

Kepler's *Harmony of the World* and the Politics of Harmony

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Abstract. Kepler's 1619 *Harmonice Mundi* was a text that straddled the divide between celestial and terrestrial harmony. It focused on harmony in a variety of aspects—mathematical, musical, astrological, astronomical, and cosmological—while also linking them to Kepler's ultimate goal, the harmony of church and state. This talk will consider Kepler's vision of harmony in the *Harmonice Mundi* by situating it alongside both traditional conceptions of harmony and the particular seventeenth-century changes that influenced Kepler's own view. It will focus in particular on Kepler's dedication of the *Harmonice Mundi* to James I of England, and on the political digression he placed at its center. Kepler signaled throughout the book that the harmony of nature could provide a blueprint for harmony in communities on earth. In so doing, however, he positioned himself against the views of Jean Bodin and other theorists who tried to bolster absolutist government with the claim of mathematical certainty, and emphasized instead a vision of communal harmony that allowed for the public good to be achieved via multiple possible configurations, and for diverse perspectives to coexist in one peaceful community.

Johannes Kepler believed his 1619 *Harmony of the World* to be the culmination of all of his prior studies and efforts. Reflecting backward on the trajectory of his work in the second, 1621 edition of his *Mysterium Cosmographicum*, he noted that he had called the original 1596 edition a forerunner (*prodromus*), without ever publishing a specific successor. Yet, he wrote,

the reader will be able to consider my astronomical works, and especially the books of the *Harmonies*, as the genuine and particular successors of this little book. Both hasten along the same path. That which was then inaccessible is now very well-trodden, and that which was the brief and fell short of the

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target is continued in the *Harmonies*, with the chariot now rounding the goalpost.¹

As with the voyages of exploration of the previous century, the *Mysterium Cosmographicum* was a first foray, 'like the first voyage of Amerigo Vespucci'; the *Harmony of the World* was the result of knowledge accumulated since, 'like today's annual voyages to America'.² In the *Harmony of the World*, Kepler wrote, 'I have most truly grasped beyond what I could ever have hoped'.³

The truth he had grasped was 'the whole nature of harmony'—the harmonic archetype that underpinned the cosmos and all things in it.⁴ Kepler's *Harmony of the World* explored the significance of harmony across multiple domains, including mathematics, astrology, music, and cosmology. Still further, Kepler extended the idea of harmony beyond the natural world to the fragmented social and political world of seventeenth-century Europe. And to Kepler, the question of harmony was not merely academic. As he slowly sought harmony in his own work, the Holy Roman Empire was moving ever closer to a devastating religious and civil war, a war which ignited with the defenestration of Prague a mere four days before Kepler completed his *Harmony of the World*, and which was to wipe out one third of the population of Germany. Kepler's ultimate goal was both to reveal the harmony in nature and to work toward a worldly harmony that might follow from it.

This paper, drawn from my larger work in *The Pursuit of Harmony* (2017), will focus specifically on Kepler's understanding of the political implications of his harmonic vision. He articulated that vision in part through his engagement with the political ideas of sixteenth-century humanist Jean Bodin, in a 'political digression' at the very center of his *Harmony of the World*. As I will show, Kepler's distinctive understanding of the harmonic tradition caused him to part with Bodin on the relationship between the mathematics of harmony and the politics of harmony. Unlike Bodin, who believed that an understanding of harmony would yield specific answers to political questions and demonstrate unequivocally the ideal form for the state (in Bodin's view, absolute monarchy), Kepler

¹ Johannes Kepler, *Mysterium Cosmographicum* (Frankfurt: Erasmus Kemper, 1621), p.1.

² Kepler, *Mysterium Cosmographicum*, p.1.

³ Johannes Kepler, *Harmony of the World*, trans. E. J. Aiton, et. al. (Philadelphia, PA: American Philosophical Society, 1997), p.389.

⁴ Kepler, *Harmony of the World*, p.389.

argued that following God's harmonic model meant allowing for multiple possible political configurations in service of the public good.

The Harmonic Tradition

To understand Kepler's own approach to the idea of harmony, let us briefly survey the ancient harmonic tradition. According to myth, Pythagoras passed a blacksmith's shop one day and discovered that hammers of different weights produced different sounds, some consonant in combination and some dissonant.⁵ As he later determined by experimenting with strings and their pitches, the reason for these differences lay in the numerical relationship between the various weights or lengths of string. Musical harmony could thus be linked directly to ordered numerical relationships, accessible via reason. Though the Pythagoras of legend had discovered the theory of harmony empirically, ancient theorists insisted that the mathematical relationships governing harmony could be determined a priori and were necessarily limited to the set of ratios based on the first four integers.

Plato linked this vision of harmony to the cosmos. In his *Timaeus*, Plato described the Demiurge's process of creation via the very proportions that Pythagoras himself had discovered in music. This resulted in a cosmos whose interplanetary distances could be represented on a musical scale, and whose planetary motions produced beautiful harmonies that were orchestrated by the Demiurge, much as a musician played his instrument. Likewise, in the Myth of Er with which Plato concluded his *Republic*, the planetary spheres were depicted as concentric wheels turning around a spindle, on each of which sat a Siren singing. The combined singing of the Sirens produced, according to Plato, an audible harmony governed by the mathematical motions of the spinning spheres.⁶

This mathematical notion of harmony and the linkage between music and the heavens was underscored in the medieval theory of music, based in particular on the writings of Boethius.⁷ That theory placed music in the

⁵ The earliest known version of this story comes to us from the *Manual of Harmonics* of Nicomachus of Geresa (c.60-c.120), trans. Flora R. Levin (Grand Rapids, MI: Phanes Press, 1993)

⁶ J. Prins, "Harmony, Renaissance Conceptions of," in M. Sgarbi, ed., *Encyclopedia of Renaissance Philosophy* (Springer Online). https://doi.org/10.1007/978-3-319-02848-4_228-2. [accessed 22 December 2020].

