The problem of incommensurability

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> *The sum of the square roots of any two sides of an isosceles triangle is equal to the square root of the remaining side. Oh joy, rapture! I've got a brain!*
>
> —Ray Bolger, as the Scarecrow

My job here is to set up the general context and then get the hell out of the way while you hear three splendid papers about the most profound problem in rhetoric, incommensurability.

The general context concerns (1) what is incommensurability, (2) how does it intersect with rhetoric, and (3) why you should care.

(1) Incommensurability, the story goes, was discovered on a boat by a disciple of Pythagoras, one Hippasus. Pythagoras, as you may remember, was devoted to the notion that everything could be measured and that all measurements were either whole numbers or ratios of whole numbers. This followed from a conviction in the beauty and power of mathematical symmetry, best summed up by the Scarecrow in (the movie of) *The Wizard of Oz*, who deliriously recites the Pythagorean Theorem upon receiving the diploma that certifies he has a brain.

Hippasus tapped Pythagoras on the shoulder, said "ahem", and relayed his discovery: that the diagonal of a square whose side was one unit could not be expressed thusly;.the two whole numbers needed to give the diagonal as their ratio did not exist. Instead, one needed to use the square root of 2, a number whose value could never be exhaustively computed (the sort that have become designated *irrational*; π is a more famous member of the class). What this meant is that there were pairs of numbers that were asummetra: without a (rational) common measure.

Pythagoras did the only thing a reasonable man could do in such circumstances. He threw Hippasus overboard and swore all of his other students to secrecy, about the murder, but especially about the notion of asummetra.[i]

Someone squealed though, and the notion of numbers without common measure made its way into Euclid's *Elements*, where it rested comfortably for two and a half millennia, somewhere in the Latin Middle Ages being converted into the near isomorphic term, *incommensurabilis*.

(2) In the early 1960s, two of the most influential philosophers of science of the latter half of that just-past century, Paul Feyerabend and Thomas Kuhn, were both at the University of California, Berkeley—Kuhn in the history of science department, Feyerabend in philosophy—where they chatted regularly about the dissolution of positivism and the need for new models of science. They came up with rather different models, but both borrowed the word *incommensurability* from mathematics for a key notion that they saw caused havoc for previous models of science. Historically, scientists often did not agree about quite fundamental matters of theory and method and data, especially at the big turning points in disciplines: the move from Ptolemaic to Copernican astronomy, for instance, the move from Aristotelian to Galilean to Newtonian mechanics, the moves from phlogisticated chemistry to oxygenated chemistry to atomic chemistry.

These sorts of disagreements had been largely elided from previous theories of scientific activity, because of their ahistoricism, but both Kuhn and Feyerabend were interested in more expansive and diachronic notions of what constituted science. They were also part of the movement that moved philosophy of science from a primarily prescriptive enterprise to a primarily descriptive one, a movement that vitiated the logical-positivist view which had held sway for most of the century but had been softening and springing leaks for at least a decade.

The logical-positivist programme – in caricature – looks like this:

- There is a linear accretion of knowledge; AKA, "progress"
- It is mediated by rational theory choice
- These theories were anchored in observation sentences, rigidly describing the data
- The theories were in turn expressed in a purified language of highly stable terminology

Kuhn and Feyerabend both argued that deep incompatibilities could develop in parallel theories of the same phenomena, such that concepts in each of them could not be translated into the other. There was no common measure by which they could be adjudicated. They were incommensurable.

Feyerabend looked the more reasonable of the two at the time. His notion of incommensurability was limited to language, holding that theories of the 'same' domains are necessarily incommensurable because their *terms* are incommensurable. This incommensurability is what gives rise to vehement, uncomprehending debate between practitioners of the two programmes.

For instance, late-Aristotelian mechanics and Newtonian mechanics both had the term *mass*, but it had very different functions in both systems. In Aristotelianism it was a rather incidental notion. In Newtonianism, it was utterly fundamental: it had to be conserved, by way of axiomatic laws, for instance, and it virtually defined gravity.

There was no way then, said Feyerabend, to truly compare the theories; and, therefore, no way to validate rationality (since they were compared, and chosen between, but not by rational means); and no way to truly determine which was "better", therefore compromising the notion of progress.

Kuhn looked like something of a maniac in comparison, throwing everything into the incommensurability hopper, not just terms, but:

- Concepts
- Theories
- Data
- Standards
- Experiments
- Problems
- "Paradigms

Ultimately Kuhn said that scientists "lived in different worlds", and he resorted to metaphors of gestalt switches and religious conversion to account for theory choice (preference).

Subsequently, their careers went in largely opposite directions. Kuhn retracted, re-defined, and reduced his position to what he called "local incommensurability", not far from Feyerabend's original view. Feyerabend, conversely, became increasingly explicit about the implications of incommensurability for rationality and the traditional practice of science. In fact, he returned to prescriptivism, and his prescription was: anything goes![ii]

The notion in this expanded form—applying not just to numbers literally but to whopping big pieces of discourse, like theories—caught on widely, dilating more and more in the process.

We are now at the point where virtually any two concepts are apt to be labelled incommensurable— cultures, religions, hockey teams, what have you. In post-modern thought, incommensurability is tossed around as a foregone conclusion about virtually any two systems one might name, and the word is catching up in general popularity to another lexical refugee from Kuhn, the notorious *paradigm*.

(3) The implications for rhetoric are profound. Should there be such a thing as incommensurable Xs and Ys in discourse, then argumentation is rendered impotent. We

might as well just all collectively turn our backs on each other, fold our arms, and stop talking. That, or fall to hostility and violence.

It's not just that incommensurability makes discussion hard or problematic; lots of things do, things as trivial as not getting a decent cup of coffee. The problem is that incommensurability rules out agreement in principle. For rhetoric, the message is, "Why bother?"

Notes

[i] See William R. Everdell, *The first moderns* (University of Chicago Press 1997: 33), and Morris Kline, *Mathematical thought from ancient to modern times* (Oxford University Press 1972:32). For discussion on the origins and implications of the story, and the overwhelming likelihood that it is wholly make believe, see Richard Crew, "Pythagoras, Hippasos, and the Square Root of Two", at http://www.math.ufl.edu/~crew/texts/pythagoras.html.

[ii] For Kuhn, see especially "Commensurability, comparability, communicability" [1982], *The road since Structure* (Chicago: University of Chicago Press, 2000: 33-57). For Feyerabend, *Against method* (London: Verso, 1975).