven . . . all that he has made: the **weight** [*stathmon*] of the winds, the **measures** [*metra*] of the water. When he made them, he saw and **numbered** [*ērithmēse*] them . . .

So, the cosmogonic use of the terms 'measure', 'number' and 'weight' came from the Hebrew Bible.⁴⁴ And the terms 'measure' and 'number' were well

43 In legal discussions, weight was included, along with measure and number, as means of quantifying property. The Library of Latin Texts lists two such uses in the *Institutes* of Gaius, the second century jurist: *Institutiones* II.196 and III.9. Its earliest use may have been Pythagorean: in the mid-fourth century, Claudius Mamertinus attributed the cosmological (but not cosmogonical) use of a similar phrase to Philolaus (c. 440 BC): 'Philolaus, according to geometrical principles, treats of music, **arithmetic, measures, weights, numbers**, insisting that these are the **principles which support the existence of the universe**', frag. 8 *apud De statu animarum* II.3; ET in Navon, (ed.) *Pythagorean Writings*, 133.

44 The cosmological use of measure-number-weight also occurs in Philo, *De somniis* 2.193 and

known from Plato in an obvious overlap with Scripture. Augustine was well within his intellectual rights to synthesise the biblical and Platonic ideas and to cite Wisdom 11:20 as his proof text.

As a result of the attention Augustine drew to it, Wisdom 11:20 became one of the biblical texts most often cited in Latin discussions of the natural world.⁴⁵ It was quoted by nearly all Latin natural philosophers from Augustine to Adelard of Bath, Agrippa of Nettesheim, John Dee, Johannes Kepler, Thomas Tymme, Francis Bacon (whom Comenius studied in his Leszno years⁴⁶) and Descartes to name just a few. In this respect, Comenius was hardly original. He was simply acting as the transmitter of a biblical *topos* or commonplace that supported his pansophic synthesis and broadcasting it to a larger audience than astronomers or philosophers.

The Wisdom tradition from Gregory of Nazianzus to Comenius

But what about the points that Comenius made that we found also reflected (albeit in secularised form) in the writings of Einstein and Davies? The idea that mathematical characteristics like weight, number and measure were somehow embedded in the human mind as well as in the natural order was extremely important because it implied that the mathematical order of creation should be discernable to those who could ‘carefully apply’ the ‘dictates of the human mind’. This idea is not found in the Wisdom of Solomon, but it does occur in Augustine’s *Confessions*, Book Five (AD 397), where he cites the work of pagan astronomers as a counterfoil to Manichean mythology:

They [the philosophers] were able to investigate the world with understanding even though they did not find its Lord [cf. Wis. 13:9]. . . . not even if their curiosity and skill **number** the stars [*numerent stellas*] and the sand [cf. Ecclus. 1:2], **measure** the starry heavens [*dimetiantur sidereas plagas*] and **trace** the paths of the stars [*vestigent vias astrorum*].

With **the mind and intellect** [*mente et ingenio*] **which you have given them**, they investigate these matters. They have found out much. Many years beforehand, they have predicted eclipses of sun and moon. . . .

2 Esdras (4 Ezra) 4:36-37. But other cosmological passages in Philo leave out weight (*Her.* 156; Prov. frag. 1, *apud* Eusebius, *Praep. Ev.* VII.21, 336c-337b).

45 Wis. 11:20 (LXX) was also alluded to by Basil of Caesarea, *De spiritu sancto* 43, and Ep. 219, both dated to AD375. Curiously, Basil did not cite this text in his *Hexameron*, which was composed fifteen years earlier (c. 360).

46 Francis Bacon was the second most frequently cited author in the *Consultatio*; Dobbie *op. cit.*, (13), p. 21. Comenius was particularly indebted to Bacon’s *Instauratio Magna: Novum organum scientiarum* (The Great Instauration: A New Handbook of the Sciences, 1620), which alluded to Wis. 11:20 in section 98.

They have not known the Way, your Word through whom you made the things that they count [*numerant*] and also **those who do the counting**, the senses thanks to which they observe what they count, and **the mind they employ** to calculate. (*Confessions* V.3-5)⁴⁷

Augustine did not try to limit the work of astronomers, but he did challenge them to recognise the source of their intellectual gifts, which were implanted as part of the divine image in creation.

This idea of a double imprinting in creation was stated more clearly in other early Christian texts like Gregory of Nazianzus's *Second Theological Oration* (delivered AD 379-380), which was focused on the doctrine of God:

Is it not the Artificer of them [all moving things], who **implanted logic in them all [*pasi logon engtheis*]**, in accordance with which the universe is moved and controlled? ... Thus **reason [*logos*] that [*proceeds*] from God, that is implanted in all** from the beginning and is **the first law in us [*prōtos en hēmin nomos*]** and is bound up in all and leads us up to God through visible things.⁴⁸ (*Oration* 28.16)

Augustine's and Gregory's pairing of the logos in all things with that implanted in the human mind provides background for Comenius's idea of a double imprinting, but it served a different function, our ascent to God rather than scientific endeavour, and it lacked the citation of Wisdom 11.

