The Metaphor of Harmony in Early Modern Knowledge Organisation: Comenius' Pansophy Caught between Aesthetics and Mechanics*

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Abstract:
Johann Amos Comenius is often regarded as a "thinker of harmony." He systematically implemented the metaphor of harmony into his epistemological framework to articulate the natural "consonance" of all things, emulate the divine order, and regulate the coherence of contemporary knowledge. This "complex" metaphor, rich with musical, mechanical, mathematical, and cosmological connotations reflects his advanced intellectual inclination toward order and exposes the key sources shaping his conceptual thought. This study explores how Comenius uses this conventional metaphor within an innovative framework, introducing it into the domain of knowledge organisation. It integrates both semantic and cognitive approaches to metaphor analysis. From a semantic standpoint, it conceptualizes harmony as a multifaceted metaphor that drew on a variety of source domains during the early modern period, incorporating not only musical elements but also rich mechanical connotations. From the perspective of cognitive theory, this study examines how Comenius uses this metaphor to articulate his epistemological ideas on the syncretic structure of knowledge. By utilising digital tools developed within the TOME project, Comenius' use of the harmony metaphor is situated within the broader context of early modern scholarly discourse.

Keywords: Harmony; Musical Metaphor; Mechanical Metaphor; Cognitive Metaphor Theory; Early Modern Culture of Knowledge; Comenius

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Introduction: Scholarly metaphor between experience and intertextuality

"*Harmony was the most loaded term in baroque thought*,"[1] musicologist Michael Spritzer wrote in his seminal book, *Metaphor and Musical Thought*. During the early modern period, the metaphor of harmony functioned as a widespread cognitive, therapeutic, and political instrument circulating extensively and efficiently across diverse fields and disciplines. It served as a language and conceptual response to the key challenges of early modern culture: the reconciliation of contradictions and the resolution of towering problems both in society and in the sphere of knowledge.

This study focuses on the link between this metaphor and the ambitious pansophic agenda as pursued by one of the foremost early modern theorists of knowledge, Jan Amos Comenius (1590–1672). This Moravian scholar, who studied under Johann Heinrich Alsted and became actively involved in Samuel Hartlib's correspondence network, used the concept of harmony extensively in his works and is often referred to as a "philosopher of harmony".[2] Beginning in the 1630s, he included this metaphor in his pansophic vocabulary to articulate the ontological "consonance" of all things and establish a systematic epistemological framework of human knowledge. Drawing upon the corpus of Comenius' writings, this paper engages with two interrelated inquiries.

The first investigates the degree to which the metaphor of harmony can be classified as a musical metaphor within Comenius' works. Although previous scholarship has predominantly highlighted the musical aspects of Comenius' use of the metaphor, this study argues that his conceptualisation of harmony in fact drew upon multiple source domains, including mechanics, theology, and natural philosophy. It was precisely this semantic layering that amplified the metaphor's versatility and explanatory power. The second investigates the broader ramifications of this metaphor for his ideas on knowledge organisation, particularly within the context of the early modern encyclopaedic movement.

Among the various domains mentioned above (mechanics, theology, and natural philosophy), this study places particular emphasis on the mechanical register of the metaphor. By foregrounding the interplay between musical and mechanical domains, it aims to offer a more balanced account by reconsidering the prevailing view that Comenius' use of the harmony metaphor stems primarily from musical influences, particularly those associated

1 Spitzer, M., *Metaphor and musical thought*. Chicago, University of Chicago Press 2004, p. 142.
2 Schifferová, V. – Prázný, A. – Šolcová, K. – et al., *Idea harmonie v díle Jana Amose Komenského* [The Idea of Harmony in Jan Amos Comenius' Work]. Červený Kostelec, Pavel Mervart 2014.

with the rich musical culture of the Unity of Brethren. This does not mean that the study dismisses the musical dimensions of the metaphor. Rather, it seeks to avoid the automatic identification of harmony as a musical metaphor, a tendency shaped by modern conceptual paradigm.

The decision to focus specifically on the mechanical domain among the various contexts is motivated by two main reasons. First, it takes use of the close conceptual and terminological interplay between music and mechanics in early modern thought. Second, it takes into account that mechanical reasoning offered particularly fertile ground for Comenius' broader metaphorical elaborations on knowledge and education. Therefore, the combination of musical and mechanical connotations within the harmony metaphor gains particular significance in the second part of this study, which examines how Comenius employs this metaphor to articulate his ideas on the comprehensive organisation of knowledge.

Although this research is rooted in a close reading of Comenius' texts, situating his figurative reasoning within the broader context of early modern scholarly discourse greatly benefits from distant reading methods. By employing digital tools developed within the TOME project,[3] his use of the harmony metaphor can be preliminarily analysed in comparison with the broader scholarly operationalization of the term "harmony" during his era, tracing its semantic evolution throughout the 16th and 17th centuries. To this end, the study concludes with several tables and charts that make use of the computational methods developed within the aforementioned project.

The interplay of domains: Musical mechanics and mechanical music

Knowledge about knowledge is highly abstract, fluid, and historically situated. To navigate such intricate complexity, authors frequently employ metaphors – dual-domain constructs that reflect both bodily and cultural experiences. These metaphors draw upon the prevailing analogies of a given era, such as machinery, networks, or ecosystems, to make abstract epistemological concepts more intelligible. As articulated in Cognitive Metaphor Theory (CMT) by Lakoff and Johnson, metaphors function through the interplay of two separate domains: the target domain, which represents the abstract concept being elucidated, and the source domain, which offers a framework for understanding the target.[4] The systematic mapping between these se-

3 For more details on TOME see the editorial of this special issue and the project's website – available online at www: http://tome.flu.cas.cz [cit. 19. 6. 2025].

4 Lakoff, G. – Johnson, M., *Metaphors We Live By*. Chicago–London, University of Chicago Press 2003 (1st edition 1980), passim.

mantic fields constitutes the core mechanism of metaphors, rendering them indispensable tools for shaping and applying abstract thought.

While often associated with modern approaches, the roots of this double-domain thesis can be traced back to Aristotle, who regarded the essence of metaphor as the transfer of meaning.[5] During the 20th century, this long-standing idea, which draws critical insights from the interaction between these two domains, gained renewed significance and emerged as an explicitly articulated tenet of CMT. From a historical perspective, which the cognitive approaches have largely overlooked, it is important to note that both semantic domains are subject to historical change and correlate with the cultural experience of their respective periods.

In the context of this study, the target domain refers to the early modern sphere of knowledge, while the term "harmony" belongs to the source domain. When the aim of a metaphor is to elucidate a complex or abstract concept through a more tangible one, it presupposes that the target domain represents a less familiar or intricate idea, while the source domain is more familiar or simpler to understand. Thus, harmony is expected to be the more concrete concept, whereas knowledge is the more abstract. However, the concept of harmony itself was not entirely straightforward. It was typically associated with music. However, the metaphor of harmony was a kind of complex or telescoped metaphor[6] and its primary meaning was grounded in ancient material culture and experience. In what follows, I argue that harmony in Comenius was situated in the overlap of music and mechanics. These ties of musical and mechanical principles enhanced the metaphor's versatility, extending its potential application beyond the realm of music.

Comenius on harmony: *Fundamentum ergò rerum omnium*

Comenius' emphasis on harmony is striking and has already attracted considerable attention from scholars. Existing studies, however, have primarily focused on how the principles of harmony manifest in his philosophy and educational theory, while the metaphorical nature of this concept has largely escaped deeper reflection. The researchers have concentrated on Comenius'

5 Aristotle, *On the Art of Poetry*. Transl. I. Bywater. Oxford, Clarendon Press 1920, ch. 21,1457b6: "Metaphor consists in giving the thing a name that belongs to something else; the transference being either from genus to species, or from species to genus, or from species to species, on the grounds of analogy." See Alharbi, A. N., Theoretical Evolution of Metaphor. *Studies in Literature and Language*, 26, 2023, No. 3, p. 1: "By this definition, all metaphors involve some kind of transference of qualities from one semantic domain to another [...]."