⁷ See Boethius, *Fundamentals of music*, trans. and introduction by C. M. Bower, ed. C. V. Palisca (New Haven, CT: Yale University Press, 1989). See also

quadrivium, the four subjects that, along with the trivium of grammar, logic, and rhetoric, made up the seven liberal arts. The quadrivium of arithmetic, geometry, astronomy, and music established music as a science, rather than an aesthetic taste or skill, one linked to the motions of the celestial bodies and governed by rules of mathematical order. Boethius's also famously identified three divisions: *musica instrumentalis*, which encompassed singing and instrumental performance, *musica humana*, the music of the body and soul, and *musica mundana*, the music of the spheres. This three-fold division was a formalization of the Pythagorean notion of harmony; *musica* represented an archetypal harmony which linked the sounds produced by voices or keyboards with the movements of the planets via the appreciation for consonance built in to the soul of man.

Harmony implied not merely the idea of mathematical order, but also, from the very start, the idea of uniting elements that were different; harmony was, by definition, the *concordia discors*, the discordant made consonant. Yet the embrace of diversity did not mean that harmony was unbounded by strict guidelines. Though harmony might embrace difference, in order to *be* a harmony, rather than a discordant jumble of conflicting elements, only certain particular orders and configurations were allowed. This was true both for the mathematically determined musical harmonies and for the strictly enforced social and political hierarchies that followed from them. The Demiurge in Plato's *Timaeus* was able to create harmony only by imposing a mathematical order on the chaos around him; it was this ordered notion of harmony, Plato suggested, that human beings were supposed to emulate.

Harmony, in this way, was both mathematical and moral; it not only linked music to the ordering of the cosmos, but also to the ordering of human society. Plato had made this linkage clear immediately simply by ending his *Republic*, a vision of the ideal state, with the Myth of Er, a vision of the musical cosmos. In his *Timaeus*, Plato had further emphasized the psychological effects of music on individuals, and in the *Republic* he forbade all innovation in music, because such innovation would inevitably alter the foundations of political society.⁸ Music affected politics, and the

Penelope Gouk, *Music, Science, and Natural Magic in Seventeenth-Century England* (New Haven, CT: Yale University Press, 1999), Chapter 3: 'Intellectual Geographies: Music, natural magic, and their relationship to experimental philosophy', pp.66-111.

⁸ See Plato, *Timaeus*, 17a-19a and 44a-d in *The Dialogues of Plato*, vol. 3, trans. and introduction by B. Jowett, M.A. (Oxford: Oxford University Press, 1892); and Plato, *Republic*, trans. G. M. A. Grube (Indianapolis, IN: Hackett, 1992), p.99.

theory of harmony represented not merely musical order but the ideal ordering of the state.

In his *De republica*, Cicero too linked the well-ordered state with the notion of harmony. Like Plato before him, he ended his *De republica* with a myth, in this case the dream of Scipio, in which he described the ways that the celestial motions produced ‘a great and pleasing sound’ based on ‘carefully proportioned intervals’.⁹ And within the text itself, he argued that musical harmony was akin to the harmony of the state:

[In music,] concord and delicious harmony is produced by the exact gradation and modulation of dissimilar notes. Even so, from the just apportionment of the highest, middle, and lower classes, the state is maintained in concord and peace by the harmonic subordination of its discordant elements. And thus, that which is by musicians called harmony in song, answers and corresponds to what we call concord in the state.¹⁰

The beauty of the state, like the beauty of music, lay in order and clear, hierarchical division of the individual elements that composed it.

The linkage between harmony and the state continued unbroken through the centuries, as united, well-governed countries were understood to be ‘in tune’ or ‘well-tempered’.¹¹ Shakespeare often invoked the language of harmony in his plays, arguing, for example, that ‘government, though high and low and lower, / Put into parts, doth keep in one consent, / Congreeing in a full and natural close, like music’.¹² Humanist Louis Le Roy likewise described political society as ‘composed of degrees or estates, as it were parts, which estates must be held in concord by a due proportion of each to other, even as the harmony in music’.¹³

⁹ William Harris Stahl, *Commentary on the “Dream of Scipio” by Macrobius* (New York: Columbia University Press, 1990), p 73.

¹⁰ M. T. Cicero, *The Treatises of M. T. Cicero on the Nature of the Gods; On Divination; On Fate; On the Republic; On the Laws; and on Standing for the Consulship*, trans. C. D. Yonge (London: Bohn, 1853), p.42.

¹¹ James Daly, *Cosmic Harmony and Political Thinking in Early Stuart England* (Philadelphia, PA: American Philosophical Society, 1979); Kate van Orden, *Music, Discipline, and Arms in Early Modern France* (Chicago, IL: University of Chicago Press, 2005).

¹² William Shakespeare, *Henry V*, Gary Taylor, ed. (Oxford: Oxford University Press, 1982), I.2.180-183.

¹³ Louis Le Roy, *Aristotle’s Politiques or Discourses of Government*, I. D (trans.) (London: Adam Islip, 1598), pp.263-4.

Harmony, as we saw in the three divisions of Boethius, underpinned *musica mundana, humana, and instrumentalis*—the cosmos, man, and instrumental music. Furthering this Boethian division, the four underlying components of the musical tetrad were linked to the four basic cosmic elements, which were then paralleled to the four humors of the human body, as elaborated by Galen.¹⁴ The body was in harmony if its humors were well-balanced and in tune. If they were not, then disharmony—that is, illness—would inevitably result. Further, since harmony was linked to the state, it is no surprise that the language of human harmony, and in particular, of the body, was used to describe communal harmony. The state was not merely described as a harmony in the musical sense; the idea of the harmonious, ordered body was extended to the state itself, via the metaphor of the body politic.

