MATHEMATICS: CODE FOR INTERDISCIPLINARY DIALOGUES

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For a long time, infinity has been involved in music, art, literature, and even in politics as well as in philosophy and theology. In this talk we present a story on infinity to introduce mathematics as a code for interdisciplinary dialogues. A principal difference between rational and irrational numbers is infinity. For example, a number is irrational if and only if the continued simple fraction of it is infinite.

Music

Pythagorean scale is based on rational numbers while equal temperament on irrational numbers. That is, Pythagorean scale is based on the finite, while equal temperament on the infinite. Each race has its own traditional string instruments. Zhong Ruan, Dan Ty Ba, and Balalaika are traditional musical instruments of China, Vietnam, and Russia, respectively. The positions of frets on the neck in the ancient versions of them are quite different. Nowadays, however, all of them are following the same principle which is equal temperament based on infinity. Geomungo, a traditional string instrument of Korea, is more than 1500 years old. The positions of frets on the neck of it are moving toward them in equal temperament. In other words, the ratios between frets are converging monotonically to the irrational numbers which are in guitar.

Arts

Max Bill who had been educated at BAUHAUS was one of the leaders of plastic arts. Quite often, infinity has been motives for his works. He had a dream of new art based on mathematics. He has said “I am convinced it is possible to evolve a new form of art in which the artist's work could be founded to quite a substantial degree on a mathematical line of approach to its content.” It is natural to see mathematics in his works. His interests in mathematics has naturally been led to infinity. His work ‘Infinite and Finite’ presents his own imagination on the infinite and the finite. On the other hand, to classify the patterns of frieze and wallpaper with symmetries we have to assume that those patterns are infinitely continued. Infinity is in friezes and wallpapers. From a mathematical point of view, infinity is in the works of Escher.

Literature

A non-Euclidean geometry is mentioned in <The Brothers Karamazov> of Dostoevsky (Dostoevsky, 1980). The essence of the Parallel Axiom in Euclid’s <The Elements> is infinity. So infinity is a fundamental feature of non-Euclidean geometry. Zeno’s paradoxes and Differential Calculus are mentioned in <War and Peace> of Tolstoy (Tolstoy, 1980). In Musil’s < The Man Without Qualities>, Broch’s <The Sleepwalkers>, Borges’ <Aleph>, and Pynchon’s <Against the Day>, mathematics of infinity plays a key role(Engelhardt, 2012).

Philosophy

In a dialogue in Plato's <MENO>, Socrates is talking about an irrational number with a boy who is a servant of Meno. The dialogue stops right at the time when the boy realizes that he doesn't know of the number. Socrates help the boy to know himself. The irrational number mentioned in the dialogues between Socrates and the boy is the length of a side of a square whose area is 8. Aristotle discusses the Zeno's paradoxes in one of his books. The essence of Zeno's paradoxes is infinity. Infinity is an important theme in philosophy of empiricism. Gorge Berkeley and David Hume could not accept the infinite divisibility which is basically assumed in classical mathematics including Euclid's <Elements>. He popose a different type of idea which can replace the infinity.

Infinity is a main theme in mathematics. Euclid proved that there are infinitely many prime numbers. Archimedes proved many theorems about the circumference rate pi of which the principal characteristic is infinity. Newton and Leibniz developed differential calculus, a theory of infinity. Bolzano, Cantor, Gödel showed some mysteries of infinity. Infinity is indispensable in theology. The existence, love, perfection, greatness, immortality of God could not be discussed without infinity. Mathematics could be a reasonable language and grammar for interdisciplinary dialogues on music, arts, literature, politics, philosophy, and theology.

References

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