6 For the concept of primary metaphors see Grady, J., Primary Metaphors as Inputs to Conceptual Integration. *Journal of Pragmatics*, 37, 2005, No. 10, pp. 1595–1614.

ideas promoting social and political consensus without acknowledging that it is actually a target domain of the harmony metaphor, leaving an important dimension of Comenius' intellectual framework – the figurative power of his language – largely unexplored. When the metaphorical nature of the concept of harmony was mentioned at all, it was typically taken for granted that harmony functioned as a musical metaphor. For instance, Vojtěch Balík, a renowned expert on Comenius' work, cites two passages from *Prodromus Pansophiae* and *Lexicon reale pansophicum* in which Comenius defines harmony. In both instances, as Balík notes, Comenius explicitly underscores that he uses *harmonia* as a metaphor, intentionally borrowed from the domain of musical theory:

> In both cases, Comenius explicitly reminds us that the term harmony (and associated terms such as *consonantia*, *dissonantia*, *concentus*…) is a metaphor taken from music theory […].[7]

Similarly, the musicologists Přívratský and Přívratská believe that the inspiration for Comenius' ideas about the harmonious order was derived from music widely cultivated in his church, the Unity of the Brethren.[8]
The connections between harmony and music cannot be denied. Comenius explicitly mentions harmony in several texts; also, in the Unity of the Brethren, music was a major feature. At least a few passages deserve attention. In his 1639 *Pansophiae Prodromus* he defined harmony as follows:

> *Fundamentum ergò rerum omnium ut condendarum, sic cognoscendarum* harmonia *est. Harmoniam musici vocant multarum vocum consonantiam jucundam. Talis verò est virtutum aeternum in Deo, virtutum creatarum in natura, virtutum expressarum in arte per omnia concordans concentus, quia tum in se unumquodque illorum harmonia est, tum in invicem, quoniam harmoniae divinae imago est natura, huius imago ars*.[9]

7 Balík, V., K interpretaci pojmu harmonia u Jana Amose Komenského [On the interpretation of the concept of harmony in Jan Amos Comenius]. In: Schifferová, V. – Prázný, A. – Šolcová, K. – et al., *Idea harmonie v díle Jana Amose Komenského*, p. 58. Unless otherwise indicated, all translations into English are my own.

8 Přívratský, V. – Přívratská, J., Hudba jako inspirace Komenského konceptu harmonické společnosti [Music as Inspiration for Comenius' Concept of a Harmonious Society]. *Historia Scholastica*, 2, 2020, pp. 100–104.

9 Comenius, J. A., Pansophiae praeludium, quo sapientiae universalis necessitas, possibilitas facilitasque… demonstratur. In: *Dílo Jana Amose Komenského / Johannis Amos Comenii Opera omnia* (hereafter *DJAK*) 15/II. Prague, Academia 1989, p. 38. Engl. transl: Comenius, J. A., *A Reformation of Schooles*. London, Michael Sparke 1642, p. 39: "Therefore, the ground as of the framing, so of the knowledge of all things is Harmony. That which the Musicians call harmony, is a sweet

In further passages, he provides the reader with even more detail:

> *Harmoniae primum requisitum est, ne quid sit dissonans. Harmonia musica conflatur ex vocibus dissimilibus atque adeò contrariis, et tamen contrarietas ad consonantiam reducitur.* […] *Ut enim qui in musicis tonorum et modorum rationes cognovit, satis quasvis melodias et canere, et componere novit: imò excogitata est ratio, quâ organici ex intuitu unici bassi generalis, quem vocant, omnes melodias ita canere possunt, ut quamvis centenis vocibus symphonia constet, nulla tamen disharmonia prodire queat.*[10]

He explicitly addresses music and uses it as a basis for the explication of harmony. Another passage mentioning the musical aspects of harmony is found in his (unfortunately unfinished) *Lexicon Reale Pansophicum*:

> *Harmonia, vox Graeca, Graecis rerum quarumcumque congruentiam, 2. musicis in specie vocum suavem consonantiam (qualem cithara vel aliud instrumentum edit) significat. 3. Quod philosophi ad sublimiora transferentes, virtutum aeternarum in Deo et virtutum creatarum in natura, virtutumque expressarum arte vel prudentiâ concordantes ad invicem rationes aptè quoque harmoniam vocant*.[11]

In *Panaugia*, the second part of his *Consultatio catholica*, Comenius develops the idea of harmony into the more comprehensive concept of *panharmony*. He distinguishes three hierarchical levels of harmony: the most elementary, composed of nine components; a higher level, consisting of three compo-

consonacie of divers tones: the like exact agreement is to be found in the eternal perfections of God, with those which are created in Nature, and those which are expressed in Art: for each ot them is harmonious in it selfe, as also in mutuall respect one to the other. Nature is the image of divine Harmony, and Art of Nature."

10 Ibid., pp. 38 and 40. Engl. transl.: Comenius, J. A., *A Reformation of Schooles*, pp. 39 and 41: "The first thing required in Harmony, is that there be nothing dissonant. Musical Harmony is composed od most different, and contrary tones, and yet there is a certaine consonancie to be found in their contrariety […]. For as in Music, he that knows the nature of the several tones, and moods, will easily be able both to sing, and compose any kind of melody, yea, such a way is found out, that players on Instruments, are able by looking upon one onely generall Base, to play many parts at once without any kind of discord […]."

11 Ibid., p. 38. Engl. transl.: Harmonia, a Greek word, signifies for the Greeks the congruence of any things whatsoever; secondly, for musicians in particular, the pleasant consonance of sounds (such as that produced by the lyre or another instrument). Thirdly, when philosophers transfer the notion to more elevated matters, they also aptly call 'harmony' the concordant relations of eternal virtues in God, of created virtues in nature, and of virtues expressed through art or prudence.

nents; and the highest, governed by a single unifying principle, all framed by the notion of musical consonance:

> *Harmoniam vocant musici svavem vocum plurium consonantiam, sive fuerint voces vivae, sive pulsu aut inflatu organi alicujus musici editae. Res tantô auribus et animis svavior, quantô psallentium chori plures plurave organa musica adfuerint. Atque pan-harmoniam, hoc est plenam et universalem omnium ad omnia consonantiam, dici convenit*.[12]

It can be concluded that Comenius employed musical references in a way that supports the assumption that he regarded harmony as a musical metaphor. For instance, the verb *transferre*, used in the above passage from *Prodromus pansophiae*, concerns the transfer of meaning – the very essence of how metaphors work (μεταφέρω = I transfer). At the same time, however, we encounter certain doubts that constrain the functionality of musical elements within the metaphor of harmony. First and foremost, music itself constituted a highly complex discourse requiring specialised expertise. In *Panaugia* Comenius himself states that only "*Ubi per intervalla tria perpetua, primae, tertiae et quintae (norunt musici extra tria haec sonorum intervalla non dari consonantiam ullam), omnia ubique in concentum veniunt*."[13]

Moreover, music was not the sole domain from which Comenius derived his explanation. In order to explain harmony, he also evokes other analogies, such as the organic analogy with a tree and a human body and the analogy with Scripture, which brings into harmony all apparent contradictions:

> […] *multa in speciem pugnantia habet: omnia tamen ad concordiam in se redeunt et in animo nostro reducenda sunt* […].[14]

Although the social significance of music undoubtedly expanded during the 16th and 17th centuries reinforcing musical connotations within the discourse of harmony, this did not necessarily mean that harmony was self-evidently understood as a musical metaphor in the modern, aesthetic sense. In

12 Comenius, J. A., De rerum humanarum emendatione consultatio catholica (hereafter Consultatio catholica). Pars II: Panaugia. In: *DJAK* 19/I. Prague, Academia 2014, p. 231. Engl. transl.: Musicians call harmony a pleasant consonance of several voices, whether these be living voices or produced by striking or blowing into a musical instrument. And it is fitting that this be called 'pan-harmony,' that is, a complete and universal consonance of all things with all things.

13 Ibid., p. 234: Engl. transl.: … musicians know that apart from three intervals of sounds – of the first, third and fifth – there is no consonance…

14 Ibid. pp. 38–39. Engl. transl.: It contains many things that appear to be in conflict; yet all return to concord within themselves and must be brought back into harmony within our mind.

both the scholastic and Renaissance traditions, music was part of the *quadrivium* (comprising arithmetic, geometry, astronomy, and music), meaning it was understood as a science of numerical proportions closely connected to mathematics and cosmology.

In his pivotal *Istituzioni harmoniche* (1558), Gioseffo Zarlino builds upon the Pythagorean tradition, viewing harmony as an expression of universal mathematical proportions that govern not only music but also nature and the cosmos and could be observed – rather than heard – in planetary motion (*harmonia mundi*) or the structure of the human body. From this perspective, harmony, music, mathematics, and cosmology were so inextricably intertwined that it becomes difficult to determine which is the source and which the target domain.[15]

The same applies to Comenius. He employed musical semantics when addressing the fundamental principles of harmony, such as consonance. However, when he sought to elaborate further on the subject, he turned to other types of metaphors that were more familiar to his audience, metaphors with which they had closer personal experience. In addition to the metaphor of the body,[16] through which he illustrated the harmonic interplay of parts forming a whole, he predominantly used mechanical metaphors.

