

Science Funding: Theoretical perspectives

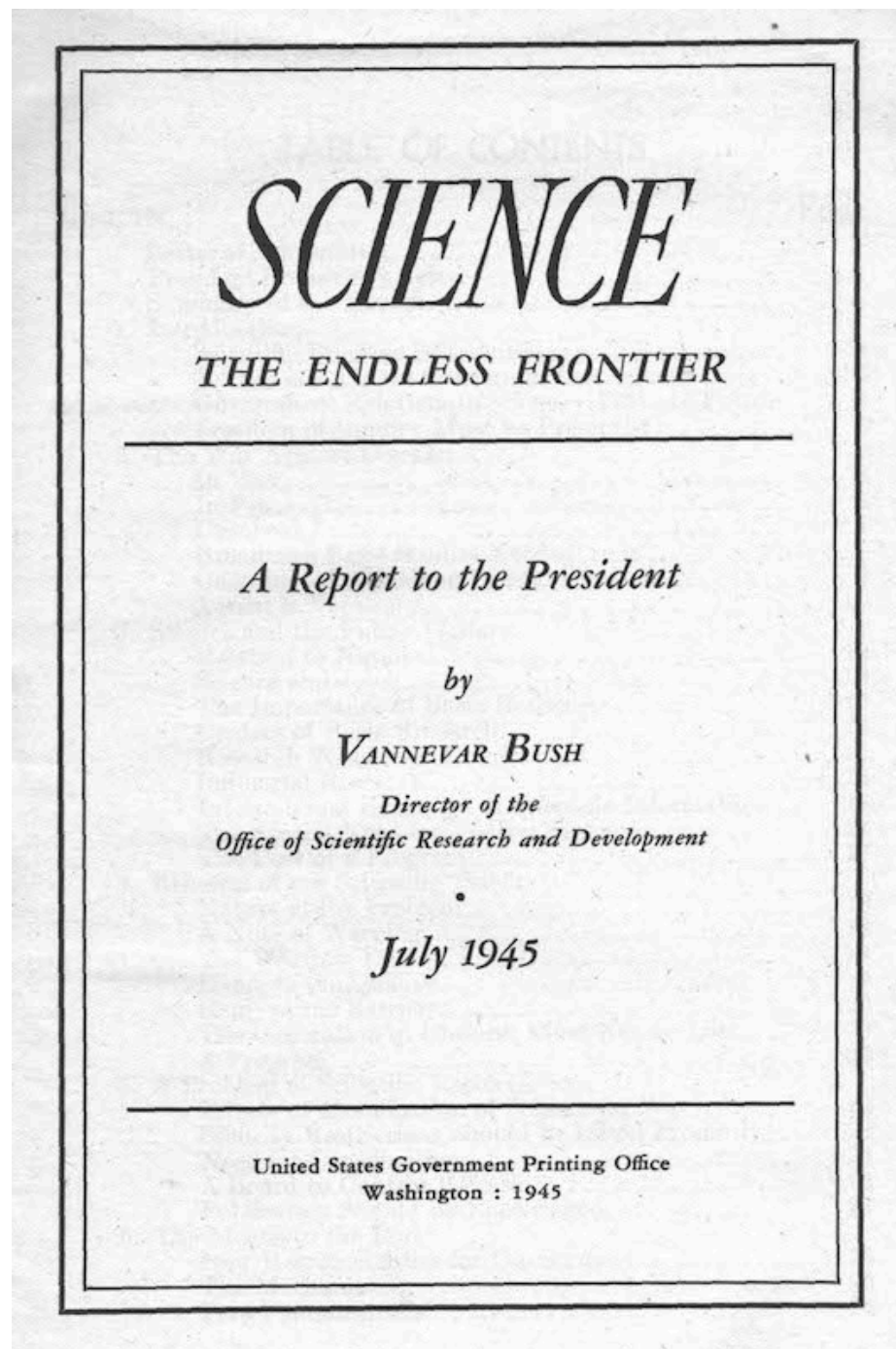
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University of Cambridge

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)



