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EDITORIAL

The Biological Sciences at a Crossroad

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> "I suspect that most Americans would prefer to belong to the society which first gave the world a cure for cancer than to the society which put the first astronaut on Mars."
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> Weinberg, AM, "Impact of Large-Scale Science on the United States", *Science*, 134, 161-164; 1961.

Over half-a-century ago, at the beginning of what is now known to be the Big Science era, a well-educated, science administrator assessed what was going on in the sciences in America and what decisions were needed to fulfill the commitment of scientists to those who made possible the advances in knowledge and technology, i.e., the public. Alvin Weinberg, the then Director of the Oak Ridge National Laboratory, was a public servant who took seriously and proudly such a denomination. In an extended article in Science magazine based on a Lecture given at a meeting of the American Rocket Society, Weinberg reflected on the perception that "tight intellectual discipline necessary for science is, especially in America, being loosened". Readers are invited to examine the full article to learn about what he had in mind. With the advantage of hindsight, it can be safely conclude that several of his predictions were well off the mark. Others are well worth considering nowadays.

For starters, he may not have much endeared himself with an audience of commercial rocketeers and universities-based space physicists when he concluded that financial support granted by the Nation for projects some of his listeners would have been benefited from lacked scientific and financial merit. As a prominent leading science-administrator he was arguing against enriching the companies and universities that employed those in the audience and in turn preventing them from acquiring the means to advance their careers. Imagine the Director of the National Institutes of Health telling publicly to a joint meeting of the AACR, the Genetics Society and the Broad Institute that the Precision Medicine or the Brain projects are not worth developing because it seems as if both the epistemological/theoretical assumptions and the methodology on which they are based are weak and that these projects may just end up being a welfare project for professional researchers and/or a bailing out of rich research-based universities from bankruptcy.

Weinberg's specific comments centered on two main questions, namely, a) "Is Big Science giving us our money's worth? And b) "Is Big Science ruining science?" At a point when the scientific community faces a crisis in the biological sciences, both questions maintain their relevance today. Opinions will vary depending on who is asked to answer them. Obviously, there are those optimists who see the glass half-full; but among those who see the same glass half-empty their dismay intensifies with time as they see lessons not learned and the continuation of a mindless policy of erroneous assessment of the value of science and the society that funds it. From his analysis, Weinberg concluded that "(T)he line between journalism and science has become blurred", "(T)he line between spending money and spending thought is blurring" and finally that "Big Science has greatly increased the number of scientific administrators". He incisively expanded on what was wrong in his contemporaneous society, including threatening developments for Little Science. Big Science requires a public relation component that is inimical to science

as a result of which it becomes difficult to discriminate what is science from what is hype. Inevitably, Big Science overwhelms Little Science mostly because big scientific institutions primarily try to maintain themselves alive and whenever possible increase their size, always in tune with a capitalist reality.

Weinberg was a well-educated pragmatist. In 1961, he claimed that "Big Science is here to stay"; that "we have to learn to live with" it. Nevertheless, what Weinberg was concerned about when judging the damage that Big Science can do was that "Big Science can ruin our universities" by "converting university professors into administrators, housekeepers and publicists". The realities of 1961 are clearly different from the environmental conditions of science in 2018. Notwithstanding, some of the underlying premises that justify funding science have not changed much. It may just be that now is the time to reformulate new priorities in view of past mistakes and try to make necessary course-corrections to avoid the kind of disasters that Alvin Weinberg and others warned us about.

Several side issues that remain implied in Weinberg's assessment are worth mentioning here. For instance, he puts first the prestige of the sciences before the perceived financial interests of the agency he directed and the expansion of tasks he and his subordinates could have benefited from. Current administrators in the life sciences, more specifically at the NIH in the USA, may advantageously follow his example when they request funds from Congress for expensive and unproductive pet projects of their own. Here is where the blurred separation between spending money and thought takes place. Time spent on spending money reduces the time spent in thinking science. When administrators manage science projects, the science takes a secondary role. This statement covers the different layers where administrators have taken leading positions on how to manage Department, Secretaries at the national levels as well as in universities, schools and school departments.

One of the concerns that Weinberg had was that Big Science would invade universities. In fact, it has and it is undeniable that professors at universities who were supposed to think and teach have become "a publicist, if not a journalist, an administrator, and a spender of big money". Some of us have conceded that university researchers encouraged, if not forced, by their administrators have become "consultants" searching for funds (from any source available) to maintain their labs while contributing to their employers' welfare through the dreaded "indirect costs". If these requirements are not fulfilled, the administrators (deans, newly created vice-deans and financial officers) will take away those faculty privileges. Moreover, research projects are becoming tailored to Study Sections whose members (the researcher's peers) will let Little Science researchers do what they consider worth doing and not what scientists consider worth thinking about.

Weinberg's concern about the dangers of "creating a political 'in' group of scientists who keep worthy outsiders from the till" has indeed materialized at least in the biological sciences, and not only in the USA. The type of research dictated from the helm of the NIH, from the War on Cancer during the second half of last century to the current emphasis on comparable "pies in the sky" under the arrogant title of Precision Medicine, are the most representative examples of such outcome.

In 1961, decisions about what direction US science policy should adopt were motivated by the need to compete with the URSS space program. Much progress in this field has accrued since then and other countries have joined the US and Russia in this goal and much is now known about outer space. What remains unclear for the public is whether the funds used for this purpose are designed to satisfy our quest for knowledge or to refine strategies in case of an eventual cyberspace warfare.

Alvin Weinberg concluded his talk before the American Rocket Society by stating that "we must not allow ourselves, by short-sighted seeking after fragile monuments of Big Science, to be diverted from our real purpose, which is the enriching and broadening of human life." Let's all vote for that…

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References

Weinberg ,AM, 1961, "Impact of Large-Scale Science on the United States", *Science*, 134, 161-164.