Particularly in the context of learning and knowledge, Comenius frequently employs mechanical and technical terminology. For instance, analysis is depicted as a 'telescope', synthesis as a 'microscope', syncrisis as a 'mirror', school as a 'machine', and books as 'instruments'. In his educational writings, Comenius mechanizes knowledge to demonstrate to his audience that learning is an accessible and almost self-initiating process – especially when students use his innovative didactic methods. This mechanical vocabulary extends to expressions such as 'repairing a machine', which signifies correcting 'shortcomings' and 'malfunction' in teaching and improving the functioning of the educational system.

15 In this context, it may be useful to compare the concept of *harmonia mundi* with a related notion, *musica mundana*. While the latter appears more explicitly musical, having been formulated within Boethius's theory of music, the former can be understood as a broader metaphysical construct in which music is but one among several structuring principles. In other words, *harmonia mundi* may be seen as the ontological content, while *musica mundana* represents its musical form or expression. A more detailed investigation of a wider corpus of pertinent texts would, however, be necessary to substantiate this distinction. See Boethius, *Fundamentals of Music*. Transl. C. M. Bower. New Haven–London, Yale University Press 1989, esp. Book 1, ch. 2, pp. 6–7. Here, Boethius distinguishes three types of music, *musica mundana*, *humana* and *instrumentalis*.

16 For a more detailed discussion on the early modern bodily metaphors see Lucie Storchová's study in this special issue.

Among the metaphors employed by Comenius, several terms from the field of agriculture can be found.[17] Notably, these are either associated with cultivation or refer to tools used during the harvesting process. The second type included, for example, the terms *tribulum* (threshing sledge pulled by oxen that farmers used to separate the corn from the husk) or *ventilabrum* (winnowing pan), an instrument with a similar function:

> *Ventilabrum est agricolarum instrumentum, quô frumenta in area ventilando paleas à grano separant. Nempe quia frumenta (unde panis paratur) non sic agris innascuntur ut pura nobis grana dent, sed adnascentibus glumis et aristis, unde flagellis exteri, et ventilabrô depurgari, necesse habent.*[18]

Also, the 'funnel' (infundibulum) proves to be a metaphor with a strong depictive efficacy in the field of knowledge.[19] Wilhelm Schickard used it in his Hebrew textbook, *Der Hebraische Trichter*, claiming that with this book, learning is so easy that even a child can master this language without Latin. Familiar with Schickard's work and possibly inspired by it, Comenius also employs this metaphor in the context of language acquisition. He envisions the creation of a new universal language that would be easy to learn, claiming that the process of mastering it is as simple and efficient as pouring liquid into a vessel through a funnel. Alongside this language – which was intended to be harmonious and pansophic (i.e. perfectly regular, internally coherent, and precisely reflective of the external world) – individuals were to simultaneously acquire knowledge about reality itself. Mastery of the language would thus go hand in hand with a deeper understanding of the world, proving Comenius' idea that linguistic proficiency and comprehensive knowledge are intrinsically linked. In this sense he wishes:

17 For a comprehensive historical treatment of the metaphor of agricultural cultivation see Alessandro Nannini's study in this special issue.

18 Comenius, J. A., Ventilabrum sapientiae sive sapienter sua retractandi ars. In: idem, *Opera didactica omnia* (hereafter *ODO*) II/4. Prague, Academia 1957, col. 42. Engl. transl.: The *ventilabrum* is a farmer's tool by which, on the threshing floor, grain is separated from the chaff by fanning. For grain (from which bread is made) does not grow in the fields so as to give us the pure kernels, but comes along with husks and awns, from which it must be freed by the flail and cleansed by the *ventilabrum*.

19 Based on data obtained from the NOSCEMUS online database, we can preliminarily conclude that during the 16th century, this term also became a medical metaphor, denoting funnel-shaped body parts. The NOSCEMUS online database is the output of ERC project No. 741374, conducted at the University of Innsbruck in 2017–2023 (PI Martin Korenjak). Available online at www: https://www.uibk.ac.at/projects/noscemus/ [cit. 19. 6. 2025].

> […] *ut habeamus linguam totam realem, facilem, harmonicam, verbô, pansophiam sonantem, aut pansophiae infundibulum* […].[20]

Of his mechanical metaphors, Comenius' favourite was the metaphor of the clock. In his didactic writings, he explains harmony using this image. It is composed of huge wheels and cylinders that fit one into the other and thus allow movement. This is the basic idea behind the concept of harmony as Comenius uses it, a mechanism which involves different elements working together, flawlessly and without much effort. A proper encyclopaedia should organise knowledge in the same effective, user-friendly way and thus facilitate learning:

> *Quas adhuc vidi encyclopaedias, etiam ordinatissimas, similiores visae sunt catenae annulis multis eleganter contextae quam automato, rotulis artificiosè ad motum composito et seipsum circumagente. Et lignorum strui, magna quâdam curâ et ordine eleganti dispositae, similiores quam arbori, è radicibus propriis assurgenti, spiritûs innati virtute se in ramos et frondes explicanti et fructus edenti.*[21]

Comenius extensively uses figurative language drawn from the realm of mechanics when discussing the domain of knowledge, while musical metaphors are rarely, if ever, applied for this purpose. If, as it is argued, "metaphors and metonymies are not random but instead form coherent systems in terms of which we conceptualize our experience",[22] it follows that the metaphor of harmony, when applied to the sphere of knowledge, carries with it mechanical connotations. In Comenius, as will be shown below, it forms a consistent semantic cluster that ties together the conceptualization of knowledge with the principles of order and interconnection characteristic of mechanical systems.

While these analogies with mechanics might be viewed negatively today, in Comenius' time they were considered an outstanding and highly desirable

20 Comenius, J. A., *Consultatio catholica*. Pars V: Panglottia. Prague, Academia 1966, p. 170. Engl. transl.: So that we may have a language that is entirely real, easy, harmonious, in a word, resounding pansophy: a funnel of pansophy.

21 Comenius, J. A., Pansophiae praeludium, p. 28. Engl. transl.: The encyclopaedias I have seen so far, even the most carefully arranged, have seemed more like a chain whose many links are elegantly interwoven than like an automaton, skillfully constructed with wheels for motion and moving by itself. And they have seemed more like a pile of logs, arranged with great care and elegant order, than like a tree rising from its own roots, unfolding into branches and leaves by the force of an innate spirit, and bearing fruit.

22 Lakoff, G. – Johnson, M., *Metaphors We Live By*, p. 41.

novelty. Mechanics, as the quintessence of efficiency, represented maximum performance with minimal effor – precisely what was required for the process of knowledge acquisition.

Considering the nature of the musical component, the harmony metaphor seems to have played two roles. The first is the heuristic role. The heuristic function of a metaphor can be understood as its role in the initial phase of understanding, where it ignites a spark of understanding of a complex subject. At this stage, the metaphor serves as an entry point, offering a preliminary insight. However, once this initial understanding is established, other metaphors may be employed to further refine, structure, or clarify the concepts, thereby extending the metaphor's role beyond the heuristic to include structural or explanatory functions.[23]

The other role of musical aspects embedded within the harmony metaphor is aesthetic. Although the term *aesthetic* only emerges as a systematic philosophical category with Alexander Gottlieb Baumgarten's *Aesthetica*,[24] this study uses the term in a broader and historically sensitive sense, referring to culturally and rhetorically shaped modes of sensorial engagement and affective resonance. Rather than applying the (post-)Enlightenment notion of beauty or artistic judgment, *aesthetic* here designates the ways in which sensory experience and forms of presentation were mobilised to support, frame, or communicate intellectual content in early modern contexts. This understanding aligns more closely with *aisthesis* as perception and sensation, rather than with later normative theories of taste or beauty.

Comenius does not provide a systematic definition of beauty. He does not reflect on what is beautiful and why. However, what he intuitive consider beautiful, exerts a binding force. This is not because it conforms to aesthetic criteria, but because it aligns with divine order. The recognition of beauty thus entails an ethical obligation. One is not merely invited to admire harmony, but called to desire it, to seek it, and to live in accordance with it. In this way, harmony takes on a normative force. Who could reject or resist a harmonious order that is not only effective, like a machine, but also divinely beautiful?

Music possesses a considerable capacity to shape social norms, as asserted by Richard Lepper in *Music, Representation, and Social Order in Early Modern Europe*.[25] This also offers one of the reasons why music held such importance

23 For this typology see Stambovsky, P., Metaphor and Historical Understanding. *History and Theory*, 27, 1988, No. 2, pp. 125–134.