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



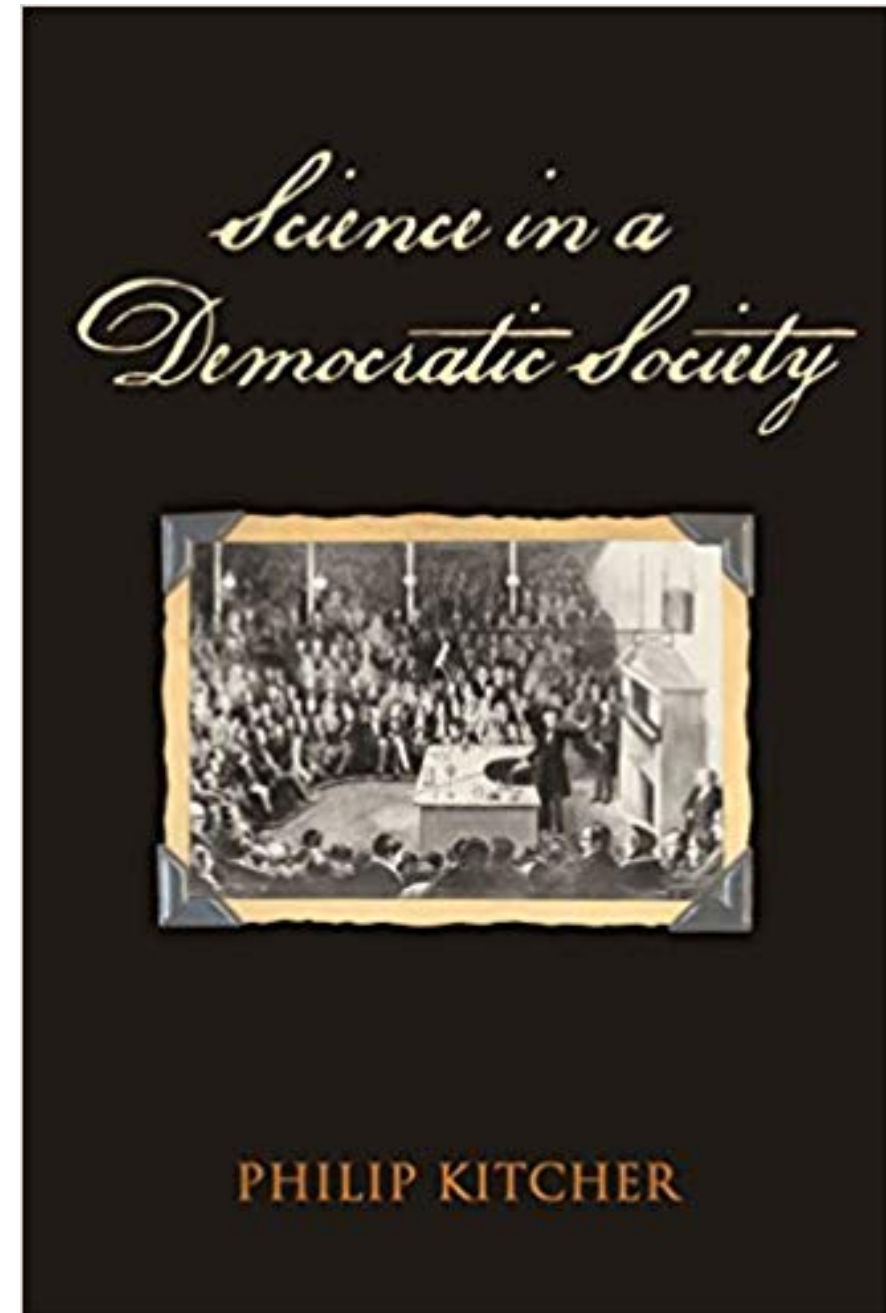
