

Science for the Sake of Science Is Not
Without Its Justifications

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In recent efforts to justify public financial support of basic research, the scientific community has, understandably, tended to emphasize its "practical" results. To describe these applications, we have borrowed from the financial community the term *spin-offs*. Spin-offs may be as concrete and consumable as the newest transistorized gadget. Or they may be as intangible and impressive as the relief afforded U.S. taxpayers by savings realized in our international programs for control of smallpox.¹ No doubt countless examples can and will be cited in this period of restricted research budgets to help the taxpayer understand why money to support even more research is indeed well-spent.

I sometimes wonder whether we err in assuming that such a unilateral justification of science is the only one the layman can appreciate. Cannot support of science, in more than a few instances, be justified on the same grounds as we justify public support of art? The public *does* support art. At times it does so grudgingly, and the amount of support fluctuates. Perhaps in terms of a percentage of the GNP it falls short of the amounts spent by secular and clerical princes of the Renaissance. But it is nevertheless considerable. Though we in the United

States may be less generous in this regard than other countries, there is rarely any serious doubt that there is true human value in some "art for art's sake."

Many scientists find the most rewarding aspect of their work in the aesthetics of its accomplishment, rather than in its product. Feuer has discussed this in great detail.² Recently Gustin also has pointed out that even for the layman the charisma of science is a blend of the charisma of "great transforming and explanatory power with that of great beauty."³ Scientists confirm this fact daily when they talk of "beautiful experiments" and "elegant proofs." The splendid, majestic simplicity of $E=mc^2$ can be described and appreciated in much the same way as one music critic has isolated the "incredibly powerful drama" of one miraculous D natural when Mozart shifts key in the slow movement of the G Minor Quintet (K 516).⁴ Beauty in science need not, on the other hand, be always so all-encompassing; the work of many biological and medical illustrators and photographers has solid artistic merit. We should remember that much of Leonardo's art was produced in his work as a botanist, anatomist, engineer, etc.

While most of us must seek to

justify support of research through its practical results, would it be wholly unreasonable for particular scientists to seek support because there is beauty in the work itself? I think that private persons and foundations might respond to such an approach, just as private philanthropy has responded in support of many living artists. There is, of course, a difficult difference. The layman can see a painting or sculpture; he can hear a piece of music. There is a physical product, and whether or not he may agree with a critic's aesthetic evaluation of a work of art, he will more than likely accept a dealer's assurance that, like it or not, it's worth money. Beauty in science, however, is less approachable, intangible. It requires a comprehension of science itself, of its strategies and techniques. It may be as difficult to understand and appreciate as it is for most of us to appreciate the development of a particular opening as "the chambermusic of chess."

Perhaps the difficulty of comprehension is just another communication gap. Perhaps we haven't tried hard enough to describe the beauty of pure science in terms or by means that will help the layman "see" and "hear" what, as scientists, we see and feel in beautiful ideas and elegant experiments. For example, until quite recently I did not know what a Moebius strip was. An artist acquaintance showed me one in a popularized math book. Since then, I have enjoyed the sheer beauty of the Moebius strip. I've learned not only to appreciate the topological complexities concealed in its simple twist, but also the beauty of its practical application in electronics. And I have found other laymen who are equally fascinated by its beauty. I think they would readily

understand that *someone* should be supported to probe the secrets of this rich topological puzzle. That we have already found practical application of it is a bonus.

Do we avoid mention of the beauty of science because we may fear being branded as nuts? Most scientists, in my experience, are quite conservative in their lifestyles. They seek acceptance in their communities as avidly as the average citizen. They avoid any hint of the hedonism generally attributed to the avant-garde. I mention this, in part, because of the rage that was stirred in me recently by a journal editor. He accused me of practicing science only for economic benefit after I had pointed out that it costs money to add journals to *Current Contents*®. He had offended the sense of beauty I find in my work. I hope that my legitimate short-term goal of maintaining solvency for CC® will never cloud my view that science presents a favorable balance sheet in humanity's quest for a more enjoyable, livable, and understandable world. After all, science is, "in its attempt to measure and order the vast universe, an utterly humanistic endeavor."⁵ That is surely better justification for its support than even the cleverest electronic spin-off.

1. Kaplan, M. Science's role in the World Health Organization. *Science* 180(4090): 1028-32, 1973.
2. Feuer, L.S. *The scientific intellectual: the psychological and sociological origins of modern science*. New York: Basic Books, 1963.
3. Gustin, B.H. Charisma, recognition, and the motivation of scientists. *Amer. J. Sociology* 78(5):1119-34, 1973.
4. Rich, A. Third annual Mozart birthday article. *New York Magazine*, 25 January 71, p. 54-5.
5. Bova, B. The evolution of a genre: from mad professors to brilliant scientists. *Library Journal* 98(10):1646-49, May 73.