24 For more detailed discussion on Baumgarten see Alessandro Nannini's study in this special issue.

25 Leppert, R., Music, Representation, and Social Order in Early-Modern Europe. *Cultural Critique*, 12, 1989, Discursive Strategies and the Economy of Prestige, pp. 25–55, esp. p. 22: "Music

for the Unity of the Brethren. The community was grounded in a fixed, hierarchical order that demanded strict discipline. It restricted the activities of its members, directed their behaviour, and regulated family life and business affairs. The seniors decided who would study and where and even had the authority to relocate brothers for disciplinary reasons, such as when rules were violated. Normativity was a dominant feature of the Unity, and musical culture played a key role within this system of discipline. It served as a means of communication with God and as an expression of acceptance of the established order.

In the writings of Comenius, several instances can be found where harmony is associated with positive aesthetic values. Harmony is described as beautiful and sweet – not only in terms of sound, but also in relation to taste.[26] Harmony brings pleasure, as expressed in the following passage:

> *Harmoniâ hominem delectari eamque cupidè persequi patet. Nam quis non formosô homine, eleganti equô, pulchrâ imagine, picturâ venustâ delectetur? Unde verò id, nisi quòd et partium, et colorum proportio jucunditatem affert? Haec oculorum illecebra et naturalissimè.*[27]

These are also qualities attributed to perfect knowledge, aesthetic values that elicit pleasure. Knowledge, therefore, is something that must be desired. It is a normative programme which utilizes aesthetic categories to promote understanding. To know is to embrace beauty; it is not power, but aesthetics.

Music in the Unity of the Brethren: The power of cultural experience

As previously noted, significant emphasis is placed on Comenius' social and religious background when discussing his use of the metaphor of harmony.

functions as a site where power is both signified and reproduced; its practices inscribe and naturalize social hierarchies," and p. 40: "Musical representation is never innocent; it is always implicated in the discourses of social order, shaping as much as reflecting them."; Gouk, P., Music as a Means of Social Control: Some Examples of Practice and Theory in Early Modern Europe. In: Cochrane, T. – Fantini, B. – Scherer, K. R. (eds.), *The Emotional Power of Music: Multidisciplinary Perspectives on Musical Arousal, Expression, and Social Control*. Oxford, Oxford University Press 2013.

26 For a detailed historical analysis of the metaphors of taste see Martin Žemla's study in this special issue.

27 Comenius, J. A., Didactica magna. In: *DJAK* 15/I. Prague, Academia 1986, p. 64. Engl. transl.: It is evident that man delights in harmony and eagerly pursues it. For who is not pleased by a handsome person, an elegant horse, a beautiful carving, or a charming painting? And whence comes this, if not from the proportion of both parts and colors bringing delight? Such is the allurement of the eyes, and most natural indeed.

However, it remains to be examined to what extent this specific environment may have influenced his conceptualization of harmony.

Comenius was a member (and since the 1630s a senior) of a particular Reform church, the Unity of the Brethren. His membership of this community was crucial for him in many respects, including his ties to music. This community, well aware of the power of music, emphasised its role in the spiritual life of believers, encouraged them to sing, and intentionally cultivated musical practices, both individual and collective. Singing was not only a part of formal services: a precise time was allocated for singing within the daily schedule, especially in educational facilities.[28]

In the 16th century, two members of the Unity of the Brethren wrote a couple of the oldest Czech theoretical treatises on music. A Unity senior, Jan Blahoslav (1523–1571), wrote the textbook, *Musica, that is, a book containing appropriate advice for singers* (1558).[29] His colleague, known under the pseudonym Jan Josquin, compiled the treatise, *Music, that is, a message suitable for singing (1561)*.[30] Also symptomatic of this reverence for music was the great attention paid to hymnals. This church created an impressive series of hymnals in Czech and German. According to the musicologist Olga Settari, the hymnal published by the Unity in Prague in 1501 is the earliest known hymnal printed in Europe.[31]

For all these reasons, historians usually explain Comenius' rich references to harmony to his belonging to this music-loving community.[32] However, despite the privileged position of music within this community, harmony was not a significant topic in its musical discourse. The Unity of the Brethren strongly focused on the textual message of the songs. It is not surprising that both of the above music books, by Jan Blahoslav and Jan Josquin, were considered prosody textbooks until the 1890s,[33] at which point the founder of Czech aesthetics, Otokar Hostinský, pointed out that it was a big misun-

28 *Řád cýrkewnj Gednoty Bratřj Českých* [A Collection of Teachings and the Ecclesiastical Rule of the Czech Unity of the Brethren]. Lissa, The Unity of the Brethren 1632, p. 133.

29 Blahoslav, J., Musica to jest Knížka zpěvákům náležité zprávy v sobě zavírající. In: Hostinský, O., *Jan Blahoslav a Jan Josquin: Příspěvek k dějinám české hudby a theorie umění XVI. věku* [Jan Blahoslav and Jan Josquin: A Contribution to the History of Czech Music and Art Theory of the 16th Century]. Prague, Česká akademie císaře Františka Josefa pro vědy, slovesnost a umění 1896, pp. 3–63.

30 Josquin, J., *Muzyka, to jest zpráva k zpívání náležitá* [Musica, that is, Information Needed for Singers]. In: Hostinský, O., *Jan Blahoslav a Jan Josquin*, pp. 67–104.

31 Settari, O., The Czech sacred song from the period of the Reformation. In: *Sborník prací filozofické fakulty brněnské univerzity. H, Řada hudebněvědná*, 43, 1994, H29, pp. [5]–11.

32 Přívratský, V. – Přívratská, J., Hudba jako inspirace.

33 Blahoslav's *Musica* was understood as a supplement to his *Gramatika česká* [Czech Grammar].

derstanding to study them as works about poetry when, in fact, they were works about music.[34] Nevertheless, this spontaneous reading of the musical textbooks in terms of poetics reflects the strong emphasis placed by their authors on the textual, metric and literary components, downplaying the role of melody. For the same reason – to foster communication with God – the Unity, even more than other Protestant churches, avoided polyphony. Polyphonic settings were suspected of distracting attention from the words to a sensual enjoyment of the artistic performance. Instead, the members of the Unity preferred simple unison performances to maximise the understanding of the words being sung.

It is telling that when Jan Blahoslav employed the term 'harmony' in his *Musica*, he saw it necessary to clarify its meaning through metaphors drawn from semantic domains more immediately accessible to his contemporaries in terms of experience, visuality, and materiality. Notably, he relied on medical knowledge and visual art, as exemplified in the following passage:

> […] through frequent practice in singing, you will come to understand when and how much you need to release your voice – whether more or less – so that there is good *symphonia*, *harmonia* or *proportio* among all those singing with you. Just as a good physician knows, when preparing a potion, how much of one herb or ingredient should be taken and when less of another, and just as painters do when mixing colours – otherwise, the former would cause certain harm, while the latter would create ugliness.[35]

The same goes for instrumental music. It was not prohibited but discouraged because communication without words was considered limited and questionable. With the same motive, the Unity of the Brethren insisted on the use of vernacular languages in their hymnals and psalters. That is also why they provided them in Czech and German. Jean Calvin recommended a similar practice. He opposed the use of harmony in congregational singing of the Psalms because it violated the unity of the body.

Comenius himself participated in this long and rich musical practice. In 1659 he published a hymnal in Amsterdam containing his own pre-

34 Hostinský, O., *Jan Blahoslav a Jan Josquin*, Preface, pp. III–IV.

35 Blahoslav, J., Musica, p. 36: "Nebo z častého se v zpívání cvičení srozumíš tomu, kdy jest a jak potřebí tobě hlasu tvého mnoho neb málo vypustiti, aby byla všech zpívajících s tebou dobrá *symphonia*, *harmonia* neb *proportio*, jako dobrý lékař ví, když traňk skládá, kterého koření neb zeliny jak mnoho se vzíti má, a kterého a kdy méně, a jako též i maleři, když barvy skládají: jinak by tento nepěknost a onenno jistou škodu způsobil."

face.[36] In this text, he praises music for its theological and social functions. He mentions the history of singing, starting with angels and Moses (*Exodus* 15,20), and onto King David, who composed psalms and introduced instrumental music into the temples, and praised singing as a practice that gives wings to the soul. He ruminates about singing in a mystical language. Singing is not of human but angelic origin. It provides an opportunity to leave the body and soar up to God, makes work more pleasant, and helps soothe children. People can sweeten their spiritual lives by singing. However, the musical theory he provides does not mention harmony. Comenius neither calculates nor deals with intervals; he refers neither to Zarlino[37] nor other early modern musical harmony theorists. He writes only about the poetic quality of the songs and their metric structure, without much attention paid to their melodies. Musicologist Petr Daněk likewise corroborates this conclusion, asserting that:

> In this tradition [of the Unity of the Brethren – LŘ], the value of a song is primarily determined by its text […]. The melody plays a subordinate role, functioning as a medium that enhances the song's significance […]. When considering the authorship of a song, the originality of its literary component is always meant first and foremost.[38]

Comenius' formulations reveal that the Unity in the mid-17th century still preferred unison performances without costly musical instruments.[39] At the time of Comenius, as he himself states, accompanied singing could be practiced only in wealthy church communities with sufficient financial means to afford those instruments, not in a small church struggling for life in exile.

