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The Humanistic Aspects of Mathematics and Their Importance

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We are now living in a period in which at least four revolutions are working themselves out — not independently. There are revolutions of ethnic, familial, and gender related values. There are the political and economic revolutions of Eastern Europe, which, in a way, represent the failure of one great idea put forward by rational thinkers to model human realities. There is the media revolution which is already changing the basic patterns of communication, socialization, and learning. There is the computer revolution, bringing with it and enormously facilitating mathematizations of every aspect of our lives.

"Any serious fundamental change in the intellectual outlook of human society must necessarily be followed by an educational revolution. It may be delayed for a generation by vested interests or by the passionate attachment of leaders of thought to the cycle of ideas within which they received their own mental stimulus at an impressionable age. But the law is inexorable that education, to be living and effective, must be directed to informing pupils with those ideas, and to creating for them those capacities which will enable them to appreciate the current thought of their epoch." (A.N. Whitehead, The Aims of Education. The Mathematical Curriculum.)

Mathematics lives in both the technological and the humanistic cultures. It exhibits features that are science-like and features that one normally associates with the humanities.

What are some of the features of mathematics that are humanistic? I seek parallels with literature, which I take as a paradigm of humanistic expression. (And I follow here Jacques Barzun in his 1972 Bollingen Lectures.)

Mathematics, like literature, has metaphor. (Models.)

Mathematics, like poetry, has ambiguity. (Will the **true** geometry please stand up?)

Mathematics possesses an aesthetic component which is strong and which is immediately apparent to the practitioner at the higher levels of the subject.

Like poetry (which, according to T.S. Eliot, cannot be totally written down,) I would assert that mathematics cannot be totally formalized.

Mathematics has paradox.

Mathematics has mystery and can convey awe.

Mathematics has a sense of outcome, a feeling of rightness, and a sense of catharsis.

Mathematics is allied to and has contributed mightily to philosophy.

Mathematics has contributed to theology. It grasps for the transcendental and, in so doing, can be a surrogate for traditional forms of religious expression.

Like literature, mathematics can be an avenue of mental escape from this world.

Like contemporary literature, mathematics is done in a vacuum of belief, if one interprets this vacuum to refer to a formalist philosophy which most (pure) mathematicians adopt when queried about the essential nature of the materials they work with.

Like literature, mathematics exhibits both redemptive and destructive features.

Mathematics has a history. I emphasize this point, not because it is something unique to mathematics, as human ideas of whatever sort presumably have histories, but because it is so often asserted that the truths of mathematics are atemporal, and hence, stand outside history.

Like anthropology and literature, mathematics embodies mythologies. I use the term "myth" not to mean that which is false, but that which is accepted as normative. My friend and coauthor, Reuben Hersh, has written about the four myths of mathematics: its unity, objectivity, universality, and certainty.

Christopher Ormell, distinguished British philosopher of mathematical education, has written about the need for the **demythologizing** of mathematics.

Perhaps what one wants is not so much a

demythification but a de-hocus-pocus-ization to counteract a prevalent feeling among 99% of humans that mathematics is nothing but another form of magic.

It would be an undertaking of the first importance to work out in detail the parallels I have just suggested.

If mathematics exhibits humanistic features, then we may reasonably expect it to promote humanistic values.

Humanistic values are those which foster the consciousness of full human responsibility. To me, the phrase "mathematics as one of the humanities" means nothing if not that.

Mathematics is partly a language. Certain things are communicated by it. Things can be described, predicted, prescribed by it. **The ability of mathematics to provide frameworks of reality and of action, and its ability to change our perception of what is, is very great.**

Our world is rapidly becoming mathematized. Some of our best talent is spent putting mathematizations in place, creating and moving around abstractions. Cosmologists do it. Inside traders do it.

David Berlinski, a mathematician, philosopher, and polemicist, has written that once a mathematization has been put in place, it is all but impossible to remove: "Mathematical descriptions...tend to drive out all the others. Mathematics is often a matter of bondage with things in thrall to theories. Strong theories make for weak objects."

Philosophically, it would be better if we ceased regarding mathematics as that great, objective, people-free, supra-moral, atemporal, reservoir of eternal truths, whose procedures we chant mindlessly and before whose inevitabilities we must bend the knee.

With mathematizations proliferating (whether we install them ourselves or import them), the principal role of the teacher should **not** be to expound formal aspects in a way that may be better accomplished by other means, or to drill on topics that have been automated out even at the market place.

If mathematics is taught simply as the learning of procedures, then none of the humanistic elements can be grasped. It is rare that the teaching of mathematics, elementary or advanced, conveys or fosters the humanistic aspects of the subject.

If there has been a shortfall of self-examination, it is not in the examination of its own inner material by its own methodology, but it is in a steady refusal to examine how the characteristic features of mathematical thought operate on us and affect us.

The principal role of the human teacher should be to humanize the subject.

To teach mathematics as one of the humanities means nothing less than to teach that it possesses the awesome power to influence and change our lives, and to teach that we who use it and foster it must subject it to constant study and scrutiny.

Very Short Bibliography

Barzun, Jacques, Bollingen Lectures, Library of Congress, 1972.

Davis, Philip J., and Reuben Hersh, Descartes' Dream, Harcourt Brace Jovanovich, 1986.

Whitehead, Alfred North, The Aims of Education and Other Essays, Free Press, New York, 1967.