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THE “MARKS OF GOD’S WISDOM” IN COMENIUS’S *PANORTHOSIA*: A BIBLICAL COMMONPLACE AT THE FOUNDATIONS OF MODERN SCIENCE

Abstract: Comenius is one of the early founders of modern scientific enterprise. 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 endeavor was based on a long-standing theological tradition that combined Old Testament wisdom with Platonic philosophy. 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.

Johannes Amos Comenius (née Jan Komenský) has been called an “incomparable Moravian.”¹ He was one of the most widely known scholars of his time. Almost everywhere I go in East Central Europe, as far east as Sárospatak in northeastern Hungary, I find monuments, schools, and museums erected in his honor.

Comenius was equally well known in Western Europe and even in Colonial America. According to one report, Comenius was recruited—albeit unofficially—to become the president of a small school in colonial America. That school was my own *alma mater*, Harvard College.² He had studied in the Netherlands and in Germany, and he spent major parts of his life in Poland, England, and Sweden as well as in Germany and the Netherlands and here in Sárospatak, where he taught in the mid-17th century.

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 realization of his prophetic, utopian vision of a unified Europe—albeit

¹ The epithet goes back to Cotton Mather and was adopted by Matthew Spinka, *John Amos Comenius: That Incomparable Moravian* (Chicago: University of Chicago Press, 1943), 84-6.

² Matthew Spinka tentatively locates this contact with John Winthrop, Jr. in 1642; Spinka, *John Amos Comenius*, 84-6.

in a more secularized form than the Christian Europe 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 necessary to think diachronically—looking as far back 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 poles: the ancient Judeo-Christian tradition and the emergence of modern science. Comenius's mediation stands as a witness against any programmatic attempt to portray religious faith and modern science as necessarily being in conflict. His work shows that modern scientific endeavor is deeply rooted in traditional Christian faith.

In order to view Comenius role diachronically, we will begin our journey with the work of present-day scientists and work our way backward.

Looking Forward: Modern Scientists on the Comprehensibility of the Natural World

Let us begin with a brief look at the ideas of some modern-day scientists. I will focus on the ideas of just two physicists.

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 by failure, but by the 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 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 Templeton laureate, 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 world³

What Davies points out here is that the pursuit of science is the result of faith. In fact, there is a dual faith at the foundation of scientific endeavor. First, scientists must believe that the cosmos is rationally ordered—that it is governed by mathematical laws of some sort. This is an article of faith since science can not tell us where that rational order or those mathematical laws come from.

Second, scientists must believe that human minds are actually capable of understanding that order—humans can develop mathematical models and rational formalisms and that will test positively in the laboratory and even in the farthest reaches of space-time. This dual faith—rational order and human understanding—is a theme that we will find running all through the history of Western ideas, particularly in Comenius.

The fact that scientific endeavor is motivated and sustained by faith was not realized for the first time by Paul Davies. In the early twentieth century, Albert Einstein clearly recognized that faith 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.⁴

Here Einstein refers back to the ideas of Christian natural philosophers of the 19th century like James Clerk Maxwell.⁵ 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.⁶

If Einstein and Davies are right, the emergence of modern science itself was dependent on a prior belief in the possibility of science. If so, 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 modern sense, they thoroughly explored the ideological and pedagogical underpinnings of science, and they anticipated the work of architects of the "scientific revolution" like Robert

³ Paul Davies, *The Mind of God: The Scientific Basis for a Rational World* (New York: Simon & Schuster, 1992), 20.

⁴ Albert Einstein, "Science and Religion II" (1941), in idem, *Out of My Later Years* (New York: Philosophical Library, 1950), 26; also in idem, *Ideas and Opinions* (London: Alvin Redman, 1954), 46.

⁵ On Maxwell's faith and its impact on Einstein, see my *Creationist Theology and the History of Physical Science: The Creationist Tradition from Basil to Bohr* (Leiden: Brill, 1997), 379-99.