He briefly mentioned figural, i.e. polyphonic singing, in his *Schola pansophica* (1651), a programmatic treatise outlining his reform plans for the Sároszpatak school. He vehemently advocates the cultivation of religious singing and adds as one of the points to improve:

36 Comenius, J. A., *Kancyonál. To gest, Kniha Žalmů a Pjsnj duchownjch* [Hymnal. That is, the Book of Psalms and Spiritual Songs]. Amsterdam, Kryštof Kunrád 1659, p. [2]. The preface is dated March 28, 1659, Comenius' 67th birthday.

37 Zarlino's systematically comprehensive treatise, *Le istitutioni harmoniche* (1558), is considered a revolutionary work on harmony. It combines musical theory and practice, and deals in detail with consonance and dissonance.

38 Daněk, P., J. A. Komenský: Kancionál, tj. Kniha žalmů a písní duchovních (Amsterdam 1659). Komentář k faksimilovému vydání původního tisku [J. A. Comenius: Hymnbook, i.e. Book of Psalms and Spiritual Songs, Amsterdam 1659. Commentary on the facsimile edition of the original print]. In: Blahoslav, J., *Musica. Faksimile vydání z roku 1569* [Musica. Facsimile edition from 1569]. Ed. P. Daněk – J. K. Kroupa. Prague, KLP – Koniasch Latin Press 2016, pp. 2–3.

39 Comenius, J. A., *Kancyonál*, p. IV.

Sed et figurali musicae assignandae erunt horae certae, ut sic etiam harmoniae studium pleniùs in schola harmonica vigeat.[40]

The emphasis on the communicative function of singing does not imply that the musical components were entirely disregarded in the Unity of the Brethren's choral practice. Comenius surely acquired substantial musical experience not only in his church but also at universities where music was an integral part of the quadrivium. Nevertheless, if music played such a prominent role in Comenius' thinking, one might reasonably expect his language to exhibit profound traces of this influence. However, this expectation is not fully met. Beyond the metaphor of harmony, his writings contain only a limited range of other musical metaphors. The metaphors of a trumpet and clarion appear in the titles of his *Bazuine des genaden jaar* (The Clarion of a Year of Grace, 1632) and *Letzte Posaun uber Deutschlandt* (The Last Trumpet over Germany, 1663). Although they refer to the musical instruments, their function is generally acoustic rather than specifically musical. In *Letzte Posaun*, the trumpet's task is to wake people and "die Seelen vor ewigen Untergang zu erhalten."[41]

The task of the trumpet is more to make noise than to spread aesthetic feelings; similarly, in *Bazuine des genaden jaar*, the clarion serves to communicate rather than to play. Just like people when singing, when sounding, the clarion bears a message. Thus, Comenius did not deviate from the older tradition, which saw the trumpet as "a signal instrument with little musical capacities by itself".[42] In this respect, he significantly differs from his colleague and correspondent Marin Mersenne, who systematically drew his own findings on harmony from his musical experiences. He devoted a substantial part of his *Harmonie universelle* (1636) to musical instruments – with particular interest in the trumpet – and let musical instruments play an important role in his epistemology.[43]

Another example which speaks against the strong position of musical concepts in Comenius' thinking is the title of his *Praeludium pansophiae*. The term *praeludium*, derived from the Latin *praeludere* ('to play beforehand', 'preface'), signalled that the text was intended neither as a definitive nor a comprehensive articulation but as a preliminary exposition of his pan-

40 Comenius, J. A., Schola Pansophica. In: *DJAK* 15/III. Prague, Academia 1992, p. 211. Engl. transl.: But certain lessons will have to be devoted to figurative music, so that in this way the study of harmony may flourish more fully in the harmonic school.

41 Comenius, J. A., Letzte Posaun über Deutschland. In: *DJAK* 13. Prague, Academia 1974, p. 101.

42 Miesen, L. van der, The Trumpet as Nature's Voice: Marin Mersenne and the Nature of Music. In: Rasch, R. (ed.), *Music and Science from Leonardo to Galileo*. Turnhout, Brepols 2022, p. 320.

43 Ibid., passim.

sophical ideas. According to etymological sources, the term's musical connotations became dominant around the mid-17th century,[44] and so it can be considered a musical metaphor. However, this title was probably assigned by Samuel Hartlib, who had solicited the manuscript from Comenius and enthusiastically published it under the title *Conatuum comenianorum praeludia* (1637) in Oxford without the author's consent. This metaphor was not one Comenius himself favoured, as evidenced by the second edition, which he personally oversaw and approved. In this subsequent edition, published as *Pansophiae prodromus* (1639), the term *praeludium* was replaced by the term *prodromus* – derived from the Greek *πρόδρομος* (*prodromos*) and figuratively meaning 'forerunner' or 'precursor'. This modification marks a deliberate departure from the original Hartlib choice.

Comenius' rejection of the musical connotations inherent in the earlier title is further underscored by another work written in defence of his pansophical endeavours: *Conatuum pansophicorum dilucidatio* (1638).[45] In this case, Comenius chose to draw on the metaphor of light, which recurs prominently throughout his works. This shift reflects his broader metaphorical preferences and underscores his alignment with imagery that conveys clarity and enlightenment rather than the performative associations of music.

Harmony in the scholarly discourse: The power of intertextuality

The reference to Marin Mersenne introduces us to another, even more pivotal circle of sources that may have acquainted Comenius with the concept of harmony. In addition to musical culture and direct musical experience, the dissemination of this concept within the early modern learned community was shaped by intertextual practices, which stimulated the spread of ideas. Comenius was not only a member of his confessionally confined church; he also operated within a broad intellectual milieu that encompassed several prominent 'thinkers of harmony,' including his eclectic teacher Johann Heinrich Alsted, the author of *Logicae systema harmonicum* and *Physica harmonica*; Johannes Kepler, author of *Harmonices Mundi*; Marin Mersenne, known for his *Harmonicorum libri XII*, and others.

Even basic computational analyses support the assumption that during the 16th and 17th centuries – particularly between 1601 and 1660 – the term *harmonia* became both widespread and deeply integrated into European in-

44 *Online Etymology Dictionary.* Available online at www: https://www.etymonline.com/word/prelude [cit. 9. 6. 2025].

45 Comenius, J. A., Conatuum pansophicorum dilucidatio in gratiam censorum facta. In: *DJAK* 15/II, pp. 57–79.

tellectual discourse (Fig. 2). The rich early modern harmony discourse contained three main components: universality, proportionality and beauty. All these principles can be found in exceptional authors, such as Cusanus, Zarlino, Cardano, Ficino, Kepler, Fludd, Mersenne, and Kircher, plus many others whose works on harmony have been previously studied in detail.

For these outstanding early modern scholars, harmony was understood as a universal metaphysical principle underlying the workings of the world, i.e. as an ontological principle. Yet harmony was not limited to this metaphysical role; it also functioned as a principle for organising knowledge. This was manifested in a rather playful way, for example, by the German poet Nikolas Bär (1639–1714), who published an extensive poetic 'encyclopaedia' of songbirds at the end of the 17th century, *Ornitophonia sive Harmonia melicarum avium*.[46] This extensive poetic composition linked the concept of harmony with birdsong and, in this sense, showed references to music. At the same time, however, the concept of harmony implied here an encyclopaedic approach bringing birds into a specific orchestra and collecting knowledge about them into one book.

In a significantly more rigorous manner, this metaphor worked as a structuring principle within the eponymous genre of Gospel harmony. The tradition of Gospel harmonies dates back to the 2nd century with the pioneering work of the Assyrian Christian theologian and apologist, Tatian. His *Diatessaron*, meaning 'out of four' or 'composed of four', sought to synthesize the four New Testament Gospels into a single, cohesive narrative of Jesus' life. Given the differences among the four Gospels – differences that critics of Christianity have pointed to as evidence of its inconsistency and lack of validity – Tatian's objective was to demonstrate that the evangelists did not, in fact, contradict one another.