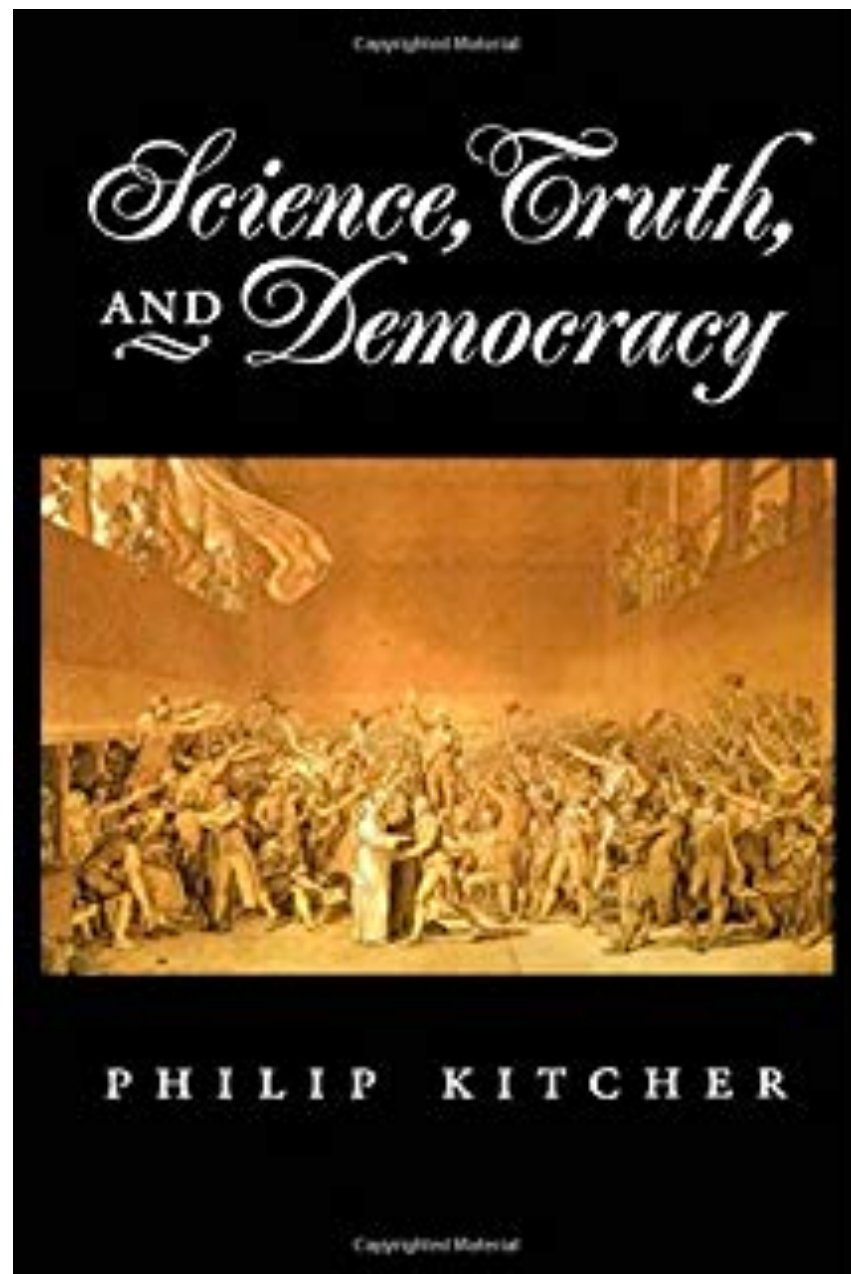
Minerva 38: 1–32, 2000.