John of Salisbury invoked both the musical metaphor and the metaphor of the body to describe the correctly ordered state. As he explained in his *Policraticus* of 1159, just as musicians ‘manage by great diligence to curb the fault of a wayward string and restore it to harmony with the others’, so too should princes ensure ‘that subjects are made to be of a single mind in a household and the works of peace and charity create one perfect and great harmony out of pursuits which appear discordant’.¹⁵ From musical harmony he then turned to bodily harmony, and explained that

the position of the head in the republic is occupied... by a prince subject only to God and to those who act in His place on earth, inasmuch as in the human body the head is stimulated and ruled by the soul. The place of the heart is occupied by the senate... The duties of the ears, eyes, and mouth are claimed by the judges and governors of provinces. The hands coincide with officials and soldiers. Those who always assist the prince are comparable to the flanks. Treasurers and record keepers... resemble the shape of the stomach and intestines... Furthermore, the feet coincide with peasants perpetually bound to the soil.¹⁶

¹⁴ See, for example, Leo Spitzer, *Classical and Christian Ideas of World Harmony: Prolegomena to an Interpretation of the Word* (Baltimore: Johns Hopkins University Press, 1963), p.64. See also Jacques Jouanna and Neil Allie, *Greek Medicine from Hippocrates to Galen*, ed. Philip van der Eijk (Leiden: Brill, 2012).

¹⁵ John of Salisbury, *Policraticus*, ed. Cary J. Nederman (Cambridge: Cambridge University Press, 1990), p.51.

¹⁶John of Salisbury, *Policraticus*, p.67.

Like the musical metaphor, the bodily metaphor makes clear that political harmony entailed both unity and a clear and well-established hierarchy. Each part must only do its own work, and must obey the part controlling it—otherwise, discord and political illness would inevitably follow. Thomas Aquinas made precisely the same point linking the ordered body to the ordered state when he wrote that

Among members of the body there is one which moves all the rest, namely the heart: in the soul there is one faculty which is preeminent, namely reason...it is [likewise] necessarily true in the case of human affairs that that community is best which is ruled by one.¹⁷

James I, to whom Kepler dedicated his work on harmony, thus asserted that ‘Kings are compared to the head of this Microcosme of the body of man’.¹⁸ Finally, Thomas Hobbes famously embraced the tradition of the body politic in his *Leviathan*. The frontispiece of the text showed the monarch, as head of state, quite literally formed out of the individual bodies of the citizens beneath him. Within the text, Hobbes consistently invoked the metaphor of the body politic, explaining that a harmonious state was a healthy state, and like a healthy body, had one head ruling it and everything else keeping to its proper place. ‘Take away in any kind of state, the Obedience (and consequently the Concord of the People)’, he wrote, ‘and they shall not only not flourish, but in short time be dissolved’.¹⁹

Changes in the Harmonic Ideal

The harmonic tradition, in its musical, cosmological, social, and religious guises, remained powerful, for some, well into the seventeenth century. Yet the move from a geocentric to a heliocentric cosmos shook its foundations. Despite the persistent myth that Pythagoras himself may have granted the sun a central place in his system, the tradition of celestial harmony was anchored firmly to the geocentric Ptolemaic cosmos. A

¹⁷ Thomas Aquinas, *Aquinas: Political Writings*, trans. R. W. Dyson (Cambridge: Cambridge University Press, 2002), p.11.

¹⁸ James I. *The Political Works of James I*, ed. Charles Howard McIlwain (Cambridge, MA: Harvard University Press, 1918), p.307.

¹⁹ Thomas Hobbes, *Leviathan; or, The Matter, Forme, and Power of a Commonwealth, Ecclesiasticall and Civil*, ed. Michael Oakeshott (New York: Simon and Schuster, 1962), p.264.

hierarchical chain tied the various layers of harmony together, from the macrocosm of the planets to the microcosm of man, and assumed an ordered cosmos in which one could descend, by levels, to the realm of man at the very center. For some, moving the earth seemed to shake the entire harmonic edifice, and called into question both the reality of the celestial harmonies and the proper role of man in the order of things.²⁰

This, in fact, was one of the central tasks of Kepler's *Harmony of the World*—to rescue the theory of harmony in a post-Copernican cosmos, by describing the new planetary intervals that would yield harmonious proportions when the sun, rather than the earth, lay at the center of the world harmony. To do this, Kepler relied on what he perceived to be two factors which distinguished modern from ancient harmonies: polyphony and just intonation.²¹ Though the origins of polyphony were debated in the sixteenth and seventeenth centuries, Kepler insisted—as did most of the scholars of his time—that polyphony was a modern innovation, and that ancient music was monodic.²² A primary reason that the ancients could not have developed polyphonic music, Kepler believed, was their overly rigid method of deriving harmonic consonances via *a priori* numerical relationships—the very relationships that Pythagoras had discovered so long ago. Because the Pythagoreans had only admitted harmonies whose ratios could be formed from the tetrad, they had excluded thirds and sixths (which relied on the number 5), and considered those intervals dissonant, rather than consonant.

Kepler believed, alongside other musical theorists of his day, that a theory of music that excluded as dissonant intervals that so clearly *sounded* consonant was untenable. The problem with earlier approaches to music, he argued in the *Harmony of the World*, was that

the Pythagoreans were so much given over to this form of philosophizing through numbers that they did not even stand by the judgment of their ears... but they marked out what was melodic and what was unmelodic, what was consonant and

²⁰ See, for example, John Donne, *An Anatomy of the World*, in *John Donne: The Complete English Poems*, ed. A.J. Smith (London: Penguin, 1977).

²¹ See especially D. P. Walker, 'Kepler's Celestial Music', *Journal of the Warburg and Courtauld Institutes* 30 (1967): pp.228–50.