The authors who followed his model and crafted their own 'diatessarons' during the next centuries often likened the Gospels to the "voices" of the four Evangelists, which this textual genre sought to attune. The standard designation of *harmony*, however, only became firmly established in the 16th century. Until that time, the titles of these works varied, often incorporating terms such as *Concordia* or *Symphonia* to convey the fusion of four voices. This development was largely influenced by key works such as Andreas Osiander's *Harmonia evangelica* (1637), Jean Calvin's *Commentary on the Harmony of the First Three Gospels* (1551), and similar works by Gerhard Mercator, Martin Chemnitz and others. Some works published under other titles in the first half of the 16th century were retitled *Harmony* when repub-

46 Baer, N., *Ornithophonia: Sive Harmonia melicarum avium*. Bremae, Joh. Wesselius 1695.

lished in the second half of the century. This points out that it was around the middle of the 16th century that the Gospel genre designation "harmony" was standardised.

In 1559, Calvin devised a plan for another work on harmony, *Harmony of the Law*, which presented thematically arranged commentaries on the last four books of Moses (*Exodus*, *Leviticus*, *Numbers*, and *Deuteronomy*). For this project, he departed from the conventional structure of his commentaries, which typically followed the sequential order of biblical chapters and verses. Instead, in alignment with the conventions of the harmony genre, he juxtaposed passages from these four books according to thematic correspondence. This work can serve as an exemplary case of the cognitive theory of genre, demonstrating how an established formal structure – here, the concept of harmony – organises and shapes knowledge.

Another example of how the metaphor of harmony spread as a label for this inherently comparative mode of writing arose in 1536 when the Czech humanist Sigismundus Gelenius (1497–1554) published his comparative etymological dictionary of Latin, German, Greek, and 'Slavic' words. Explicitly drawing on the *Diatessaron*, he called his work a *Symphony*. By the second half of the century, however, Jan Blahoslav, a senior figure in the Unity of the Brethren and the aforementioned author of the *Musica* theoretical treatise, referred to it as a *Harmony*. This shift in terminology further underscores the increasing dominance of the concept of harmony in describing this literary and theological genre.

During this period, other works followed a similar principle. For instance, *Harmonia humorum* and the later *Harmonia mensurarum* exemplify this approach. A notable member of the Unity of the Brethren, Václav Budovec of Budov (1551–1621), crafted a harmony of the Old and New Testaments, while his close associate Amandus Polanus (1561–1610) entitled his theological reflections *Symphonia catholica, seu consensus catholicus et orthodoxus dogmatum*, blending Patristic and contemporary sources into a cohesive synthesis.[47]

In a similar vein, Johann Heinrich Alsted (1588–1638) produced two works following this model: *Systema physicae harmonicae* (1612) and *Physica harmonica* (1616). His aim was to harmonize four distinct branches of natural philosophy: the Mosaic, Hebrew, Peripatetic (Aristotelian), and chemical. In doing so, he created a *Diatessaron* of four physical schools – a harmony of four voices. It is precisely this formal literary structure that shapes deeper cognitive frameworks. From this perspective, the connection between the

47 Han, B. S. (ed.), *Symphonia Catholica: The Merger of Patristic and Contemporary Sources in the Theological Method of Amandus Polanus (1561–1610)*. Göttingen, Vandenhoeck & Ruprecht 2015.

formal structure of writing and the mind is crucial. However, scholars of natural philosophy often overlook this aspect when studying Alsted's work, tending instead to focus on the content of his ideas rather than the manner in which they were blended.[48]

It is important to emphasize in this context that, while many philosophical, cosmological, and even musical writings on harmony were primarily intended for an educated audience, the harmonization of the life of Jesus reached a much broader Christian public. This not only reinforced the presence of the term *harmony* in the contemporary discourse but also helped to solidify clear techniques for organising knowledge, techniques designed to unify disparate facts and eliminate any potential contradictions within them.

Comenius made two notable contributions to this genre, *Harmonia evangelistarum, pulcherrimo concentu mundo salutem applaudens*, lost in the fire that destroyed Leszno in 1656, and the lesser-known Czech *Harmonia. Historie o vzkříšení Páně, též ze všech čtyr evanjelistů sebraná* (A History of the Resurrection of the Lord, drawn from the Four Evangelists) published in Lissa in 1631 and later reissued in Amsterdam in 1663. In addition, he also envisioned harmonical lexicons and harmonical grammars.[49]

All these texts increased the presence of the concept of harmony in the scholarly discourse, not only as an ontological principle – viewing the world as an entity organised through harmonious relations – but also as an epistemological one. There were many metaphors available for knowledge organisation.[50] Using this one in particular, Comenius articulated his strong belief that the structure of knowledge should mirror the structure of the world which, however, is hidden and invisible and also much more sophisticated than the usual encyclopaedias suggested. Unlike his earlier encyclopaedic projects,[51] which were structured around distinct disciplines, Comenius' pansophic project aimed to promote a higher, more harmonious arrangement of knowledge. It entailed three key assumptions: first, that individual

48 Čížek, J., 'Physica Mosaica' Johanna Heinricha Alsteda (1588–1638). *Teorie vědy / Theory of Science*, 42, 2020, No. 1, pp. 111–139.

49 Comenius, J. A., *Consultatio catholica*. Pars V: Panglottia [V/12], [1966] p. 164.

50 For a more general discussion on the role of metaphors in the field of the knowledge organisation see, for example, Bies, W., Thinking with the help of images: On the metaphors of knowledge organization. *Knowledge Organisation*, 23, 1996, No. 1, pp. 3–8. For the early modern period specifically see, for example, Pavlas, P., Up to Five Books of God: The Metaphorical and Theological Background of Herborn Encyclopaedism. *Reformation and Renaissance Review*, 24, 2022, No. 3, pp. 188–207; Řezníková, L., Theatrum Historiae. The Metaphors of J. A. Comenius' Historical Theory and Narration and their Empirical Context. *Acta Comeniana*, 35, 2021, No. 59, pp. 9–33.

51 Comenius, J. A., Theatrum universitatis rerum. In: *DJAK* 1. Prague, Academia 1969, pp. 97–181; idem, Amphitheatrum universitatis rerum, ibid., pp. 185–194.

facts would not contradict one another; second, that they would be interconnected within a network of mutual relations; and third, that from a very small number of principles, a large number of variations could be achieved through combinations:

> *Tertia harmoniae proprietas est, ut quanquam infinita sit sonorum et melodiarum varietas, illa tamen è paucis principiis certisque differentiarum modis exsurgat. Omnes enim harmoniarum differentiae, quotquot excogitatae sunt et excogitari possunt, exsurgunt è septem vocibus et tribus consonantiis. Omnia corpora, quotquot mundus habet, exsurgunt è paucissimis illis elementis et aliquot qualitatum differentiis*.[52]

According to Comenius, the harmonic structure requires more than a simple linear progression, such as the straightforward succession of the numbers 1, 2, 3, 4, etc. Instead, it sought to uncover a universal invisible order – one that lay hidden behind seemingly random phenomena. In such a framework, the harmonic principle of organization was supposed to reflect a deeper and more intricate interconnectedness of all things, embodying the concept of syncretism, where everything is related to everything else. To explain and manifest this syncretic experience within a broader, unifying principle, Comenius employed a well-known visual diagram of harmonical order (Fig. 1) used by Peter Appian, Robert Fludd, and other prominent early modern intellectuals. It resonated with the Pythagorean concept of musical harmony, where numerical ratios governed the structure of both sound and celestial motion. This diagram served Comenius as a model of a deeper order that governs both the cosmos and human understanding – a syncritic system where music, chronology, astronomy, and cosmology reflect the same fundamental principles:

> Astronomiae coronis est Computus temporum, per dies, menses, annos numerandorum. Superstitiosum est, sed ingeniosum, dies hebdomadae à Planetis denominari; non quô illi ordine in Coelis sunt, sed harmonicè, ceu in Musica, per quartas descendendo, et per quintas ascendendo sic:[53]

52 Ibid. Engl. transl.: The third property of harmony is that, although the variety of sounds and melodies is infinite, it nevertheless arises from a few principles and from fixed modes of difference. For all the varieties of harmonies, as many as have been devised and as many as can be devised, arise from seven notes and three consonances. In the same way, all the bodies the world contains arise from those very few elements and from certain differences of qualities.