⁶ Interestingly, Einstein did not view the new science of quantum theory as "rational" in this sense due to the seemingly contradictory properties of photons; see Marcus Chown, "Einstein's Rio Requiem," *New Scientist* 181 (6 March 2004), 50-51.

Boyle and Isaac Newton. They exemplify the dual faith that subsequent generations of physicists inherited and on which they built the “miracle” of modern science.

The “Marks of God’s Wisdom” in Comenius’s Panorthosia

In order to illustrate this twofold faith and explore its ultimate sources, I shall focus on Comenius’s *Panorthosia*, or “Treatise on Universal Reform.” The *Panorthosia* was just one part of Comenius’s magnum opus, *De rerum humanarum emendatione consultatio catholica* (ET, “A General Deliberation about the Improvement of Human Affairs”)⁷ written in the 1640s and ‘50s, which has been called “the climax of his whole philosophy.”⁸

The part of the *Panorthosia* that concerns us here is chapter XI, “Concerning the New ‘Universal Philosophy’ [*Philosophiam Catholicam*] Which Will Guide the Human Mind toward a State of Perfection.” Although this particular part of the *Panorthosia* was not published during Comenius’s lifetime, the ideas were an integral part of his teaching and conversation and, no doubt, were taught here in Sárospatak.⁹

What Comenius had in mind when he spoke of a “Universal Philosophy” was a set of basic principles that would lead to a new natural philosophy of universal scope—in other words, modern science. For Comenius, this scientific endeavor was an integral part of his lifelong quest for a Christian Pansophy or “Universal Wisdom”—the quest for a harmonic, encyclopedic system that embraces science, politics, and ethics as well as theology.¹⁰

We will begin our discussion with section 8 of this chapter. 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, or the Christian Bible, or the Qur’an. But prior to the secularization of modern science, Europeans also thought of

⁷ A.M.O. Dobbie, “Translator’s Preface” to *John Amos Comenius: Panorthosia, or Universal Reform, Chapters 1-18 and 27* (Sheffield: Sheffield Academic Press, 1995), 11. The form of the title is also given as *De emendatione rerum humanarum consultationis catholicae* in Dmitrij Tschizewskij and Klaus Schaller, eds, *Johann Amos Comenius: Ausgewählte Werke*, 3 vols (Hildesheim, 1973).

⁸ Dobbie, “Translator’s Preface” to *John Amos Comenius: Panorthosia*, 16. Comenius’s earliest known mention of the *Consultatio* was in the dedication of Comenius’s *Via Lucis*, circulated in 1642; Dobbie, “Translator’s Preface,” 13-14.

⁹ Chapters I-X of the *Panorthosia* were first published in 1657; Dobbie, “Translator’s Preface” to *John Amos Comenius: Panorthosia*, 23. A new edition was published in Prague in 1950; Dobbie, “Translator’s Prologue” to *John Amos Comenius: Panorthosia, or Universal Reform, Chapters 19-26* (Sheffield: Sheffield Academic Press, 1993), 9; cf. Igor Kišš, “Johann Amos Comenius’ Vorstellungen über die Einheit Europas und der Welt,” in *Informationes Theologiae Europae: Internationales ökumenisches Jahrbuch für Theologie*, ed. Ulrich Nembach (Frankfurt am Main: Peter Lang, 2003), 284n.8.

¹⁰ Comenius developed his pansophic program as early as 1630, when he began work on his first encyclopedia, *Janna rerum* (“The Gate of Things”), and in 1637 in his *Pansophiae prodromus* (“Introduction to Pansophy”), both written in Leszno, Poland. In 1641-2, while he was in London, C. wrote *Via lucis* (“The Way of Light”), as a manifesto of Christian pansophy and world missions.

nature and human reason as God's books because they were both believed to be created by and illuminated by God.