²² See Nino Pirrotta and Nigel Fortune, 'Temperaments and Tendencies in the Florentine Camerata', *The Musical Quarterly* 40, no. 2 (1954): pp.169–89.

what was dissonant, from their numbers alone, doing violence to the natural prompting of hearing.²³

Kepler, by contrast, followed those who hoped to establish a theory of harmony that, while rooted in mathematics, ‘would satisfy the judgment of the ears in establishing the number of the consonances’.²⁴

This was especially important, for Kepler, because without a system of intonation that allowed for thirds and sixths, true polyphony was impossible. And it was polyphony, above all, that distinguished the superiority of modern music in Kepler’s view. Kepler argued that only in polyphonic music had man finally managed to imitate the cosmic harmonies. He wrote in the *Harmony of the World* that

man, aping his creator, has at last found a method of singing in harmony which was unknown to the ancients, so that he might play, that is to say, the perpetuity of the whole cosmic time in some brief fraction of an hour, by the artificial concert of several voices, and state up to a point the satisfaction of god his Maker in His works by a most delightful sense of pleasure felt in this imitator of God, Music.²⁵

What did this mean, from the cosmological perspective? Kepler ultimately developed a new system for grounding the harmonies, one which was *geometrical*, rather than the *arithmetical* number-based system of the Pythagoreans. He then linked that geometrical system not to the distances between the planets, which is how planetary harmony had been understood up until that point, but to their speeds—and, in particular, to their angular velocities with reference to the sun, at the moments of perihelion and aphelion. These extreme speeds determined the scale of each planet by demarcating its highest and lowest notes. Moreover, the planets jointly produced polyphonic harmonies generated by the intervals of the scales of the planets, produced by their convergent and divergent angular velocities.

While Kepler ultimately privileged polyphony, he thus created a system in which *both* monody and polyphony were present, the first in the motions of the individual planets and the second in their combined movements. While polyphony was superior because it represented the cosmos as a whole, Kepler insisted that monody too, had a place in God’s ultimate

²³ Kepler, *Harmony of the World*, p.137.

²⁴ Kepler, *Harmon of the World*, p.139.

²⁵ Kepler, *Harmony of the World*, pp.446-7.

vision, and contributed, in its own way, to the beauty of the whole: 'different types of harmonies... must have been organized', he maintained, 'so that the beauty of the world might be expressed in harmony through all possible forms of variation'.²⁶

A further implication of this approach to cosmic harmony was that when it came to the actual sounds produced by the planetary motions, they were, on the whole, dissonant. Dissonance itself had been embraced with increasing frequency in the musical theory of Kepler's contemporaries, for it was seen as providing an essential contribution to the ultimate beauty of the overall harmony. Context mattered, theorists began to insist with greater frequency, and it was not rational proportion alone that determined the quality of a harmony.²⁷ Kepler compared the use of dissonance in musical harmony to the use of yeast, salt, or vinegar in cooking, and noted that while 'complete dishes are not made from them', they are still used to great effect for emphasis.²⁸ And given the specific intervals produced by each planet, moments of harmonic consonance between the majority of them would be incredibly rare. According to Kepler, the planets all played a perfect harmony at the very moment of Creation, and they might play one again in end of days. In the interim, large scale dissonance and smaller, more individual harmonies were all that could be expected.

Kepler's understanding of harmony thus privileged a number of components that were either absent or undervalued in most theories of harmony before the sixteenth and seventeenth centuries, as he understood them: polyphony, or the ability of multiple voices to express themselves, consonances that were true to experience, rather than merely to a truth determined mathematically, variety of harmonic forms, and dissonance itself as both inevitable and central to the ultimate experience of harmony. And Kepler also emphasized in the *Harmony of the World* itself that his new vision of harmony might yield important insights for those who hoped to achieve harmony of church and state. 'May the author of the heavens himself', he wrote,

... bring about that we as imitators of God may emulate the perfection of His works, by sanctity of life... and may keep far

²⁶ Kepler, *Harmon of the World*, p.462.

²⁷ See, for example, Girolamo Cardano: 'Better things are always pleasing after worse ones...so light pleases after darkness, sweetness after bitterness, oil of roses after dill, and consonant tones after dissonances'. In Clement Albin Miller, ed., *Writings on Music*. (Middleton: American Institute of Musicology, 1973), p.212.

²⁸ Kepler, *Harmony of the World*, p.250.

from us all the dissonances of enmity, all contention, rivalry, anger, quarrels, dissension, sectarianism, envy, provocation, irritating facetiousness, and other works of the flesh... spurning all vicious practices of all factions though cloaked and painted over with an outward show of zeal, or of love of truth, or of singular erudition, or of deference to contentious teachers, or any other specious pretext.²⁹

Kepler saw his work on harmony as a call toward a new kind of behaviour in a world characterized by dispute, discord, and violence. But his understanding of harmony did not simply yield vague reminders of the importance of peace and unity—it had specific, more practical implications. To get a better sense of the precise connection Kepler hoped to draw between the cosmic and political orders, we need to look more closely at his debate, within the pages of his *Harmony of the World* itself, with another theorist who applied the harmonic model to politics in very specific ways—Jean Bodin.

Kepler and Jean Bodin on Political Harmony

Kepler engaged with the political ideals of Bodin at the very end of Book III of the *Harmony of the World*, in a ‘Political Digression on the Three Means’. This digression was a late addition to the text; Kepler opened it by explaining that when he had first prepared the text, he had included only a brief paragraph in the midst of Book III on the idea of harmonic proportions in the state. There, he had written a marginal note pointing to ‘the splendid passage in Bodin on the state’. However, this paragraph was accidentally omitted, because the pages of the original had been ‘carelessly distributed’ during the printing. Upon recognizing the omission, Kepler wrote, he decided instead to add the paragraph to the very end of Book III, and then to expand upon it into a longer discussion of the politics of harmony, based on the model of Bodin. He focused on Bodin, he explained, to clarify and correct Bodin’s own discussion of political harmony which he felt was both obscure and mathematically faulty, and he focused on politics more generally in order ‘to lighten the tedium of dour mathematical demonstrations, of which the whole book consists, by the interpolation of some enjoyable popular material, and to display a foretaste of its considerable usefulness in understanding the State’.³⁰

²⁹ Kepler, *Harmony of the World*, p.452.