53 Comenius, J. A., Atrium. In: *ODO* II/3, col. 634. Engl. transl.: The completion of astronomy is the computation of time to be reckoned in days, months, and years. It is a superstitious but

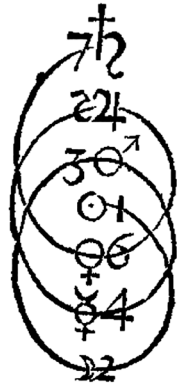

Figure 1. Comenius, J. A., Atrium.
In: *ODO* III/2, Prague 1957, col. 634.

In this scheme, the planetary cycles correspond to the days of the week (Sunday to the Sun ☉, Monday to the Moon ☽, Tuesday to Mars ♂, Wednesday to Mercury ☿, Thursday to Jupiter ♃, Friday to Venus ♀ and Saturday to Saturn ♄), creating a temporal structure shaped by celestial harmonies. Thus, the numbers do not follow a simple ascending sequence (1, 2, 3, etc.) Instead, they form a seemingly arbitrary sequence 7, 5, 3, 1, 6, 4, 2.[54]

It is surely no coincidence that within this framework, the progression *per quintas* upward and *per quartas* downward, creates the ratio of 5:4, which corresponds to the major third, an interval traditionally associated with a joyful affect, in contrast to the minor third (6:5), historically linked to melancholy or sadness.

Through this scheme, Comenius articulates a universal principle of order that governs the natural world and which, precisely for that reason, ought to serve as the structuring framework for human knowledge. What is postulated is a conceptually intricate structure. Now, his goal is not an encyclopaedia that places disciplines side by side in an additive manner, but a mode

ingenious thing that the days of the week are named after the planets, not in the order in which they are in the heavens, but harmonically, as in music, by descending through fourths and ascending through fifths, as follows.

54 It is worth noting that the number 5 corresponding in the diagram to both the fifth day of the week and the planetary position of Jupiter ♃ is printed in mirror image. This inversion may have resulted from a mistake made by the artisan responsible for preparing or cutting the diagram for printing. Given the conceptual complexity of the schematic, it is possible that its symbolic structure was not easy to understand, which could have contributed to the error. Such irregularities were not uncommon in early modern print production, particularly in cases involving specialised or non-standard content.

of organising knowledge that reflects the deep internal interconnectedness of all insights. As Umberto Eco stated:

> The world knowledge provided by an encyclopedia has nothing to do with our direct, physical, and frequently idiosyncratic experience of the world; it has, on the contrary, to do with other semiotic phenomena, with intertextual knowledge, with a chain of interpretants.[55]

Conclusion: Mechanical music and the aesthetics of mechanics

This study started with the question of to what extent music could be a source domain of Comenius' figurative thought. In this regard, music is a tricky field with specific limits. As Michael Spitzer wrote, "Music theory is admirably poor at describing how music is composed or heard, and even more suspect when it attempts to prescribe these practices."[56] In order to explain them, authors tend to resort to other non-musical metaphors. So, what made harmony so effective in articulating even more complex problems? It was not only its musical basis, but the very lucky combination of a set of aspects.

Firstly, it was the significance of material culture. While harmony is often perceived as a highly intricate concept with sophisticated mathematical implications, the word originated from an entirely different source domain: ancient material culture. The root of the word referred to all kinds of joining things together or making them compatible: typically, the fastenings of a door, or in shipbuilding joining planks together with joints – *harmoi*.[57] In ancient cultures, harmony already held a strong position, as it bridged the abstract notion of connecting things, people, or ideas with tangible aspects of material culture. This dynamic also applied in the early modern period, when the metaphor retained its mechanical connotations.

Secondly, harmony embodied sensory perception. This connection to the bodily experience is another factor strengthening its figurative power. Harmony was not merely a musical but also an acoustic metaphor. It encompassed not only music – understood as aesthetically produced sound – but also sound and noise in general. While not everyone joins planks on a daily

55 Eco, U., Metaphor, Dictionary, and Encyclopedia. *New Literary History*, 15, 1984, No. 2, p. 255.
56 Spitzer, M., *Metaphor and Musical Thought*, p. 2.
57 According to Morrison, in ancient Greek shipbuilding the words harmos, harmodzein, and harmonia implied fastening of one plank to another. Morrison, J. S., Names and Things in Greek Maritime Contexts. *Mediterranean Language Review*, 4–5, 1989, pp. 58–60.

basis, nearly everyone has the ability to hear. During the early modern period, sound became a subject of widespread scientific inquiry across Europe: 17th-century scholars studied not only musical instruments but also animal sounds, echoes, vibrations, and frequency, leading to new theories about hearing.[58] Harmony was integral to this discourse, not only because of its musical associations but also due to its connection to broader debates on the audibility and inaudibility of the 'music of the spheres'.

As cognitive linguistics teaches us, metaphors typically originate from concepts firmly anchored in our minds, often through embodiment or cultural familiarity. Harmony's direct connection to material culture on the one hand and to hearing on the other was instrumental in establishing it as a strong, complex metaphor. Firstly, the popularity of the metaphor of harmony lay in the flourishing of musical culture during the early modern period. Secondly, its appeal was reinforced by the fact that it carried not only musical but also mechanical connotations. In fact, many early modern authors perceived music itself as a domain closely intertwined with mechanics or even as an integral part of it, dealing with ratios, vibrations, and the physics of bodies in motion.

This blending of mechanical and musical meanings was the basis for establishing harmony as a complex metaphor for another target domain, in Comenius' case for the domain of knowledge and its structure. The concept of harmony became crucial to him, not only in the social but also in the epistemological sense. By adopting the concept of harmony, he was trying to surpass the concept of an encyclopaedia, which no longer fully suited the syncretic experience of his Pansophic period. Harmony was a complex metaphor and a model example of conceptual blending. The combination of musical and mechanical meanings enables the articulation of both aesthetic and operational roles.[59] Its function was strongly heuristic, offering a framework for communicating his ideas about proper knowledge organisation.

Unlike the widely popular metaphor of the book,[60] which was frequently employed to conceptualize knowledge in the early modern period, harmony was a metaphor of a strikingly nonlinear nature. It presupposed a profound interconnectedness of all individual segments of knowledge, challenging the

58 Miesen, L. van der, Studying the echo in the early modern period: between the academy and the natural world. *Sound Studies*, 6, 2020, No. 2, pp. 196–214.

59 For the Theory of Conceptual Blending see Fauconnier, G. – Turner, M., *The Way We Think: Conceptual Blending and The Mind's Hidden Complexities*. New York, Basic Books 2002. According to this theory, distinct domains can be under certain conditions co-activated and create new cross-domain associations.

60 For the metaphor of the book see the conclusion of Petr Pavlas' study in this special issue.

principles of a culture fundamentally rooted in textuality. The concept of organising knowledge in such a way that all individual facts are interconnected fundamentally exceeds the principles of textuality. While textual forms impose a linear structure – words, sentences, and ideas unfold sequentially, which inherently limits the ability to represent non-linear relationships, multidimensional connections, and dynamic interdependencies – Comenius envisioned such a comprehensive organisation of knowledge in his *Pansophia*, aiming to reflect the harmonious interconnectedness of all things. However, achieving this goal within the constraints of a textual medium was rather utopian. As the dominant mode of early modern scholarly communication, the medium of text lacked the capacity to stage the intricate web of relationships he imagined. While he could describe these connections conceptually, the linear and static nature of text could not effectively simulate the fusion of disparate elements of knowledge.

In other words, the medium of textuality may have been a significant obstacle to realizing the pansophic ideal, as it was inherently connected with the ambitious goal of representing universal harmony. The limitations of text in conveying non-linear systems underscore the utopian nature of such an ambitious endeavour. While developing *Pansophia*, Comenius experimented extensively with its generic structure. However, he was unable to devise a singular genre capable of fully encapsulating his goal. Instead, *Pansophia* remained a hybrid of various genres (including dialogues). While the metaphor of harmony was successful in articulating Comenius' ideas of how to organise knowledge, *Pansophy* failed to embody them in any material manifestation.

The very fact that Comenius turned to the metaphor of harmony suggests not only a commitment to the idea of internal coherence and cosmic consonance, but also a deeper epistemological impulse to conceive of knowledge as structurally integrated and non-linear. Yet this vision came into conflict with the constraints of the medium through which it had to be expressed. Early modern textuality, sequential writing, typographic uniformity, and fixed structure imposed a linear logic. The resulting dissonance between the conceptual virtuality of Comenius' pansophic thinking and the materiality of the medium available to him constitutes an unsolvable tension in his work. While the metaphor of harmony encouraged him to imagine a model of knowledge that transcended disciplinary and temporal fragmentation, the alphabetic text remained his only viable tool for its articulation.