There may well be other early texts (of which I am as yet unaware) that did interpret Wisdom 11:20 in terms of a dual imprinting the way Comenius later did. But the idea definitely came into its own with the Christian humanist renewal of interest in Platonism in the fifteenth, sixteenth and seventeenth centuries, just prior to Comenius's time.

We come closest to the thinking of Comenius in Johannes Kepler's *Harmonices mundi* ('Harmonics of the Universe'), which had been published in 1619. Like Augustine and Gregory of Nazianzus, Kepler thought of the divine ideas like those of mathematical geometry as being imprinted on the natural world and also impressed on the human mind as part of the image of God (similarly synthesising biblical and Neoplatonic traditions):

Geometry, being part of the divine mind from time immemorial, from before the origin of things, being divine itself . . . has supplied God with the models for the creation of the world and has been implanted in human nature along

47 Augustine *Confessions* V.iii.3-5; *Corpus Scriptorum ecclesiasticorum latinorum* 33:91-92, ET from Chadwick, H. (trans.) *Saint Augustine: Confessions*, Oxford: Oxford University Press (1991), 73-73, adapted to match the Latin. An exact citation of Wis. 11:21 is found two paras. later (*Conf.* V.iv.7).

48 Gregory of Nazianzus *Oration* 28.16; ET in Nicene and Post-Nicene Fathers, Second Series, 7:294b; also in Library of Christian Classics, 3:147, adapted to match the Greek text (PG 36).

with the image of God.⁴⁹ (*Harmonices mundi* IV.1)

As a result of this dual imprinting, humans could indeed have confidence in their ability – provided they undergo suitable training – to discern the geometries and laws that God had implanted in the natural world.

This leads us to an important difference between Comenius's pansophic statement in the *Panorthosia* XI.16 and Augustine's discussion of the astronomers. Comenius not only infers the human mind's capability of 'finding the numbers, weights and measurements' (always with suitable training), but he attributes a more positive value to it as part of his Universal Philosophy (not just a way of refuting the Manicheans). What for Augustine was a glass half-empty was for Comenius a glass half-full.

In order to find precedent for Comenius on this point, we may again refer to Johannes Kepler who cited the basic idea in Wisdom 11:20 in much the same way as Comenius:

Then humanity will at last **measure the power of its mind** on the true scale and will realize that God, who **founded everything in the world according to the norm of quantity** [Wis. 11:20], also has **endowed humanity with a mind which can comprehend these norms**.⁵⁰ (Letter to Michael Mästlin)

This statement may be the closest we can come to Comenius's own words. The idea of a dual implantation is there. So is the idea of humanity's using those God's gifts to 'measure the power of its mind on the true scale'. Compare Comenius's millenarian contention that the New Universal Philosophy would 'Guide the Human Mind toward a State of Perfection'.⁵¹

49 Kepler *Harmonices mundi* IV.1; *Gesammelte Werke*, 20 vols., Caspar, M., von Dyk, W. et al. (Munich, 1938-88), 6:233; ET by Westfall, R.S. 'The scientific revolution of the seventeenth century: the construction of a new world view', in Torrance, J. (ed.) *The Concept of Nature*, Oxford: Clarendon Press (1992), p. 65, adapted to avoid Westfall's wording that suggests an equation of geometry with God and better match the Latin text. The connection between number, measure, weight and the impressed image of God also appears in Comenius's Dedicatory preface to *Via lucis* (para. 22).

50 Kepler's Letter to Michael Mästlin, 9 April 1597; *Gesammelte Werke*, 13:113, Nr. 64; ET in Holton, G. *Thematic Origins of Scientific Thought: Kepler to Einstein*, Cambridge, MA: Harvard University Press (1973), p. 84; revised edn (1988), p. 68.

51 I have seen no indication that Comenius was familiar with Kepler's writings – they were rather more technical than his – but Kepler may well have been one of Comenius's models by reputation. He had resided at the court of Rudolf II at the Castle of Hradčany in Praha in the early seventeenth century, and he later became famous for in his mathematical investigations of the orbit of the planet Mars. Moreover, Kepler was sustained by his deep faith in the wisdom of God in creating the world and equipping humans with the intelligence needed to understand it. He was also known for his irenicism in the confessional disputes of the time. Comenius could not help but be aware of this precedent for his own programme.