³⁰ Kepler, *Harmony of the World*, p.256.

Before coming to Kepler's discussion of Bodin, let us briefly review Bodin's approach on its own. Jean Bodin is today most famous for his theory of absolute sovereignty. In the *Six Books of the Republic* of 1576, in which he first articulated this theory, Bodin hoped to help resolve the civil unrest in France that had begun with the start of the Wars of Religion in 1562. He would do so, he argued, by demonstrating the best way to organize the state: this was through the rule of the absolute monarch, answerable to no one but God. His arguments clearly reverberated with sixteenth-century readers; by 1600, at least twenty-four editions of the book had been published, both in the original French and in Latin and other translations.³¹

In explicating his politics, Bodin reached back to the long harmonic tradition linking politics to the cosmos and the body. 'There is no need to insist further that monarchy is the best form', he wrote,

seeing that the family, which is the true image of the commonwealth, has only one head, as we have shown. All the laws of nature point towards monarchy, whether we regard the microcosm of the body, all of whose members are subject to a single head on which depend will, motion, and feeling, or whether we regard the macrocosm of the world, subject to the one Almighty God. If we look at the heavens we see only one sun. We see that gregarious animals never submit to many leaders, however good they may be....The true monarchical state, like a strong and healthy body, can easily maintain itself. But the popular state and the aristocracy are weak and subject to many ills...³²

Bodin did not stop with this general linkage, however. Reaching back to the Pythagorean tradition, He argued that as harmony was a musico-mathematical concept, one needed to consider the mathematics that underpinned it, and apply that mathematics to the political sphere. To do so, he invoked the Pythagorean notion of the three means or proportions, mathematical relationships that created different kinds of numerical

³¹ See Howell A. Lloyd, Introduction in Howell A. Lloyd, ed., *The Reception of Bodin* (Leiden: Brill, 2013), pp.1–20, at 5; see also Ann Blair, 'Authorial Strategies in Jean Bodin', in Howell A. Lloyd, ed., *The Reception of Bodin* (Leiden: Brill, 2013), pp.137–56.

³² Jean Bodin, *Six Books of the Commonwealth*, trans. M. J. Tooley (Oxford: Blackwell, 1955), pp.199–200.

series—arithmetic, geometric, and harmonic (also called sub-contrary).³³ In the arithmetic proportion, ‘the first exceeds the second by the same amount as the second exceeds the third (e.g. 6, 4, and 2)’. In the geometric proportion, ‘the first stands in the same relation to the second as the second to the third (e.g. 8, 4, and 2)’. And in the harmonic proportion, ‘the first term exceeds the second by the same fraction of itself as the fraction of the third by which the second term exceeds the third (e.g., 6, 4, and 3, where $6-4=2$, i.e. $1/3$ of 6, and $4-3=1$, e.g. $1/3$ of 3)’.³⁴ In the ancient world, the first two of these proportions came to embody two different kinds of equality, and thus to be linked to two different kinds of justice and government. Though in the arithmetic proportion the distance between each term was equal, the ratio between the terms is increasingly unequal the higher up the scale one goes. By contrast, in the geometric proportion the distances between the terms was unequal, but the ratios remained the same no matter how high on the scale one ascended. If the terms were understood as people, and the numerical values of each term were understood to correspond to the values of the individuals (whether conceived in terms of virtue, wealth, or nobility of birth), then different political conclusions clearly followed.³⁵

Plato and Aristotle had both focused on the arithmetic and geometric proportions to discuss ideal forms of justice and government.³⁶ Bodin did so as well, but unlike Plato and Aristotle, Bodin invoked the harmonic proportion as well in his political discussion. That proportion, in his view, united the two, by directly combining elements of the arithmetic and geometric. Bodin argued that this harmonic ‘blending’ of the two series corresponded to a harmonic justice that avoided ‘the unmitigated rigidity of the commutative principle, and the variability and uncertainty of the distributive’.³⁷ More broadly, Bodin argued that the arithmetic proportion corresponded to a democracy, where the nobility were given no special privileges, and equality under the law reigned supreme. The geometric proportion corresponded to an aristocracy, where some individuals were privileged over others, and the law was able to take those privileges into account. Finally, Bodin once again invoked the harmonic proportion, which he argued combined the principles of the other two. This, according

³³ See F. D. Harvey, ‘Two Kinds of Equality’. *Classica et Mediaevalia* 26 (1965): pp.101–29.

³⁴ Harvey, ‘Two Kinds of Equality’, pp.103–104.

³⁵ Harvey, ‘Two Kinds of Equality’, p.104.

³⁶ See Harvey, *supra* 33.

³⁷ Bodin, *Six Books*, p.206.

to Bodin, corresponded to a monarchy with an absolute sovereign. In such a system, the laws allowed for a measure of equality, but some distinctions between nobles and commoners remained, and the sovereign was given the power to supersede the law to achieve the best results for his people. Indeed, in Bodin's view the person of the sovereign guaranteed the harmonious blending of the commutative and distributive principles. According to Bodin, 'the wise king ought therefore to govern his kingdom harmoniously, subtly combining nobles and commons, rich and poor... In doing this the prince reconciles his subjects to one another, and all alike to the state'.³⁸

Bodin also moved beyond the proportions to number symbolism—and in particular, harmonic number symbolism—more generally in order to highlight the absolute sovereignty of the monarch. The orders of society in a harmonic government, he argued, corresponded to the numbers 1 to 4. The king, 'exalted above all his subjects, whose majesty does not admit of any division, represents the principle of unity, from which all the rest derive their force and cohesion'.³⁹ Below him, representing 2 to 4, were the three estates—the clergy, the military, and the people. Bodin maintained that in order to have a truly harmonious relationship between these groups, 'the union of its members depends on unity under a single ruler, on whom the effectiveness of all the rest depends. A sovereign prince is therefore indispensable, for it is his power which informs all the members of the commonwealth'.⁴⁰ Since the king represented the number 1, his sovereignty and authority needed to be absolute and indivisible, just as he needed to be above the law in order to properly blend the different kinds of justice. Moreover, since all harmonic consonances could be produced with the ratios of the numbers 1 to 4, the monarchical system was complete—any change would 'mar the harmony, and make an intolerable discord'.⁴¹