© 2000 Kluwer Academic Publishers. Printed in the Netherlands.

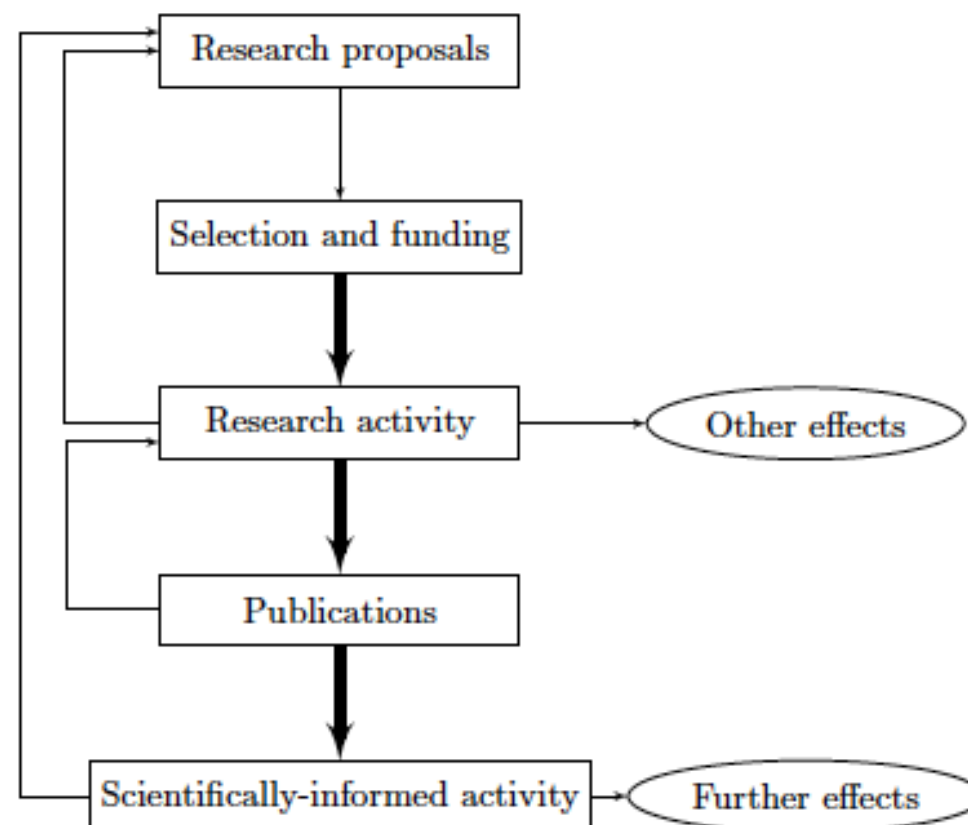
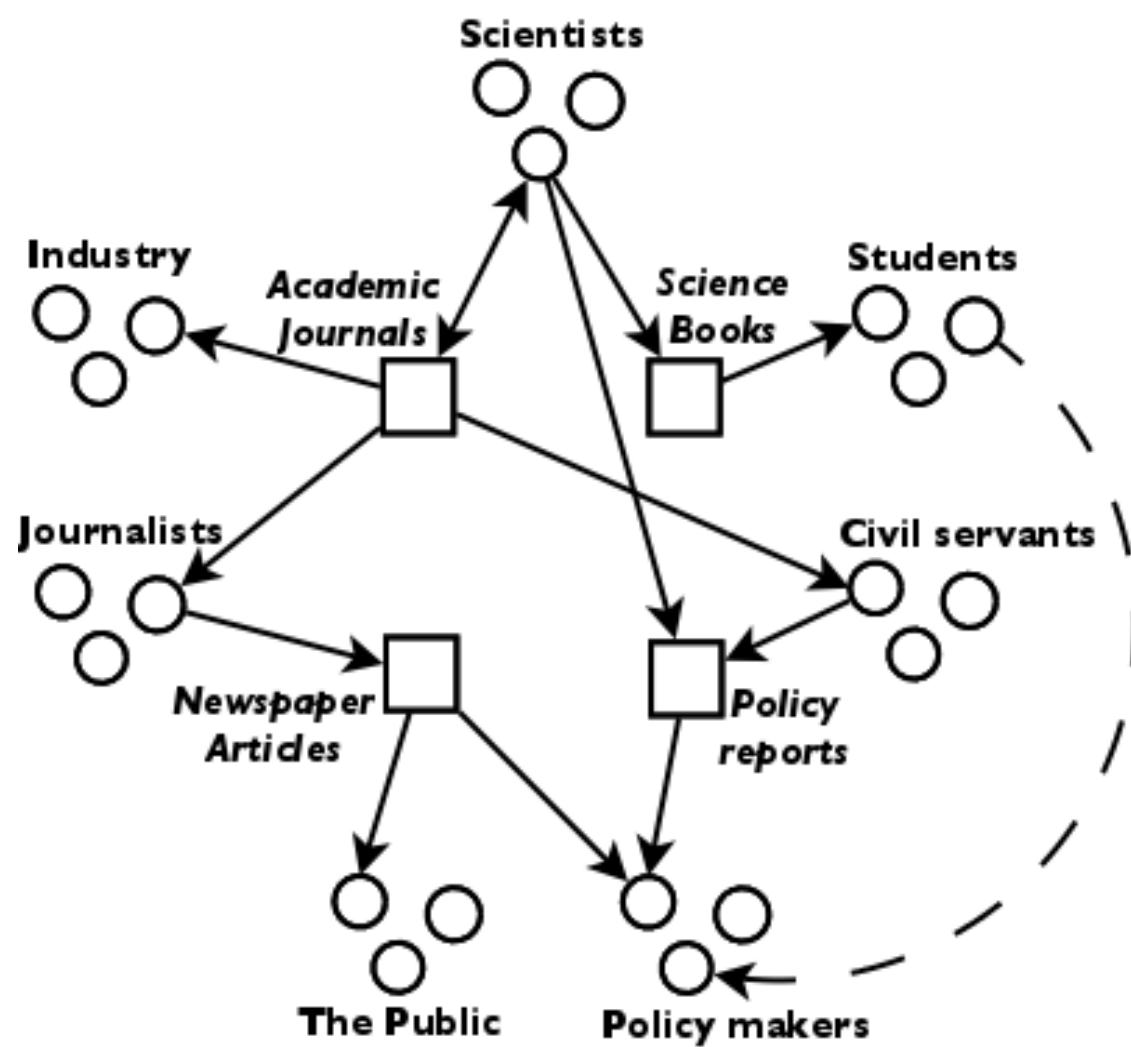
- Governments should support science to achieve **eventual** benefits in:
 - health,
 - national security,
 - economic growth and
 - the quality of life of citizens.

