door but to ask for interactive dialogue on how we want to shape our world and what are the most pressing needs we face as a global society.

Is it possible to articulate a vision of the good so that we may better determine the directions our experimentation takes? For science will continue to follow the powerful visions of the society that it serves. We determine directions all the time, but the vision is usually fixed by the highest bidder, not the greatest good. It is therefore no longer safe for science to be completely unchained from questions of ethics and virtue and for progress to be its only yardstick. For our society is groaning, not under the straitjacket of a medieval religious authority (to which Kantrowitz alludes) but under an increasing burden of technological materialism that we hardly know what to do with, from imagination-dimming Nintendo to the complexity of economic collapse in a post-cold-war world in single-company cities too dependent on manufacturing weapons systems.

I am not arguing for science once again to be the chained servant of wider ideologies, but rather the opposite, for science has become the willing bond servant of politics, economics and nationalism, which do not concern themselves with the universals that should concern scientists and ethicists.

So, what kind of risks should we take? Risks are for gain, but we must differentiate among the kinds of gain. Risks can be for improving the quality of society and for relief of suffering. They can also be for nationalist gain or personal and institutional prestige. Nobel laureate Roald Hoffmann writes: "In this century science and technology have transformed the world. What we have added, mostly for the best of reasons, is in danger of modifying qualitatively the great cycles of the planet."[1] Taking a calculated and brave risk is one thing. Failing to foresee overwhelming danger is quite another. Kantrowitz fails to point out the difference. And it is the difference between hope and despair.

Stanley Hauerwas, an ethicist at Duke University, suggests that "the ethical problem is how to be joined to the Good without illusion . . . for right action and freedom are possible only on the basis of our prior attention to the Good."[2]

We must ask the question, What would a better world actually look like? and not assume a straightforward trajectory based on what has been done in the past. Our technological legacy is every bit as morally ambiguous as every other field of human endeavor, including politics, economics and, yes, religion, all of which fail miserably when not imbued with a moral vision of a good society.

It is therefore my hope that the scientific community will take steps to tackle ethical questions in the larger context of shared concerns with others attempting to articulate a better vision for our society and our world. Only then will we be able to meet Kantrowitz's closing challenge: "to shed light on the 'invisible' evils of the late 20th century."

References

1. R. Hoffmann, Cornell Alumni News, December 1991, p. 43.
2. S. Hauerwas, *Vision and Virtue*, U. Notre Dame P., Notre Dame, Ind. (1974).

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KANTROWITZ REPLIES: Roger A. Badham appeals to the scientific community to join with others in tackling ethical questions. He asks that scientists and ethicists "concern themselves with the universals."

Whenever, in responding to this persistent request, science gives any support to the pretension that its achievements are miracles attesting to higher wisdom, then that fraud invalidates the factual output that a rational society requires from science. If in addressing the "universals," we abandon science's essential restriction to falsifiable statements, then our self-policing methodology will be incapacitated and scientists' "vision of the good" will have no special validity.

It was of course the thrust of my Opinion column that science should do more to communicate its knowledge and especially its ignorance to the public when that information is important in the making of public policy. In describing this thrust as a demand for "a better PR job," Badham apparently seeks to belittle the role of science in providing public information essential to democratic control of technology.

Risk management provides a good example. Repeated raising of false fears has increased human suffering (for example, by delaying the progress of medicine and agriculture). Badham's allusion to "failing to foresee overwhelming danger" without providing a single example is an unfalsifiable statement clearly motivated by his "vision of the good." Risk assessment needs all the information science can provide. Making an effort to protect that information from the confusion created by unfalsifiable statements will improve democratic risk management and reduce human suffering.

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An Ethics Exam for Physicists Everywhere

I am delighted by the new APS guidelines for professional conduct (see PHYSICS TODAY, January 1992, page 62) and I thank the responsible committee very much for the effort!

Questions of ethics are best treated by example, and a public discussion of ethical issues of our profession would surely increase the awareness of the physics community. The following are some issues I would like to see discussed:

▷ The relationship between junior and senior coworkers: For example, when can a senior author's name be on a paper by a junior student or postdoc? When the senior person is supplying the money? The initial working direction? The experimental setup? Or does it have to be more?

▷ What importance should be placed on seniority when it comes to giving grants? If a senior worker has hundreds of papers on his or her resumé, and a junior person ten, when should the junior person get the grant? I have heard that about 80% of the grants in materials research are given to people over 40. Is this the best way to do it?

▷ No matter where he or she is on the author list, the senior person is the one most often quoted as responsible for a paper, presumably because of name recognition. Is this professional?

▷ Can a referee recommend rejecting a paper for a "grayish" reason? Say the author has a theoretical model: Can the referee reject it because the author has not shown that the model agrees with *all* experimental data? Can one reject it because it is not "important" enough, not "novel" enough?

▷ I noticed with delight that the APS guidelines ask for peer reviewers to disclose conflicts of interest, such as being a direct competitor of the person whose work one is reviewing. I bet it is almost universal, however, that one *is* reviewed by a direct competitor. What should be done in this case?

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