Accordingly, for Comenius, there were three Books of God:

- (1) 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;
- (2) The human Mind, which is guided by the internal light of reason and divinely inspired ideas;
- (3) Divine revelation primarily through the reading of God's written word, but also through the inner feelings or intuitions God's Spirit grants us in response to fervent prayer and the divine judgments that are manifested in the history of the world.¹¹

We find here the same twin beliefs (1 and 2) that were described by Einstein and Davies, but for Comenius they are set within the framework of a third book, based on the spiritual disciplines of Bible-reading and prayer (3). But nothing is said in section 8 about the way in which the human mind and the external, natural world are coordinated. It is simply stated as a fact.

It is important to keep the idea of these three Books of God in mind as we turn to Comenius's major point in section 16 of chapter XI—an affirmation of the viability of a universal philosophy. I am particularly interested in the biblical reference here because it provides us with a mirror for looking back to the Old Testament and its early Christian interpretations and also to some of Comenius's contemporaries. Here is the key text from section 16:

We must seek assistance [to demonstrate the truth]...from real things in the World, on which God has printed the marks of his Wisdom (numbers, weights, and measurements), and from the dictates of the human Mind, which, if carefully applied to things, is capable of finding the numbers, weights and measurements of them all better than the most ingenious of men could dictate.¹²

Comenius has three distinct ideas here:

- (1) The "real things in the [external] World," upon which God has imprinted numbers, weights, and measurements;
- (2) The "dictates of the human Mind," which enable the Mind to discern those numbers, weights, and measurements;
- (3) The correspondence between the World and the human Mind based on the "marks of [God's] Wisdom" (numbers, weights, and measures) that God had imprinted on both.

¹¹ *Panorthosia* XI.8-10; trans. Dobbie, 177-8. A similar idea is found in Comenius's English Preface (dated 1650) to his *Physicae ad lumen divinum reformatae synopsis* (ET, *Synopsis of Physicks: Naturall Philosophie Reformed by Divine Light*, London, 1651). Here the corresponding "three principles of Philosophy" are "[the Testimonie of] Sense, [the Light of] Reason, and the Guidance of God [Scripture]"

¹² *Panorthosia* XI.16; trans. Dobbie, 181.

The context would seem to indicate that these three points correspond to the three Books of God described in section 8. But how? The first two points clearly correspond to the first two books: the external, natural world; and the human Mind, guided by the internal light of reason. But what about the reference to the “marks of [God’s] Wisdom”? We would expect to find something here that is related to the third Book of God, God’s written word.

The clue we are looking for is found in Comenius’s deliberate reference to the “marks of God’s Wisdom” as “numbers, weights, and measurements.” This is a reference to a (deutero-) canonical book of the Old Testament, called the “Wisdom of Solomon.” The deutero-canonical texts of the Bible are not so widely read today, particularly not in Protestant circles, but they were included in early Protestant Bibles (as well as the Vulgate) and were well known in the time of Comenius.

When God created the world, according to Wisdom 11:20, God “arranged all things by measure and number and weight.” These are the exact words that Comenius states twice in our passage (although number is moved up to the first place in the sequence), so there can be no doubt as to the ultimate source of this text. But the Wisdom of Solomon uses the idea to explain God’s deliverance of the Israelites from Egypt. So how did Comenius come by his interpretation of Wisdom 11:20? The best way to answer the question of Comenius’s sources is to look backward at earlier citations of the text.

Looking Backward: The Biblical and Patristic Tradition

This use of Wisdom 11:20 did not come to Comenius directly from the Old Testament, however. Comenius benefited from a long, complex history of interpretation.