- 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)



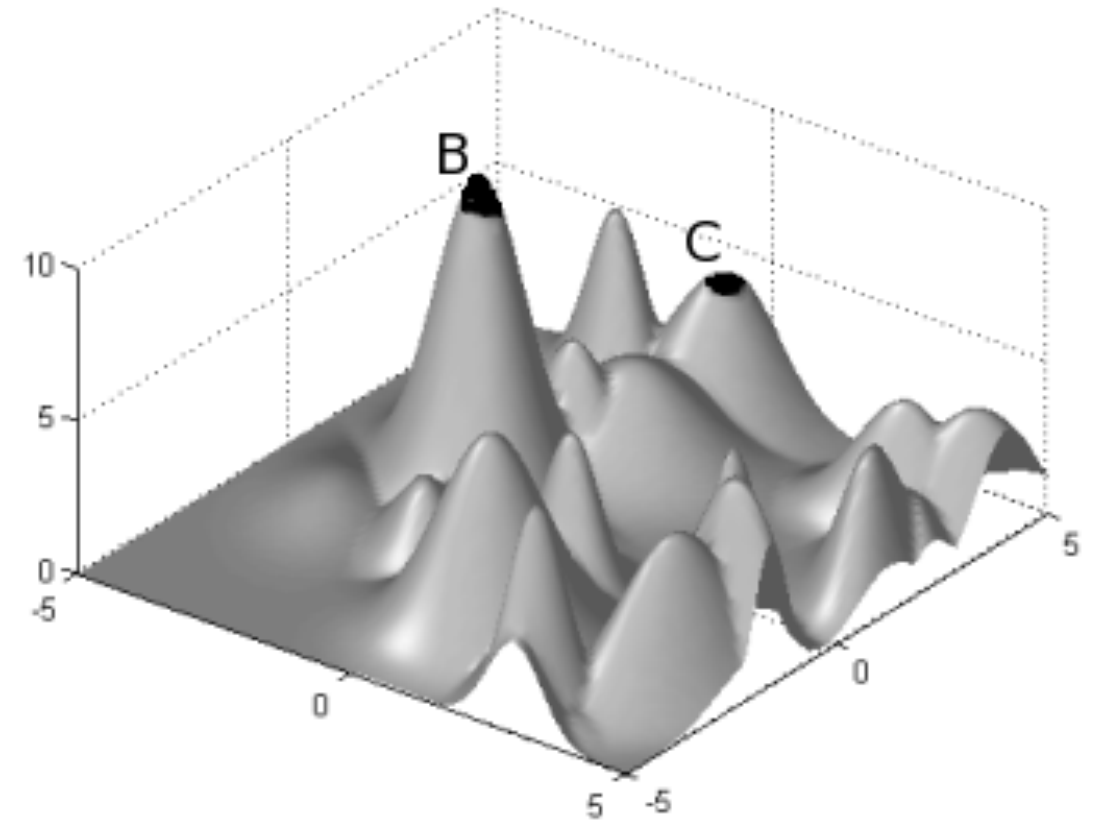
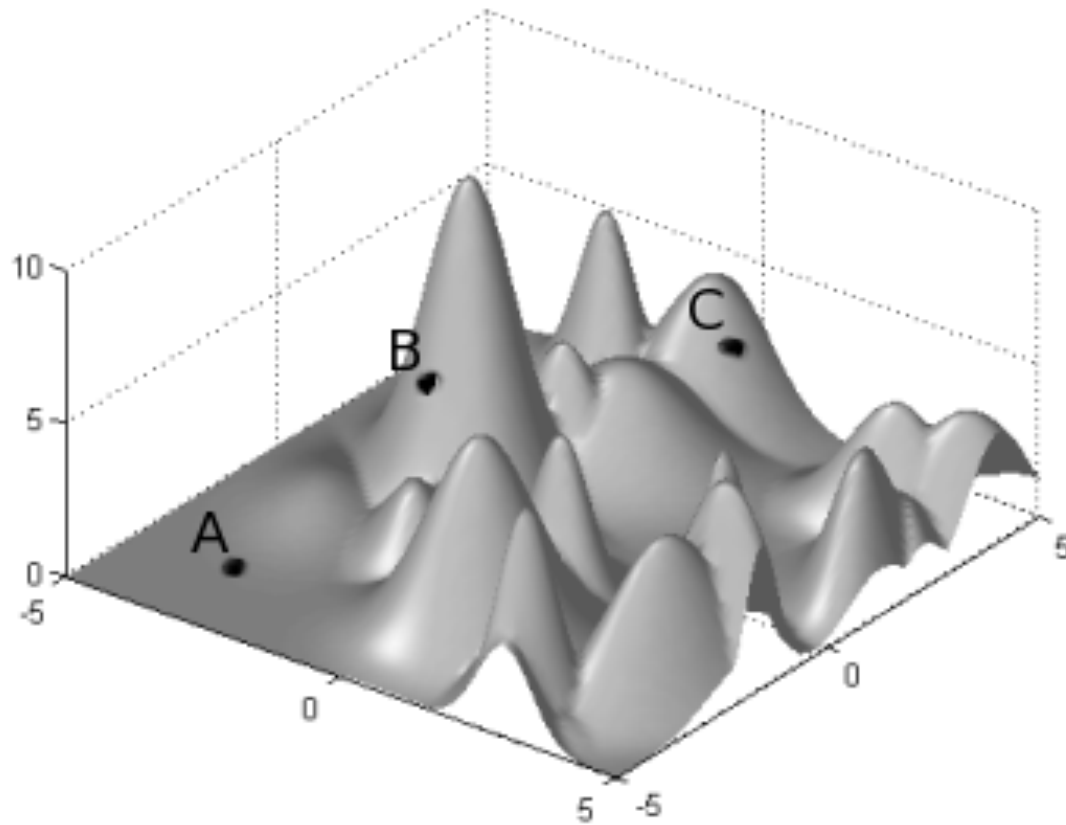
- Science is **value laden**
- In a democracy, the public should ultimately set the values
- Kitcher outlines a process of ideal science:
 - Groups of scientists present different research programmes
 - Citizens (or their representatives) decide between the programmes after **tutoring** and **value deliberation**