This is not to suggest that Comenius subscribed to a reductive or exclusively linear conception of textuality in the modern sense. On the contrary, his intellectual formation was deeply informed by theological traditions, particularly Trinitarian and Neoplatonic metaphysics, that recognised lan-

guage, thought, and mediation as fundamentally relational and potentially non-sequential. However, whatever alternative models of meaning and structure he may have envisioned, he nonetheless had to operate within the medial framework of his time. From this perspective, the unfulfilled promise of Pansophy might be seen not as the failure of an intellectual project, but as a symptom of a historical moment in which the structures of thought exceeded the structures of mediation. Comenius thus stands at a threshold between two regimes: the metaphysical ideal of participatory knowledge, and the material reality of print culture.

Appendix

The following figures and table have been generated as a part of the WEEMS (Word Embeddings for Early Modern Science) software.[61]

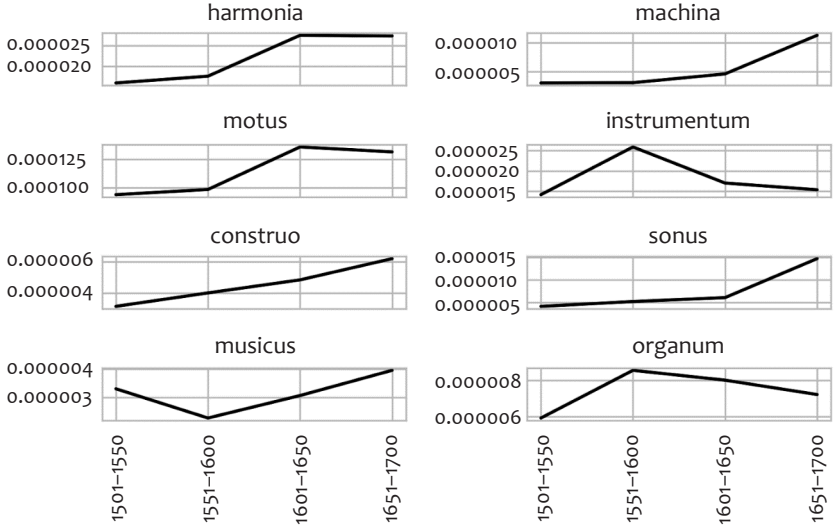

Figure 2. Frequencies of 8 selected target terms over time. Frequency is calculated as the number of instances of the term's lemma divided by the number of word tokens within the respective half-century subcorpus. Note that the *y-axis* limits are for each term determined independently based on the minimal and maximal value.

61 Kaše, V. – Tvrz, J. – Švadlenková, J. – Pavlas, P., WEEMS (v0.2.2). *Zenodo*, 2020. Available online at www: https://doi.org/10.5281/zenodo.14626412 [cit. 19. 5. 2025].

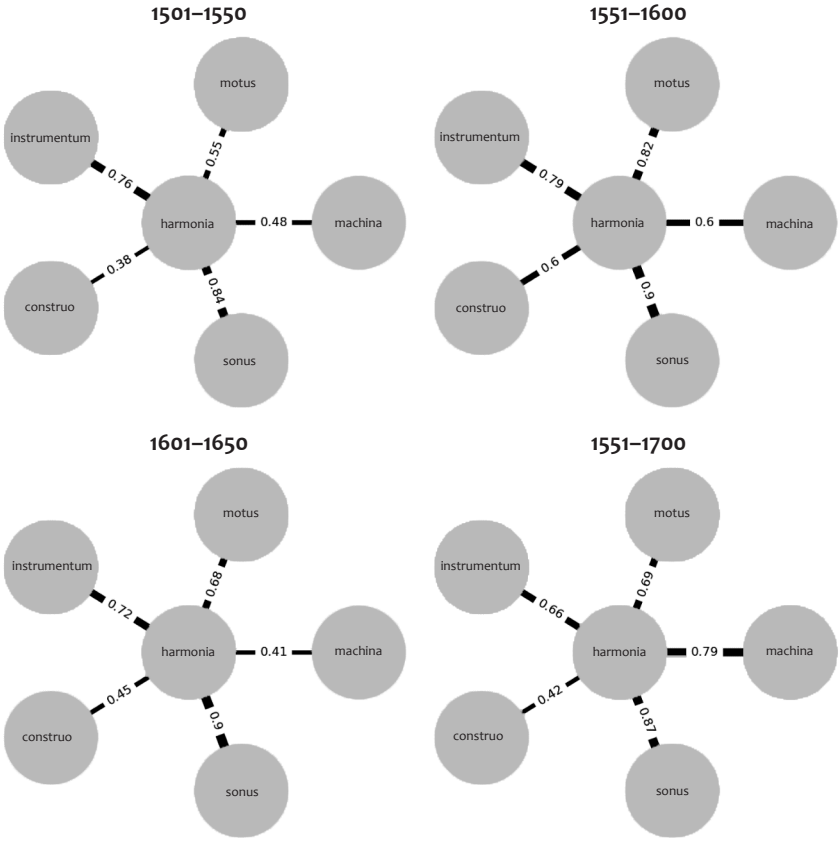

Figure 3. Cosine similarity of selected pairs of word vectors across four models trained on four corresponding subcorpora, covering the periods 1501–1550, 1551–1600, 1601–1650, and 1651–1700. Higher similarity values indicate a stronger semantic relatedness between the word pairs within each subcorpus. Notable fluctuations in similarity across periods suggest semantic shifts in the meaning or usage of at least one of the terms. For example, the relationship between *harmonia* and *sonus* remains relatively stable, fluctuating by no more than 6 percentage points across the four periods. Conversely, the pair *harmonia* and *machina* displays a significant increase in similarity, particularly from the third to the fourth period, indicating a possible semantic shift in one or both terms over time.

Figure 4. Multidimensional scaling (MDS) visualization of word vector similarities across four models trained on corresponding subcorpora (1501–1550, 1551–1600, 1601–1650, 1651–1700). Words placed closer together share higher semantic similarity, while greater distance suggests lower similarity within each period. The terms *harmonia*, *sonus*, *instrumentum*, and *organum* consistently cluster, reflecting their stable conceptual link in musical contexts. However, *machina* (machine) shifts further away over time, indicating a semantic drift towards more technical meanings. *Construe* (*construo*) remains consistently distant, emphasizing its conceptual separation from musical discourse. These changing proximities reflect subtle semantic shifts in early modern Latin vocabulary across the studied periods.

1501–1550	1551–1600	1601–1650	1651–1700
concentus	concentus	concentus	concentus
organum	consono	musicus	musicus
musicus	concino	musica	musica
concino	musicus	consono	dissonus
musica	musica	concinnus	consono
vox	concinnus	compositio	organum
communio	sonus	sonus	dispositio
immortalitas	dissonus	decanto	modulus
corporeus	concors	ordo	chorda
imitatio	resulto	auctor	sonus
compono	compositio	theologus	compono
fabrica	cithara	hymnus	admirabilis
politia	cantus	attendo	dulcissimus
communitas	compositus	attentio	chorus
sonus	compono	compono	mirus
functio	actio	cantor	difficillimus
concinnus	mundanus	consentio	ordo
copula	accommodatus	oratio	ordino
inviolatus	cithara	adiungo	suavis
immortalis	motio	numerus	concinnus

Figure 5. Table of the 20 nearest neighbours (terms with the highest cosine similarity) to *harmonia* across four subcorpora (1501–1550, 1551–1600, 1601–1650, 1651–1700). Each column lists the most semantically related words in decreasing order of cosine similarity for the corresponding period.

A notable semantic shift can be observed in the relationship between *harmonia* and terms associated with musical practice versus abstract concepts. Early in the 1501–1550 period, *harmonia* is closely associated with terms like *organum*, *musica*, and *sonus*, emphasising a connection to musical theory and sound. By the period 1651–1700, however, terms such as *dispositio* (arrangement), *modulus* (measure), and *ordo* (order) gain prominence, reflecting a broader conceptual shift where *harmonia* appears to be increasingly linked to structural or theoretical order rather than just musical performance. Additionally, terms like *cithara* and *hymnus* in the mid-periods reflect a continued but narrowing focus on musical instruments and compositions, while later associations like *difficillimus* (most difficult) and *admirabilis* (admirable) suggest a more evaluative or rhetorical use of *harmonia* in the later corpus. This progression points to a semantic drift where *harmonia* gradually expands from its core musical meanings toward more abstract notions of order, structure, and conceptual harmony in early modern Latin discourse.