



The Liberal Arts Tradition with Dr. Kevin Clark and Ravi Jain

Lesson 12: Astronomy and Music

Outline:

Astronomy and Music

- Why were Astronomy and Music so important to the curriculum?
 - We see Astronomy and Music in every culture.
 - Peoples from around the world found order and kept time with the stars.
 - The heavens declare the glory of the God, the skies proclaim the work of His hands. Day after day they pour forth speech, night after night they proclaim knowledge.
 - There is mystery bound up with knowledge of the heavens, yet there is truth continually rained down from them.
 - What is our role in the Cosmos?
 - For Plato and Augustine and Aquinas music was the beginning and end of education.



Music

- “Nature in the cosmos is harmoniously composed of the limited and unlimited, both the entire cosmos and everything in it.” Philolaus, 5th century B.S.
 - Nature: Physical
 - Cosmos: Order, beauty
 - Harmony: Proportions, ratios, mathematics participating in logos
 - Ratios are woven throughout all of reality.
- The Greeks had a low view of the created world.
 - The deprecation of the physical world is not Christian.
 - The Greek tradition thought of mathematics in the realm of perfections. The stars were celestial beings, immaterial.
 - Music was seemingly immaterial. There was a sense that mathematics could participate in what was immaterial.
 - In the Pythagorean tradition (*musica mundana*), they affirmed mathematical proportions throughout reality. In Neoplatonism (2nd-5th centuries A.D.) you see a diminished attention to mathematics in the natural world.
- Pure and the Applied



- Here the Christian tradition has never deprecated in its orthodox theology, the role of the body in the Christian life.
- As Christian theology helped refine and be in conversation with ancient Greek thought (with Plato, Augustine, Maximus, Aquinas, Aristotle), one of the ways this manifest itself is by a **recognition by Kepler and Copernicus that there need be no opposition between mathematics and material, sensible, or physical reality.**
 - Christian thought has a crucial role to play here in the rise of mathematical science.
 - Christianity fulfilled the promise that the realm of pure number could also be synthesized with the realm of applied number. This hope of Pythagorean had gradually diminished. In the Scientific Revolution, Galileo recognized this number everywhere.
- Sensible and Intelligible
 - Kepler calls his book *The Harmonies of the World*. How can they be looking at the same subject matter and one calls it music and one calls it astronomy?
 - From 300 B.C., the tradition of Astronomy was very mathematical, but the mathematical order was going from observations to putting those observations into a system (sensible to the intelligible).
 - Kepler was much more interested in moving from the intelligible to the sensible. Kepler's first attempt at his astronomy was to think about five platonic solids could be used to order the way the planets' orbits function (and reflected Copernican structure to the universe).
 - We go both from observation to theory and other times we go from theory to observation. As educators, are we willing to train students to do both?
 - Typically mathematical science will have students from the intelligible to the sensible. Where is the opportunity for children to move from the sensible to the intelligible?
 - How can students discover the intelligible for themselves? This will take time to develop in a curriculum
 - **The best way to do this is through the narrative of discovery. Follow the order of discovery. Look over the shoulders of those who have gone before us.**
 - If pure number is not manifest in the world, then it is not clear that we will ever understand pure number. Archimedes was motivated by physical motivations.
- All of these things work to provide a path from wonder to wisdom to include puzzle proof and play, to think about following the narrative of discovery. By looking over the shoulders of those that go before us we follow a path that is an irreducible union of skill and content. This is the content that led to the Scientific Revolution.



- *This teaches students to not slavishly master the facts, but to understand their practice in terms of what it truly means and how it can be honed over time through their intellect.*

What do you see the recovery of the liberal art of Music look like at a classical Christian school?

- This might be a trajectory within the mathematics curriculum.
- Music theory is very relevant. This could occur in the third/fourth grade.
- It would be good for students to both recognize an octave, but also to hear an octave.
- People use statistics quite a bit to study human society. Number pervades human society in ways that we think of it being ordered.
 - Numbers can be associated with determinism, which is problematic.
 - *Musica humana* is not simply the same thing as simplistic law, but likely there is number in how we think about human society.
 - Augustine allows that there are insights that human society is animated by number, but it is not only or merely animated by number.
 - Law is not the only way of thinking of number suffusing reality (fractals look more like a tree full of leaves than graph paper).

What is the difference between an art of math and mathematical science?

- There is a big division today between pure and applied mathematics. The older tradition accepts both pure and applied.
- What does math look like embodied (in the sensible)?
- Mathematicians are sometimes very sensitive to talking about mathematical science as mathematics because it is embodied, in reality, and in human society.

Why is the order of discovery important?

- Some of these physical problems really animated mathematical discoveries. These discoveries were extended to the intelligible realms to then lead to further physical discoveries. The interplay between the two has always been very generative.
- It is problematic when mathematicians try to defend a realm of only the pure. This denies the historical reality of a deeply Christian insight. This undercuts the possibility of having the arts of math.
- Mathematics and Natural Science are not always a conjoined pair. When describing different kinds of dogs, do you want to describe them through mathematical equations? You need Grammar, Dialectic, and Rhetoric in the Natural Science.



Astronomy
by Matthew Clark

