

APPLIED MATHEMATICS FIRST, PURE SECOND

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Mathematics is taught on a Platonist schema. According to a Platonist philosophy, mathematics is about *abstract* world of numbers, sets and vector spaces, and the pure mathematical results about them are, down the track, “applied” to questions arising in physics, biology, finance and so on. Most students’ mathematical education stops before any serious engagement with those areas, so students are often trapped in a world of unmotivated abstractions. That has inevitable negative impact on interest and understanding, while employers complain that mathematics graduates know little about how to use their knowledge.

An Aristotelian philosophy of mathematics, on the other hand, sees mathematics as inherently about certain aspects of the real (non-abstract) world – structural and quantitative aspects such as symmetry, continuity and ratio. It sees mathematics as arising from study of those aspects of the world, and pure mathematics as being an intensive study of the harder topics that are found to apply in great generality (or whose motivation has been forgotten over generations).

The talk examines a few of the historical classics in real-world mathematics: Archimedes’ derivation of the law of the lever from symmetry, Euler’s work on the Bridges of Königsberg, and the exponential model of population growth. In each case it is explained how a naturally-arising problem about a structural aspect of the real world is expressed mathematically so as to reveal the necessities in the world – “Why it must be so”. These cases also show that some of the deepest themes of mathematics, such as discrete versus continuous and local versus global, span the pure/applied division.

The talk concludes with a brief look at one contemporary success in incorporating a direct “applied” perspective in teaching, the COMAP Mathematical Contest in Modeling.

