

editorial

Are physicists to blame?

The urbanologist Lewis Mumford has just appeared in print with an essay, entitled "Science and Technology," that has much to say about the theme of this month's special issue on Physics and Environment. In my estimate, his views (which are published in four consecutive issues of *The New Yorker* starting 10 October) constitute the most sophisticated line of argument yet to be seen in support of the idea that science is to blame for the serious mess that modern technology is making of the environment.

His piece warrants the attention of physicists because he argues that in particular it was the logical-positivist view of science, introduced by Galileo and Descartes and championed by physicists ever since, that has shaped the design of the all-powerful Megamachine—the name that Mumford gives to the techno-economic system that he believes now autonomously rules the lives of unwitting citizens at all levels in modern industrialized society.

According to Mumford, the dazzling successes that physicists, starting in the 17th century, have been able to achieve by focusing on what can be concretely observed have inspired the collective mind to a religious veneration for technology in which the natural scientist has become "elevated to absolute lawgiver" and quantifiability has become accepted as the test of truth. The final result, Mumford argues, has been a society whose values are derived from a mechanical world picture, a world in which primary importance is reserved for things that can be measured or counted.

Although Mumford concedes that this priority of emphasis has led to an economic system that is extremely efficient in carrying out machine-like activities such as technological development, mass production and marketing of goods and services, he has assembled a wealth of historical data to show how the more subtle and complex human needs—those that can not easily be measured or even well defined but that distinguish humans from machines—have gradually been eliminated from consideration as the Megamachine has evolved to its present state of supremacy. Operating under the technological imperative (once something becomes technically feasible to do then the system must go ahead and do it), Mumford's Megamachine obliges him with no end of examples of how technical innovations have been pressed forward at the expense of the total human condition. The most recent example is the proposal to build a supersonic transport.

Few physicists would argue the point that the economic system has too often exploited technology in shortsighted ways. But are physicists really to blame for the fact that we have an overly materialistic society? There is, it seems to me, a grain of truth in Mumford's accusations. Let us grant, even as Mumford points out, that the prominent voices in physics (as far back as Galileo and more currently, say, Einstein and Oppenheimer) have typically belonged to individuals whose personal lives showed high regard for the humanistic, non-materialistic side of life. In fact let us grant that the average physicist today is more in touch with humanistic concerns than is the average citizen. But in terms of what constitutes ultimate truth there is little question that we physicists have been the hard-core enthusiasts of the logical-positivist position.

The idea that this philosophical viewpoint could have played a fundamental part in shaping our cultural values may not seem so completely farfetched when we consider the inhibiting influence this philosophy has had on the "softer" sciences. For years biologists and psychologists have struggled to make their disciplines conform to the ideal model of objectivity they saw exemplified by physics. It is interesting that now, at a time when public interest is turning to the organic needs of life, we find that philosophers of science are concluding that the higher disciplines such as biology can not be reduced ultimately to the language and concepts of physics and should not be striving to this end. In fact the philosopher Michael Polyani has presented convincing arguments that logical positivism is overemphasized even in physics. He points out that the information from a physics experiment must always contain elements that involve tacit understanding on the part of the observer. Laplacian determinism in his view is not a legitimate goal for *any* of the scientific disciplines.

But on a more practical level the point at which other disciplines and perhaps the whole culture have been misled is embodied in the notion that to be truly objective and scientific one's observations must yield numbers that can be manipulated with mathematics. There is nothing about the scientific method that requires the data be quantitative as opposed to qualitative. Charles Darwin did very well without using mathematics and so can many modern investigators. As the recognized expositors of the scientific method, we physicists could perform a service by making this point clear first to ourselves and then to a wider part of the intellectual community.

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