The first place to look is the writings of Augustine of Hippo—the writer most frequently cited by Comenius in the *Consultatio*.¹³ Augustine frequently cited Wisdom 11:20 in order to uphold the rationality of God’s creation against its detractors (particularly Manicheans). Let us look at just one of his better known passages, found in the *Civitas Dei* (“The City of God”). In chapter XII, Augustine cited Wisdom 11 in association with Plato’s account of creation in the *Timaeus*:

Plato emphasizes that God constructed the world by the use of numbers, while we [Christians] have the authority of Scripture where God is thus addressed, “You have set in order all things by measure, number, and weight”¹⁴

¹³ According to Dobbie, “Translator’s Preface” to *John Amos Comenius: Panorthosia*,” 21, the four most frequently cited are Augustine, (Francis) Bacon, Campanella, and Plato, in that order.

¹⁴ Augustine, *City of God* XII.19; ed. David Knowles (Harmondsworth: Penguin Books, 1967), 496. Augustine appears to be arguing against the followers of Origen here; cf. Kaiser, *Creational Theology*, 25n.54.

Augustine uses Plato to get the attention of his educated Christian readers, but he uses a biblical text to make his point authoritative. Was he justified in making this association between Plato and the Bible?

The synthesis of biblical and Platonic ideas was a commonplace in early Jewish and Christian thought—it was hardly a new idea with Augustine. In fact, the Wisdom of Solomon had already incorporated popular ideas from Plato's Dialogues. Compare the following passage from Plato's *Timaeus* 53a:

At first, the elements were all without reason and measure.... Such being their nature, God now fashioned them by form and number.

The reference to measure and number is the same in both Plato and the Wisdom of Solomon. So Augustine was right to associate the two. However, Plato said nothing about the weight of the elements—perhaps because the weightiness of matter was irrational for Plato and therefore quite unlike the more abstract categories of measure and number.

The idea of weight as a category of divine creation came from several Old Testament examples that antedate both Plato and the Wisdom of Solomon. Here are two examples:

Isa. 40:12-13 "Who has measured the waters in the hollow of the hand and... enclosed the dust of the earth in a measure and weighed the mountains in scales and the hills in a balance?"

Job 28:25-6 "God gave to the wind its weight, and meted out the waters by measure."

So the terms "measure" and "weight" came from the Hebrew Bible and the terms "measure" and "number" came from Plato with an obvious overlap. Augustine was well within his intellectual rights to synthesize the biblical and Platonic ideas and to cite Wisdom 11:20 as a prooftext.

As a result of the attention Augustine drew to it, Wisdom 11:20 became one of the biblical texts most often cited in discussions of the natural world. It was quoted by nearly all natural philosophers from Augustine to Adelard of Bath, Agrippa of Nettesheim, John Dee, Johannes Kepler, Thomas Tymme, Francis Bacon, and Descartes to name just a few. In this respect, Comenius was not original. He was simply acting as the transmitter of a biblical *topos* or commonplace and creating a pansophic synthesis.

The Tradition from Gregory to Comenius

But what about the points that Comenius made that we found also reflected in the writings of physicists like Einstein and Davies? One was the idea that mathematical characteristics like weight, number and measure were imprinted on both creation and the human mind—this was extremely important because it implied that the mathematical nature of creation should be visible to anyone with the proper training to see it. This idea is not found in either Wisdom 11 or in Augustine's interpretation of it.

This idea of a double imprinting does occur in other Christian texts like Gregory of Nazianzus's Second Theological Oration (delivered 379-80 CE):

Is it not the Artificer of [all moving things] who implanted reason [*logon*] in them all, in accordance with which the universe is moved and controlled? ... Thus reason that proceeds from God, that is implanted in all from the beginning, and is the first law in us, and is bound up in all leads us up to God through visible things.¹⁵

Gregory's pairing of the logos in all things with that implanted in the human mind is very similar to Comenius, but lacks 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 came into its own with the Christian humanist renewal of interest in Platonism in the 15th, 16th, and 17th centuries, just prior to Comenius' 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 Gregory long before him and Comenius afterwards, 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:

Geometry, being part of the divine mind from time immemorial, from before the origin of things, being God himself...has supplied God with the models for the creation of the world and has been transferred to [or 'implanted in'] human nature along with the image of God.¹⁶

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 the second difference between Comenius's statement in the *Panorthosia* XI.16 and Augustine's use of Wisdom 11. Comenius clearly infers the human mind's capability of "finding the numbers, weights and measurements," something that Augustine would have written off as idle curiosity.

