

# An Inquiry Into Inquiry

## —Some Questions to Discuss

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**For a scientist to challenge freedom of inquiry is akin to heresy — but is inquiry itself to be exempt from inquiry?**

**T**HE RIGHT of free inquiry was hard won. It has served us well. Surely, any who would restrain inquiry should give full cause.

Indeed, for a scientist to challenge freedom of inquiry is akin to heresy — if not suicide. But is inquiry itself to be exempt from inquiry?

The stage of history does change. When knowledge was scant and technology feeble and the art of inquiry itself an infant, full freedom of inquiry could be readily championed. Today science and technology — born, to be sure, of free inquiry — have transformed our world and have given us great powers. The art of inquiry itself is now mature and deeply penetrating. And a sober and reflective reevaluation of the purposes and consequences of inquiry may well be in order.

It may be that the highest wisdom is to recognize that we should not trust ourselves to civilize the course of inquiry. Human history from the Inquisition to Lysenko suggests the probability of abuse of such power.

But it is at least instructive to consider the alternative, and it just may be imperative. Restraint can mean guidance and pacing, not eternal prohibition. Curiosity is not necessarily the highest virtue — and science, the distillate of curiosity, may not merit *total* commitment.

To be meaningful, an inquiry into inquiry should provide specific instances. From such instances some generalizations may be possible.

For what specific purposes might we wish to limit inquiry? Do we wish to curb only the means or even the

ends of inquiry? I expect each person might devise his own list, but let me advance some suggestions.

One is the preservation of human dignity. We should not do experiments that involuntarily make of *man* a means rather than an end. The ethics of human experimentation are, I think, now rather well understood — even though it must be recognized that such restraints blunt pure inquiry.

Another reason to limit at least the means of inquiry is the avoidance of involuntary hazard, physical or biological. As might be expected, the level of hazard which demands restraint will be arguable. We have already one instance of such limitation in the — not universally accepted — ban on atmospheric nuclear testing. We can all recall the controversy which preceded adoption of this ban.

The field of recombinant DNA research has an analogous potential for widespread, inadvertent danger from the leakout of possibly toxic organisms; a danger even more difficult to quantitate, so that the limited precautions already proposed are certain to be the subject of continued controversy. This hazard — posed by the invention of synthetic biology — has a novel aspect. Unlike fallout or DDT, it is potentially irreversible, for synthetic living organisms are, by definition, self-reproducing.

We may be lucky; Nature may again protect us from our ignorance. I personally dislike to leave such a grave consequence in hostage to fortune.

Yet another reason to limit inquiry may be the sheer cost of a research project. This issue introduces a new perspective. In the previous instances we were concerned only with the means of inquiry and did not question the ends. The constraints suggested to be imposed upon inquiry derived from commonly accepted ethical principles, although, as always, one might quarrel with their specific application.

By introducing the element of cost one asks if the primary consequence of the inquiry — the knowledge to be gained — is worth the expenditure of talent and time and resource. Decisions as to the allocation of resources are usually, and properly, left to the political sphere. However, scientists are also citizens — and despite our enthusiasms we should endeavor to be at

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least dimly aware of the realities of competing concerns. For instance, I would find it difficult in today's world to justify, in terms of the benefit to science, the expenditure of 100 billion dollars to land a man on the Martian planet. Such extreme enthusiasms might at least be tempered with common sense.

Progressing ever deeper into controversy, one may extend inquiry into the ends of inquiry to question, in particular instances, whether we want to know the answer in any case — whether the secondary consequences of such knowledge (given the nature of man and of human society) are, on balance, likely to be beneficial.

Here it may be that the highest wisdom is to recognize that we are not wise enough to know what we do not want to know — and thus to leave the ends of inquiry unrestrained. Indeed, I expect there are only a few instances where prudence would be in order. But the set may not be null; let me present a few examples for consideration.

I would suggest that the temporal order of scientific inquiry deserves some thought. It is usually conceived that the stream of scientific advance follows a linear course, dictated by the internal logic of each discipline — that is, by the availability at any time of knowledge and technique. To which I would add, also by the

available inspiration, which in turn is closely coupled to motivation. And to this extent I conceive that the pattern of development of science is not wholly innate or preordained — that we are not tracing out in an inevitable web.

If so, then in particular it would seem to me desirable to keep some proportion between our predictive capabilities and our deflective capabilities. Is it useful to be able to predict the latent consequence of genetic defects if we cannot avert or mitigate their effects? Is it useful to be able to predict the approximate date of an earthquake if we cannot appreciably spare its consequence? And reciprocally, we have need to be able better to predict the aftermath of our interventions into Nature before they become too gross — as with fluorocarbon propellants or perhaps with recombinant DNA.