In Kepler's treatment of Bodin's ideas in the digression to the *Harmony of the World*, he first began with an explanation of the three mathematical proportions. Though Bodin had argued that the harmonic proportion was a combination of the arithmetic and the geometric, Kepler disagreed. He

³⁸ Bodin, *Six Books*, p. 211; see also Georges Kouskoff, 'Justice arithmétique, justice géométrique, justice harmonique'. in *Jean Bodin: Actes du colloque interdisciplinaire d'Angers* (Angers: Presses de l'Université d'Angers, 1985), pp.327–36.

³⁹ Bodin, *Six Books*, p.212.

⁴⁰ Bodin, *Six Books*, p.212.

⁴¹ Bodin, *Six Books*, p.212.

focused on harmony as something that was both mathematical and also musical, something that could be *heard*, rather than simply a series of numbers that could be calculated. He noted that there were many instances in which the arithmetic and geometric proportions could be combined in the manner described by Bodin, yet would not yield a harmonic series in the musical sense. On the other hand, there were harmonic series that were also only geometric or only arithmetic, with no combination of the two—and some which were neither. Kepler referenced his own earlier discussion of musical harmony in *Harmony of the World* which provided examples of such series, and emphasized that harmony could not be arrived at simply by recourse to the mathematical theories of the ancients. Experience of the senses, too, needed to play a role in the determination of what constituted a harmony; Bodin, in his attempt to link harmony only to the combination of the geometric and the arithmetic, had ‘rebel[ed] on the authority of the ancients against the sense of hearing’.⁴² Kepler, as we saw earlier as well, sought to frame harmony as a principle that was *both* mathematical *and* empirical; the Pythagoreans, he felt—and Bodin like them—had emphasized the former at the expense of the latter.

This criticism—that Bodin had sacrificed the complicated nature of true harmony for mathematical simplicity—was one that Kepler applied to Bodin’s politics as well. Bodin had insisted that in justice and government, as in music, harmony was produced by the blending of the arithmetic and the geometric—that is, by the blending of the principles of equality and similarity. Kepler, by contrast, argued that oftentimes such blending simply destroyed both principles and did not arrive at true harmony. In order for true harmony to be achieved, Kepler insisted, it had to be thought of as a principle *sui generis*, one which superseded both the ideas of equality and similarity. When it came to issues of justice or morality, Kepler therefore maintained that the principle of harmony symbolized the common or public good: ‘the public good’, he wrote, ‘has a certain correspondence with the way in which singing in harmonic parts is pleasing’.⁴³ In politics, Kepler maintained that the principle of harmony stood for the good of the state. He explained that ‘this one supreme law, the mother of all laws—that anything on which the safety of the state depends is ordered to be sacred and lawful—is...consistent... with harmonic ratios... even if that law contains nothing further similar either to geometric or arithmetic proportions’.⁴⁴ In both instances, if one argued

⁴² Kepler, *Harmony of the World*, p.257.

⁴³ Kepler, *Harmony of the World*, p.268.

⁴⁴ Kepler, *Harmony of the World*, p.268.

for the harmonic proportion, one implied that the common good or public welfare stood above and beyond the needs of individuals, and beyond any formulaic maxims of justice or truth. There was, in other words, no universal law of harmony in politics that could be described in mathematical terms.

In order to elaborate these ideas, Kepler first turned to Bodin's conception of justice, and focused on an example in which he agreed with Bodin's conclusion, but not his reasoning. According to Kepler, Bodin had retold a story derived from Xenophon about the childhood of Cyrus of Persia, in which Cyrus had observed a tall man wearing a short tunic standing near a dwarf with an overly long tunic. Cyrus had argued that the two should exchange garments to obtain what would be best for them both. His master had instead ordered that each should keep his own garment. Cyrus, according to Bodin, had focused on the geometric proportion, where justice ought to take account of what was best for each individual. His master, by contrast, had focused on the arithmetic proportion, where each individual ought to keep what was rightfully his. Bodin suggested that the harmonic principle of justice could be achieved if the tall man had paid the dwarf money in order to exchange garments. For Bodin, this was harmonic because it combined the specific needs of each individual with the equality of their resources—that is, it was a combination of both earlier suggestions. Kepler agreed that this was a harmonic resolution, only because it arrived at the greatest common benefit—'for the common benefit of both is compared with the pleasantness of singing in harmony'.⁴⁵ The difference between these two positions is not great, but comes down to this: for Bodin, harmonic justice can be achieved through a formula, by calculating the resources and needs of both parties. For Kepler, harmony is not a question of mathematical exchange, but of something much more general and intuitive—the greater good of the whole. This need not be broken down in mathematical terms, and often it could not be.

Harmonic justice, according to Kepler, needed to stand on its own merits. To demonstrate, Kepler again offered an example in which he agreed with Bodin's result but not his rationale. Bodin had noted that punishments for murder tended to accord with harmonic justice, since 'in the divine law all murderers are punished by death with arithmetic equality, but the kind of death to be inflicted is within the power of the judge in geometric correspondence with the dissimilar facts and variety of circumstances'.⁴⁶ In particular, Bodin noted that the punishment for killing

⁴⁵ Kepler, *Harmony of the World*, p.261.