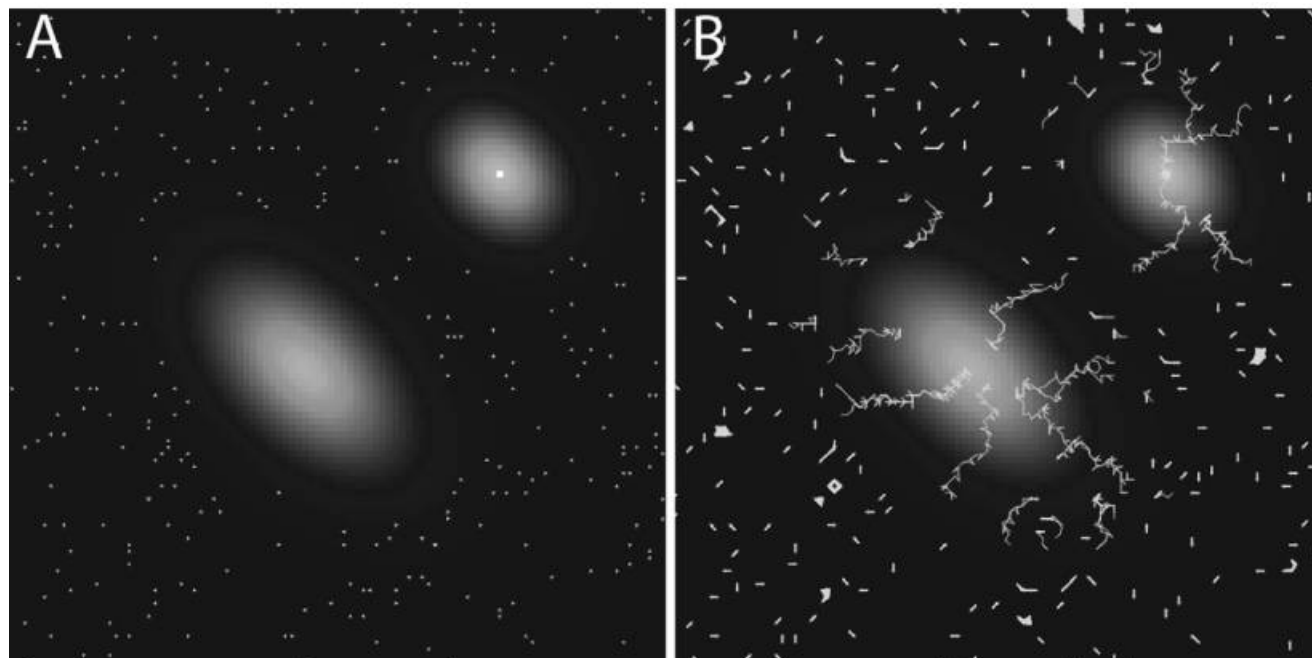
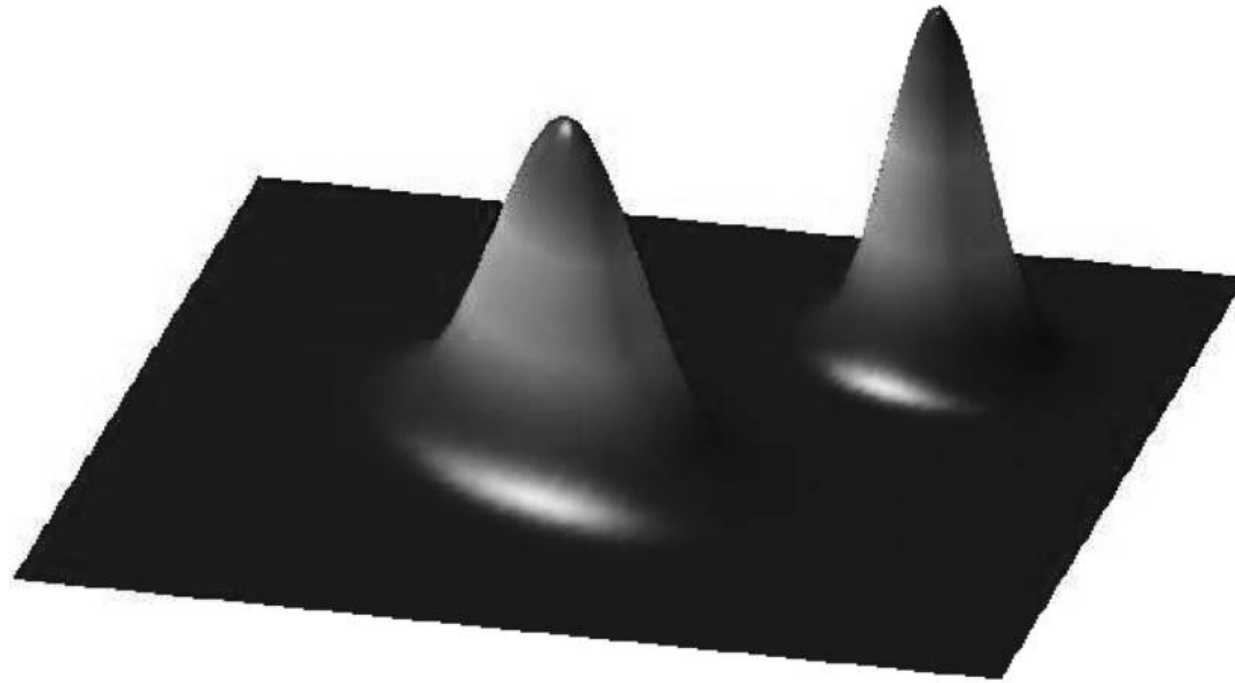
The “epistemic fitness” of a corpus of information is the measure of fit between the causal consequences of the information existing in that corpus and the societally adopted notion of well-being.

