

special brownie points in the evaluations when contracts come up for renewal.

The twin aspects of *potential* applicability and *openness* of the research are crucial to "grappling with the key moral issue of the uses to which their research results will be put," as Shapley puts it in her dramatic ending. The applicability of such research is very wide, and most of the results will be used in peaceful applications. A case in point is the research of S. J. Kline on "Basic structure and stability of turbulent shear flows," discussed in the report. There can hardly be more basic experimental research in this subfield. Its results will nurture fluid mechanicians for generations. And yet some of the insights therein should lead to better design of rocket nozzles if DOD engineers digest Kline's results and implement them. The Russian engineers also have the publication, translated into Russian, where these results appeared (1) and are just as likely to improve their rocket motors. But the application of the research of Kline's group may as likely be in the rejuvenation of the Great Lakes, through an understanding of the parameters controlling the mixing of fluids. Those who are upset by the circumstances of the funding of this research should ask themselves, "Should such research not be funded at all because of its potential applicability?" What research would then deserve funding? (They should also ask themselves whether it is immoral for that research to be of potential use to DOD engineers, keeping in mind other moral issues associated with, say, the lessons of Budapest (1956) and Prague (1948 and 1968). But many students have not heard of or have forgotten these events in their understandably deep concern for the lessons of Vietnam.)

If the main objections are to the source of the funding rather than to the research itself, the critics should be lobbying in Congress rather than exposing the tight-rope which the beleaguered contract monitors of ONR, AFOSR, and ARO are trying to walk during this austerity cycle. One wishes that the new groups in the Department of Transportation, the Environmental Protection Agency, etc., had developed a comparable philosophy with respect to long-range, basic, potentially applicable research. NSF, of course, has the philosophy, but not the funds, to take over much of the ongoing basic DOD research. In the type of research discussed in Shapley's report, is the issue really a moral one, resting with the sci-

entists and the monitors, or is it politico-economic, resting with Congress and the public at large?

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References

1. S. J. Kline, W. C. Reynolds, F. A. Schraub, P. W. Runstadler, *J. Fluid Mech.* **30**, 741 (1967); H. T. Kim, S. J. Kline, W. C. Reynolds, *ibid.* **50**, 493 (1971).

Deborah Shapley's review of the SWOPSI (Stanford Workshop on Political and Social Issues) student report on DOD research at Stanford ends with the comment that "... DOD now exempts all scientists from grappling with the key moral issue of the uses to which their research results will be put." Let me propose a generalization of this moral issue to the effect that *all* scientific research has a finite probability of being applicable to uses which most men would agree are immoral. The problem is two-fold; is this probability calculable, and if so, where does each scientist set the probability level above which he will choose not to pursue the research. (You will notice that I still fancy that the scientists have a choice, though one could argue that both the students and the professions are doing their best to eliminate it.)

If one cringes at the task of measuring the probability that a given area of research may lead to negative benefits for humanity, then perhaps a historical study would be a starting point. Poor Faraday.

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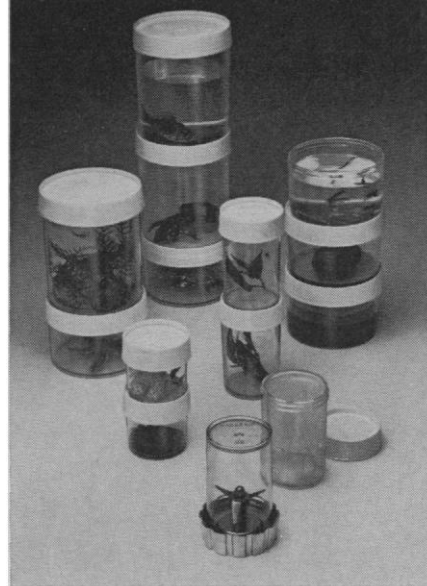
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