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

¹⁵ *Oration* 28.16; ET in Nicene and Post-Nicene Fathers, Second Series, 7:294b; also in Library of Christian Classics, 3:147

¹⁶ Kepler, *Harmonices mundi* IV.1; *Gesammelte Werke*, 20 vols., ed. Max Caspar, W. von Dyck, et al. (Munich, 1938-88), 6:233; ET by Richard S. Westfall, "The Scientific Revolution of the Seventeenth Century: The Construction of a New World View," in *The Concept of Nature*, ed. John Torrance (New York, 1992), 65.

God, who founded everything in the world according to the norm of quantity, also has endowed humanity with a mind which can comprehend these norms.¹⁷

Wisdom 11:20 here is reduced to the concept of quantity. But this statement may be the closest we can come to Comenius's own words. The dual beliefs are there, and so is the reference (albeit truncated) to Wisdom 11:20.

In fact, Kepler may well have been one of Comenius's models—Kepler resided for years at the court of Rudolf II at the Castle of Hradčany in Praha in the early 17th century, and he later became famous for in his own mathematical investigations of the orbit of the planet Mars. In this Kepler was sustained by his deep faith in the providence of God in creating the world and equipping humans with the intelligence to understand it. Comenius could not help but be favorably impressed.

Significantly, Kepler's faith in the comprehensibility of the natural world continued to be an influential model for physicists right into in the early 20th century. In fact, Albert Einstein cited Kepler as the inspiration for his own efforts in mathematical physics in the early 20th century:

How great must Kepler's faith 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.¹⁸

This quote 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 scientific endeavor. 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 for whom 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" and paralleled the intellectual gifts that God had impressed on humans as part of the divine image—exactly the same ideas we found in Kepler and Comenius.¹⁹

¹⁷ Kepler's Letter to Mästlin, 9 April 1597; *GW*, 13:113, Nr. 64; ET in Holton, *Thematic Origins* [1973], 84; revised edn, 68.

¹⁸ Einstein, "Kepler" [no date], in *The World as I See It (Mein Weltbild)*, Amsterdam, 1934, trans. Alan Harris, London, John Lane, 1935), 142.

¹⁹ James Clerk Maxwell, "Molecules" (1873 BAAS Lecture), in *The Scientific Papers of James Clerk Maxwell*, 2 vols., ed. W. D. Niven (Cambridge: Cambridge University Press, 1890; reprinted New York: Dover, 1965), 2:377.

So Comenius dream of a “New Universal Philosophy” lived on in the work of Newton, Maxwell, and Einstein, and it continues to live on in Einstein’s successors who now working on ideas like superstrings and loop quantum theory that may finally unify all of the fundamental forces and particles in one theory in a way that is still comprehensible to people with the necessary training.

Conclusion: Recovering the Root of Scientific Endeavor

This brief review has shown that faith in the coordinated rationality of the cosmos and the human mind 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 trident of this science-fostering belief.

Comenius was truly a “Janus-faced” figure. He looked back to the ancient Wisdom tradition of Scripture and he pointed the way forward to the development of modern science. He was also conversant with leading natural philosophers of his own time, thinkers like René Descartes and Johannes Kepler, who were applying these biblically based ideas to their own scientific endeavors.

Today we are frighteningly dependent on the fruits of science and technology. Even the small villages like Sárospaták and those in Moravia where Comenius was born are being swept up in the development of a global technological society—all based on the latest scientific knowledge.

No doubt, Comenius would be optimistic about what is happening today. He would see the fulfillment of his pansophic dream in the progress of modern science and the globalization that brings nations in closer contact. But he would also advise us to recover the pansophic root of scientific endeavor 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 national interests.