⁴⁶ Kepler, *Harmony of the World*, p.267.

a head of state was far greater than for killing a peasant. Kepler agreed with Bodin that this was an instance of harmonic justice, but not because it sought to combine the arithmetic and the geometric. ‘This inequality in punishments’, Kepler wrote, ‘is due not so much to the individual persons injured as to the safety of the whole republic’.⁴⁷ Kepler argued that this was harmonic justice only because it sought to preserve the public good above all else, by preserving those who were charged with safeguarding it. Here again, Kepler emphasized harmony as something essentially social, something that needed to be applied to the community as a whole rather than the individuals within it.

Kepler focused not just on Bodin’s approach to justice, but also to the various forms of government. Here, Kepler argued against the mathematized politics of Bodin, in which a harmonic series could be broken down into its component geometric and arithmetic parts in order to yield a specific formula for governance. ‘If the harmonic proportions of numbers bring any light to bear on the understanding of politics’, he wrote, ‘they do it on their own account, independently of any relation with geometric proportions’.⁴⁸ Harmony was a *sui generis* principle, Kepler emphasized yet again, and the lessons it yielded for statecraft were also *sui generis*. What, then, were those lessons? Kepler remained vague on the particulars, and chose to focus only on the general concept of political harmony as public good. He demurred that he himself was not so politically experienced, nor did his book focus primarily on politics—but suggested that even so, his political perspective was preferable to Bodin’s. ‘Certainly if I had acquired knowledge of the state, and was dealing with politics in this book’, he wrote, ‘... Bodin would have learnt from this Harmony of mine...how to be a better political philosopher’.⁴⁹

In particular, he offered one clear and central point of disagreement with Bodin. Bodin had sought to apply his mathematical ideas to both law and government, and had argued that the harmonic principle (in his view, the combination of geometrical and arithmetical principles) was the best in both cases. Since Kepler, in contrast to Bodin, that harmony could *not* be reduced to clear laws and formulae, he emphasized that harmony ought to always be applied to government, but perhaps not always to the law. Legal justice, that is, might sometimes benefit from Kepler’s loose conception of harmony, but might sometimes benefit from the kind of clear application of the law that Bodin emphasized. ‘I should say’, he wrote,

⁴⁷ Kepler, *Harmony of the World*, p.268.

⁴⁸ Kepler, *Harmony of the World*, p.275.

⁴⁹ Kepler, *Harmony of the World*, p.275.

that the condition of the state and the pattern of its government were one thing, and the administration of justice another, for they differ as part and whole; just as in mathematics geometric and arithmetic proportions in numbers are one thing, and musical harmonies expressed in numbers another.⁵⁰

Judges might at times justifiably administer the rule of law strictly according to either the geometric and arithmetic proportions—that is, with careful consideration for the letter of the law or for fairness.

As an example of this, Kepler cited with distaste Bodin's description of the ways that judges assigned fees for their cases. Often, Bodin had noted, cases that required the most effort were the least profitable; therefore, harmonic justice allowed judges to assess their cases and demand appropriate fees from the litigants, particularly in cases where the fee from the republic was insufficient for the effort required by the case. 'I leave this harmonic part-song to its author Bodin as a Frenchman', Kepler responded, adding, 'Among us Germans justice in the chief states and provinces is kept far away from meanness of that kind, and it is not lawful to demand anything beyond what is prescribed by law'.⁵¹ By contrast with this emphasis on the prescriptions of the law, the ruler was 'exercising a higher office, safeguarding the state and its individual limbs', and ought always to be guided by harmonic proportions—he should, that is, have the prerogative to depart from all considerations of legality or individual fairness at will, and to focus solely on public harmony and the welfare of the state.⁵²

Here, Kepler was deliberately vague on what sort of ruler he had in mind—and by extension, on what he felt was the ideal form of government. While Bodin had argued that mathematics had definitively pointed to the absolute monarch as the ideal, Kepler instead described his ruler simply as 'this regent, whether he be king, or the aristocracy, or the entire people'—for all of these could, in principle, be guided by the notion of political harmony as Kepler had described it.⁵³ Kepler further emphasized the fact that harmony, when it came to government, was not an objective mathematical blueprint for how to govern, but rather an argument for the free and subjective judgments of those who governed. If those responsible

⁵⁰ Kepler, *Harmony of the World*, p.275.

⁵¹ Kepler, *Harmony of the World*, p.272.

⁵² Kepler, *Harmony of the World*, p.275.

⁵³ Kepler, *Harmony of the World*, p.276.

for the welfare of the state were bound by detailed mathematical guidelines and ‘inflexible administration of both kinds of justice’, Kepler argued, ‘for God’s sake, what a crop of arguments there would be!’⁵⁴ His own vagueness on the ideal form of the state and the appropriate decisions of the ruler was itself a political stance guided by harmony, as it left the ruler with the freedom and discretion to guide the state to safety and security. But this freedom did not allow for the arbitrary and uncontrolled power of the ruler—the ruler could not, that is, use this as an excuse to do whatever he pleased. Rather, the good ruler followed the principle of harmony only if all his actions contributed to political unity and the public good. The function of the ruler, that is, was both to follow the model of harmony as a political ideal, and also to create harmony in the state.⁵⁵

Bodin and Kepler thus had much in common in their focus on harmony. Both saw it as a central principle that underpinned the natural world (Bodin himself had described it as such in his 1596 *Theater of Nature*). Both believed that harmony entailed the embrace of diversity and an appreciation for the beauty of the whole. Similarly, both sought to link the harmony of nature to the harmony of church and state. Both lived in a world beset by uncertainty, violence, and strife, and both hoped to use their work to improve that world and pave the way for peace. Yet when it came to the relationship between natural and political harmony, Bodin and Kepler opted for two very different strategies. Bodin emphasized the mathematical foundations of his harmonic theory in order to highlight its certainty. As the foundations for political order seemed increasingly unstable, Bodin attempted to provide a new, secure basis for the French monarchy. He argued that absolute sovereignty was demonstrably rooted in the mathematics of harmony, and hence that mathematics provided clear and direct rules, or laws, by which politics ought to be organized and conducted. By ending his *Republic* with a discussion of harmonic theory, Bodin sought to support his entire discussion of politics with a mathematical foundation, described via the language of music.

