Plato’s Influence in the Modern World Through Geometry

"An unexamined life is not worth living," said Socrates. Plato was a student of Socrates, and he took that quite literally, trying to examine everything in his life and life itself. In doing this, he debatably became one of the most influential mathematicians of ancient history. In fact, over the entrance to his school, The Academy, hung the words "Μην αφήσετε κανέναν φτωχό γεωμετρία να εισέλθει στις πόρτες" (Harris) which means, "Let no one destitute of geometry enter my doors" (translated by google).

Plato (c.427-347 B.C.E.) was born to an aristocratic family in Athens. As a young man, Plato had political ambitions, but he lost that desire because of Athens' political leadership. He eventually became a disciple of Socrates, accepting his basic philosophy and dialectical style of debate, the pursuit of truth through questions, answers, and additional questions. Plato witnessed the death of Socrates at the hands of the Athenian democracy in 399 BC. (The Suicide of Socrates)

Plato played an influential role in supporting and inspiring Greek intellectuals to study mathematics as well as philosophy. His Academy edified mathematics as a branch of philosophy, as Pythagoras had done. The first ten years of the 15-year course at The Academy involved studying science and mathematics, including plane and solid geometry, astronomy, and harmonics. Plato became known as the "maker of mathematicians", and his Academy produced some of the most prominent mathematicians of the ancient classical world, including Eudoxus, Theaetetus, and Archytas.

Plato is perhaps best known in geometry for his identification of 5 regular symmetrical 3-dimensional shapes, which he declared was the substructure for the whole macrocosm. They have become perceived as the Platonic Solids: The tetrahedron has four triangular faces, the cube six square faces, the octahedron eight triangular faces, the dodecahedron twelve pentagonal faces, and the icosahedron twenty triangular faces. Plato proposed that four of these solids built the Four Elements: tetrahedra represents Fire, octahedra represents air, icosahedra expresses water, and cube represents Earth. Lastly, the decahedron, which is the shape of the Universe as a whole. Plato's conceptions lent dignity and grandeur to the study of geometry and greatly stimulated its development. The thirteenth and final book of Euclid's Elements, the grand synthesis of Greek geometry, which is the founding text of axiomatic mathematics, culminates with the construction of the five Platonic solids and proof that they exhaust the possibilities (Wilczek). Philomaths theorize that Euclid orchestrated the Elements with that climax in mind from the commencement.

According to Wilczek, "Modern physicists, when seeking equations to describe the unfamiliar laws of the microcosm, must make guesses based on fragmentary information. Optimistically—and lacking constructive alternatives—they have turned, as Plato did, to symmetry as their guide. The symmetry of equations is perhaps a less familiar idea than the symmetry of shapes, but there is nothing obscure or mystical about it. We say an equation, like a shape, displays symmetry when it allows *changes that make no change*." Therefore, physicists in modern times revert to the ideas of Plato to solve equations using symmetry.

Geometric shapes also play a paramount role in prevalent recreational activities, such as video games, sports, and even quilting. Without geometry, engineers and architects wouldn't be able to design and construct houses, buildings, cars, and implements that make life more facile and more relishable. From this statement, an inquiry may arise, how are platonic shapes used in architecture and other things in our world?

Charles-Edouard Jeanneret, known as Le Corbusier (1887-1965), is one of the architects that has influenced the modern architecture of the 20th century. He is the father of the modulor, that is, a system based on proportions of the human body and connected to the golden section, "which is a common mathematical ratio found in nature that can be habituated to engender pleasing, natural-looking compositions in design work." (Staff, Creative Bloq). In his project for the Convent of Saint Marie de la Tourette at Eveux-sur-Arbresle, near Lyon, France, Le Corbusier applied the polyhedral shapes to accentuate the "rigor" of the Religious order of the Dominican. (Choay)

The platonic shapes were also used to find the distance between planets and their orbits. According to Cicutaepisteme, "By ordering the solids correctly—octahedron, icosahedron, dodecahedron, tetrahedron, cube—Kepler found that the spheres could be placed at intervals corresponding (within the accuracy limits of available astronomical observations) to the relative sizes of each planet's path, assuming the planets circle the Sun. Kepler also found a formula relating the size of each planet's orb to the length of its orbital period: from inner to outer planets, the ratio of increase in orbital period is twice the difference in orb radius."

In conclusion, Plato's work in geometry was remarkably influential. His conceptions are habituated to make virtually everything around us, from cars and houses to even the video games children in our society play. In the antediluvian world, people utilized his ideas to advance to the conceptions we have now. Even modern mathematicians and physicists employ his ideas to make breakthroughs. Without Plato, we may not have many of the philosophical conceptions we have today, and possibly even more impactful, many of the advances made in modern math may not have ever transpired.

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