Science Funding: Theoretical perspectives

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Outline

• Public funding via peer review
• Democratic Science
• Epistemic landscapes
• Economics of contests
• The scientists’ perspective
The main aim of public science funding bodies is the increase of well-being via the scientific generation of new, reliable, communicable information.
Bush (1945), Polanyi (1962)

SCIENCE
THE ENDLESS FRONTIER

A Report to the President
by
Vannevar Bush
Director of the
Office of Scientific Research and Development

July 1945

MICHAEL POLANYI

THE REPUBLIC OF SCIENCE:
ITS POLITICAL AND ECONOMIC THEORY
Minerva, I(1) (1962), 54–73

My title is intended to suggest that the community of scientists is organised in a way which resembles certain features of a body politic and works according to economic principles similar to those by which the production of material goods is regulated. Much of what I will have to say will be common knowledge among scientists, but I believe that it will recast the subject from a novel point of view which can both profit from and have a lesson for political and economic theory. For in the free cooperation of independent scientists we shall find a highly simplified model of a free society, which presents in isolation certain basic features of it that are more difficult to identify within the comprehensive functions of a national body.

The first thing to make clear is that scientists, freely making their own choice of problems and pursuing them in the light of their own personal judgment are in fact cooperating as members of a closely knit organisation. The point can be settled by considering the opposite case where individuals

Governments should support science to achieve eventual benefits in:

- health,
- national security,
- economic growth and
- the quality of life of citizens.
• Research projects should

- **come from scientists**, and

- **be evaluated by scientists** through a network of overlapping expertise

• to avoid “the adulteration of science by cranks and dabblers”.
Kitcher (2003, 2011)
• Science is **value laden**

• In a democracy, the public should ultimately set the values

• Kitcher outlines a process of ideal science:
  
  • Groups of scientists present different research programmes
  
  • Citizens (or their representatives) decide between the programmes after **tutoring** and **value deliberation**
The “epistemic fitness” of a corpus of information is the measure of fit between the causal consequences of the information existing in that corpus and the societally adopted notion of well-being.

\[ f = F(I, W) \]
Epistemic landscapes
Weisberg & Muldoon (2009)
But... epistemic fitness can change over time

- Duplication and redundancy
- Convergence: novelty versus support
- New avenues
- Inertia
- Revealed risk
- Reduction and emergence
- Practices and technology
- Environmental effects
- Communication technology
- Hype
- Isolation and boundaries
“Parameter crisis”: When the number of parameters required to make justified predictions exceed the capacity of an individual to satisfy them empirically.
Avin (2017)

- Adding trigger events
  - Winner takes it all
  - No longer surprising
  - New avenues

- Adding selection mechanisms
  - Old boys
  - Best (God's eye)
  - Best visible (peer review)
  - Lottery
  - Triage
Best visible
Lottery
Figure 6: Comparison of significance accumulation under different funding mechanisms for different vision ranges.
Figure 8: Comparison of renewal likelihood under different funding mechanisms.
Harnagel (2018)
\[ b(v) = \arg \max_x \left\{ (v_0 + v)\eta(x) - (1 - k)c(v, x) \right\}. \]

Investigator's ROI = \( \frac{(v_0 + v)\eta(b(v)) - (1 - k)c(v, b(v))}{c(v, b(v))} \).
The scientists’ perspective
Ferroelectric and Antiferroelectric Liquid Crystals

Author: SVEN LAGERWALL
Source: Ferroelectrics, Volume 301, Number 1, 2004, pp. 15-45(31)
Publisher: Taylor and Francis Ltd

Abstract:
Ferroelectric liquid crystals have been a major research topic since 30 years. However, when it comes to liquid crystals, the terminology is ambiguous and frequently not only leads to confusion and misunderstanding but also obscures the basic concepts. The proper term is “ferroelectric” and it was first claimed in 1975. Five years later so-called surface-stabilized ferroelectric liquid crystals were described, which were important because of their promising electro-optical applications, in particular for high-resolution liquid crystal displays. The field of ferroelectric liquid crystals has found considerable activity in synthesizing new compounds with the desired properties. In the course of the development, crystals were then also sought for and finally identified in 1989. At the same time as the first industrial ferroelectric device entered the market in 1995, the antiferroelectric liquid crystals were being considered as even more promising for applications. In 1995, a new phenomenon, the “thresholdless antiferro-electric effect,” was observed. It has a certain lack of comfort in adopting terms and definitions taken from the field of solid state phenomena. Therefore, it might be easier to understand the liquid crystal materials really well. Ferroelectric, anti-ferroelectric and ferroelectric. My own answer to this is to let it be ferroelectric. I will review our current understanding of polar liquid crystals and contrast them with antiferroelectric solid crystals. While some of the electric properties can be very similar, it is the optical properties that really are interesting. In particular, the optical properties of antiferroelectric liquid crystals are surprisingly rich, as discovered only in th
Amabile (1996)
I regret to inform you that your funding application has not been successful. We are sorry to send you this disappointing news. The decision is final. We are not able to enter into further correspondence about the decision.

**Better luck next time...**
“Sir Mark said that the traditional system of researchers sending in detailed proposals was a "curious form of application" that amounted to a folie a deux, a madness shared by researcher and funder.”

– THE 12/11/09
Credits

• Bush, V. (1945). Science, the endless frontier: A report to the President. US Govt. print. off..


• Avin, S. (2017). Centralised Funding and Epistemic Exploration. British Journal for the Philosophy of Science