But some directions of inquiry carry within themselves the seeds of what I would label social hazard or, perhaps, just plain mischief. In this case the inquiry itself is not really hazardous, but the almost certain social consequence most assuredly is. And this hazard would seem likely to far outweigh any foreseeable social benefits.

Now there is a hallowed and traditional point of view that it is the business of the scientist to inquire, to discover new knowledge. It is not our concern but society's what use, if any, to make of that knowledge.

In my view, in our world as it is, such a position is very largely a cop-out. In general, our society lacks both the means and the will to avert the development and use of the products of scientific discovery.

We live in a free enterprise society. Any development that provides gratification or can yield a profit or is deemed to strengthen the national defense will most often be adopted, frequently with remarkable speed. And I am not sure we would care for, nor science thrive in, a society which had the extensive control system necessary to prevent such applications.

At the same time, we do live in a strained society of uncertain elasticity. It is a part of rationality to recognize that mankind harbors always the potential and the reality of irrationality. There *are* arsonists and assassins, terrorists and tyrants.

Let me give four selected illustrations of research whose likely consequences would seem to me to be major and to be at this time in our society of appreciably less advantage than harm. It may be that these are but personal crotchets. But I believe these merit discussion, *before* the experiments are done. One example is from radio astronomy, one from physics, two from biology.

We have heard many proposals that we should attempt to contact presumed "extraterrestrial intelli-

gences." I wonder if the authors of such experiments have ever considered what might be the impact upon the human spirit if it should develop that there are other forms of life, to whom we are, for instance, as is the chimpanzee to us. Especially devastating, it seems to me, would be the impact upon science itself, once it were realized someone already knew the answers to our questions. We know in our own history the shattering consequence of the impact of more advanced civilizations upon the less advanced. In my view the human race has to make it on its own — for our own self-respect.

Research upon improved, easier, simpler, cheaper methods of isotope separation. Result: slightly cheaper power, far easier bombs. Is that, on balance, in anyone's best interest?

Research upon a simple means for predetermination of the sex of children. Result: some boon to animal husbandry; boys or girls upon parental request — and the potential for a major imbalance in the human sex ratio. Is this disruption of a balance already provided by Nature really a desirable advance?

Indiscriminate research upon the aging process. What is the long-range purpose of aging research? The purpose of cancer research is clear — the eradication of cancer. Is the purpose of aging research the eradication of aging? None would quarrel with research to relieve the infirmities of old age. But in the section "Purpose of Legislation" in the House Committee statement accompanying the Research on Aging Act of 1974, it is stated, "This Institute (the National Institute of Aging) will provide a natural focus for the research necessary

to achieve the great goal of keeping our people as young as possible as long as possible." Is this on balance, a desirable goal?

By now I have probably cited enough instances to have trod on at least one toe of every reader — thereby proving the truth of my earlier cautions. But more seriously, the point is that the role of science — which is our principal organ of systematic inquiry — the role of science in society has changed in the course of the 20th century, although our perceptions have not kept pace. It has changed because of the success of science itself. In the nucleus of the atom and the nucleic acids of the cell we have discovered the core of matter and energy and the core of life. These discoveries place in our hands immense powers, far beyond human scale and experience.

In consequence, I think there are limits to the extent to which we can rely upon the resilience of Nature or of social institutions to protect us from our follies and our finite vision. Our thrusts of inquiry should not too far exceed our perception of their consequence. There are time constants and momenta in human affairs. We need to recognize that the great forces we now wield might drive us too swiftly toward some unseen chasm.

The very success of science has ended its pleasant isolation. The impact of science and the increasing coupling of science to human affairs do encumber us with new responsibilities. Yet at the same time we do not wish to shackle inquiry with the bonds of responsibility. Somehow we need to find a way to be doubly responsible, both to mankind and to science, as one of man's finest creations. That will not be easy.

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### *Afterthought*

A far more pervasive (and insidious) rationale for the restraint of scientific inquiry will likely derive from the phase transition from the spontaneous to the planned society, from past loose-jointed self-reliance to future tightly integrated interdependence. Planning is invasive; once begun in one sector, it tends to expand inexorably to adjacent sectors of the social enterprise, lest their unplanned fluctuations perturb the adopted plan.

In the fully planned society, change and innovation must be regulated, and thus science itself — as the fountainhead of change — will be carefully channeled and metered.

Spontaneity (essential to the scientific enterprise) and crystallinity (essential to the planned society) can only coexist within narrowly determined conditions. It may become a most important task for scientists to help define those conditions. □