Even if Comenius was not aware of this precedent in Kepler, Albert Einstein was. In fact, he wrote an essay in which he cited Kepler's faith in the power of speculative geometry as a model for modern physicists:

How great must **Kepler's belief in natural law** have been, to have given him the strength to devote ten years of hard and patient work to the empirical investigation of the movement of the planets and the mathematical laws of that movement, entirely on his own account, supported by no one and understood by very few.⁵² ('Kepler')

This quotation from Einstein brings our journey full circle. The beliefs underlying modern science are deeply rooted in the biblical tradition as mediated by pivotal figures like Kepler and Comenius.

How did these ideas reach modern physicists like Einstein and Davies? Wisdom 11:20 continued to be used as an inspiration to (and legitimation of) scientific endeavour. Some examples of its use include seventeenth and eighteenth-century British natural philosophers like Walter Charleton, William Petty, Isaac Newton and Stephen Hales. It even became the motto for the British Society of Civil Engineers, founded in 1771. In the immediate background of Einstein, it is enough to mention James Clerk Maxwell whose field theory became the basis of Einstein's Theory of General Relativity. For Maxwell, the uniformity of physical parameters (like those of molecules) across the entire universe was evidence of their being created 'perfect in number and measure and weight' (the same order of words as in Comenius) and coordinated with the intellectual gifts that God had impressed on humans as part of the divine image – the same dual belief that we have been tracing.⁵³

So Comenius's dream of a 'New Universal Philosophy' lived on in the work of Newton, Maxwell and Einstein, and it continues to live on (in a secularised form) in Einstein's successors who are now working on ideas like superstrings and loop quantum theory that may finally unify all of the fundamental forces and particles in one theory.

Conclusion: recovering the theological roots of scientific endeavour

52 Einstein 'Kepler' [no date], in *The World as I See It (Mein Weltbild)*, Amsterdam (1934), Harris (trans.), London: John Lane (1935), p. 142).

53 James Clerk Maxwell, 'Molecules' (British Association for the Advancement of Science Lecture, 1873), in Niven, W.D. (ed.) *The Scientific Papers of James Clerk Maxwell*, 2 vols., Cambridge: Cambridge University Press (1890); reprinted New York: Dover (1965), 2:377. This is the last citation of Wis. 11:20 by a natural philosopher that I have found so far. The idea of 'weight' had long been replaced by mass as a technical term in physics, and quantum theory would soon rethink the concept of spatial measurements. The idea of number is complicated by the existence of virtual particles.

This brief review has shown that belief in the coordination of the human mind to the rationality of the cosmos was a heritage of the Judeo-Christian-Platonic tradition that was passed on particularly in association with the citation of Wisdom 11:20, 'You have arranged all things by measure and number and weight.' Johannes Amos Comenius was an important tradent of this science-fostering belief at a critical time in the history of Western thought.

Comenius was truly a 'Janus-faced' figure in a 'Janus-faced' generation. He looked back to the Wisdom tradition of Scripture and the early Church, and he anticipated the development of modern science as part of his Universal Philosophy. He was also conversant with leading natural philosophers of his own time, thinkers like René Descartes, who were applying these biblically based ideas (in different ways) to their own scientific endeavours.

Today we are dependent on the fruits of science and technology in ways that Comenius could not have foreseen. Even small villages like Sárospatak and those in Moravia where Comenius lived are being swept up in the development of a global technological society, all based on the latest scientific knowledge.

Still, I think Comenius would be optimistic about what is happening today (he was optimistic under even more disheartening circumstances in his own lifetime). In spite of subsequent secularisation,⁵⁴ he would see the gradual fulfilment of his pansophic dream in the progress of modern science and in the globalisation that brings nations in closer contact. He would also have supported the United Nations and the International Court of Justice (the World Court) as the beginnings of a 'Universal Political System', toward which he had called for a World Assembly or Ecumenical Council, one that would consist of philosophers and church leaders (of all denominations), as well as politicians.⁵⁵ But Comenius would also advise us to recover the root of scientific endeavour in the 'marks of God's Wisdom' in order that its true meaning might be better appreciated and that science-based societies would serve the common good rather than their own parochial interests.

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54 The secularisation of Western culture is an important topic in itself. For my own analysis of its stages and the challenges it presents to the tradition discussed here, see 'From biblical secularity to modern secularism: historical aspects and stages', in Postiglione, S.M. & Brungs, R. (eds.) *Secularism versus Biblical Secularity*, St Louis: ITEST Faith/Science Press (1994), pp. 1-43 (updated version available at www.academia.com); and *Toward a Theology of Scientific Endeavour*, chap. 4.

55 *Panorthosia*, chaps. 22-25. On this assessment of Comenius's legacy, cf. Spinka 'Comenian Pansophic Principles,' 164-165.