By highlighting Bodin’s work in his political digression, Kepler associated his own ideas with those of Bodin; indeed, he noted that when it came to the general linkage between the harmony of nature and the harmony of the state ‘I agree with his purpose as much as anyone’.⁵⁶

⁵⁴ Kepler, *Harmony of the World*, p.276.

⁵⁵ See especially August Nitschke, ‘Keplers Staats- und Rechtslehre’, in *Internationales Kepler-Symposium*, Vol. 1 (Weil der Stadt: Hildesheim: HA Gerstenberg, 1971), pp.409–24.

⁵⁶ Kepler, *Harmony of the World*, p.278.

Indeed, even in praising Bodin so highly, Kepler highlighted the practical goal of worldly harmony, for few of his fellow Protestants would have had anything positive to say about the work of the Catholic Bodin. Yet though Kepler linked his mathematical and musical arguments to his political discussion, he did so in a manner that differed dramatically from that of Bodin. Bodin had sought to demonstrate that harmony was a mathematical combination of the geometric and arithmetic means, while Kepler argued that harmony was a principle unto itself. Further, when it came to politics, harmony provided no specifics for governance. Harmony pointed only to the fact that the public good and the welfare of the state should be preeminent. It offered a relatively free reign to rulers—royal, democratic, or aristocratic, as the case may be—so long as they sought to actively foster the good of the state above all else. In fact, establishing too specific a model for government would only hinder this goal in Kepler's view, and lead to further disagreement.

That Kepler's idea of political harmony encompassed many different potential models was clear both from the content of the political digression and from the framing of the *Harmony of the World* as a whole. Kepler dedicated the book to James, the King of England, yet was explicit in that dedication about his own position as advisor to the Holy Roman Emperor. He wrote appreciatively of the political work of Bodin, who supported monarchy in France, while also referring within his discussion of Bodin to his own identity as a German, and noting specific areas where the German approach to justice ought to be preferred. In framing the book with reference to England, France, and the Holy Roman Empire, Kepler demonstrated that his approach to political harmony might, in theory, embrace all three, so long as their rulers heeded his lessons. If the end result was political harmony and peace, then Kepler deemed it a positive one, regardless of the specific form and constitution of the government.

Still more, in citing Bodin, a Catholic, and dedicating his book to James, a Calvinist, Kepler, as a Lutheran, sought to demonstrate that one specific confession was not essential to the establishment of political harmony.⁵⁷ This irenicism—the refusal to identify not just one political configuration, but one religious confession, as the only pathway to truth—was another outgrowth of Kepler's approach to harmony. In the *Harmony of the World*, Kepler had argued that when it came to music, 'just as... individual consonances considered separately are pleasing on account of the fact that

⁵⁷ Bodin shared this understanding of religious harmony: see Jean Bodin, *Colloquium of the Seven about Secrets of the Sublime*, trans. Marion Leathers Daniels Kuntz (Princeton, NJ: Princeton University Press, 1975).

they are plainly not identical notes, but in a way figured and different notes... in the same way... the harmonious singing of parts... without any variety in them ceases to be pleasing altogether'.⁵⁸ He invoked this notion of harmony when articulating his irenic vision of a religious community that embraced diversity and disagreement in its midst. Just as music was only harmonious if it contained many different notes, so too, Kepler believed, earthly communities needed to create a kind of cohesiveness that embraced difference, rather than one that sought to do away with it. Though Kepler identified as a Lutheran throughout his life, and identified the Lutheran Church most closely with the truth, the reunified Christendom that he hoped to help create was not, in his view, to be identified with any one confession, even his own. Rather, it was to embrace them all; to offer some common ground on which all could agree, and then to allow for the fact that nobody would be able to agree on everything, particularly when it came to questions of theology. Partisan exclusivity, in Kepler's view, was only a destructive force: 'I am pleased either by all three parties, or at least by two of them against the third, in the hopes of agreement', he wrote, 'But my opponents are only pleased by one party, imagining eternal irreconcilable division and quarrel. My hope, so help me God, is a Christian one; theirs, I do not know what'.⁵⁹

Conclusion

Unlike earlier invocations of harmony, which had embraced a rigidly upheld social and political order determined by a logic unconcerned with context or perception, Kepler's harmony signified diversity alongside unity, and embraced multiple possible configurations rather than one absolute. In Kepler's view there was no one perfect form of government, and no one confession that had perfectly articulated the divine truth. Mathematical models could yield certainty about the movements of heavenly objects, but not about the relationships between people on earth; there, they could only provide a general impetus toward tolerance, community, and peace. For while the rules of geometry were clear and unchanging, the human world was changeable and varied, and people were often mistaken and confused. This didn't mean that politics should be avoided, but rather that it should be handled with care, like 'a ship...

⁵⁸ Kepler, *Harmony of the World*, p.252.

⁵⁹ Johannes Kepler, *Johannes Kepler Gesammelte Werke*, Max Caspar et al., ed., 22 vols (Munich: C. H. Beck, 1937–2009), 12:27, lines 22–25.

shaken by dangerous storms'.⁶⁰ Geometry might light the way for that ship, and guide it toward greater harmony. Kepler hoped that ultimately the world would heed the model he had illuminated in the *Harmony of the World*. During times when that seemed increasingly uncertain, one might at least take refuge in the geometrical studies themselves. 'When the storms are raging, and the shipwreck of the state is frightening us', Kepler wrote, 'let us let down the anchor of our peaceful studies in the ground of eternity'.⁶¹

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⁶⁰ Johannes Kepler, in *Kepler in Seinen Briefe*, Max Caspar and Walter von Dyck, eds, 2 vols (Berlin: Oldenburg, 1930), 2:308.

⁶¹ Kepler, in *Kepler in Seinen Briefe*. 2:308.