$$f = F(I, W)$$

Epistemic landscapes



Weisberg & Muldoon (2009)



But... epistemic fitness can change over time

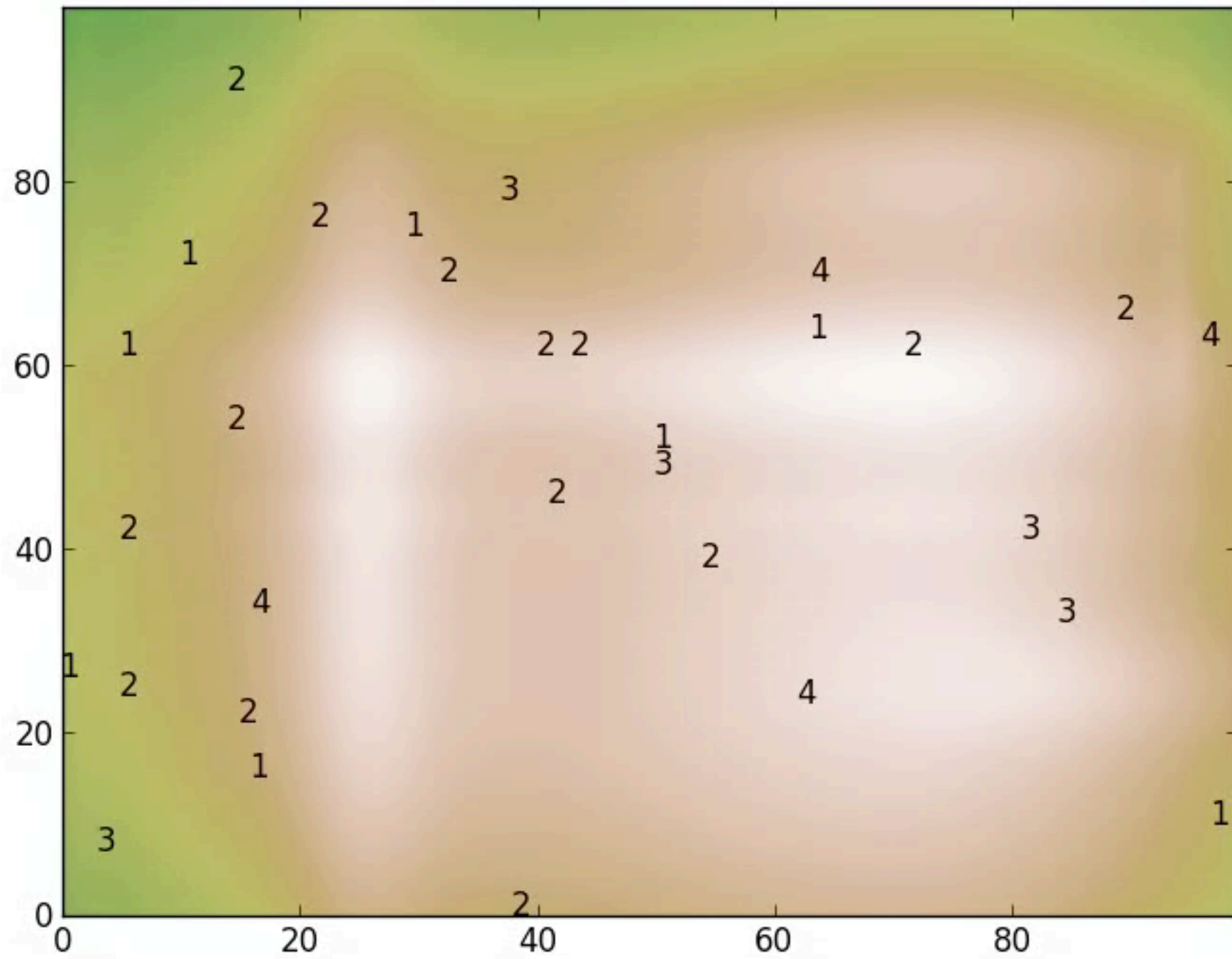
- Duplication and redundancy
- Convergence: novelty versus support
- New avenues
- Inertia
- Revealed risk
- Reduction and emergence
- Practices and technology
- Environmental effects
- Communication technology
- Hype
- Isolation and boundaries

“Parameter crisis”: When the number of parameters required to make justified predictions exceed the capacity of an individual to satisfy them empirically.

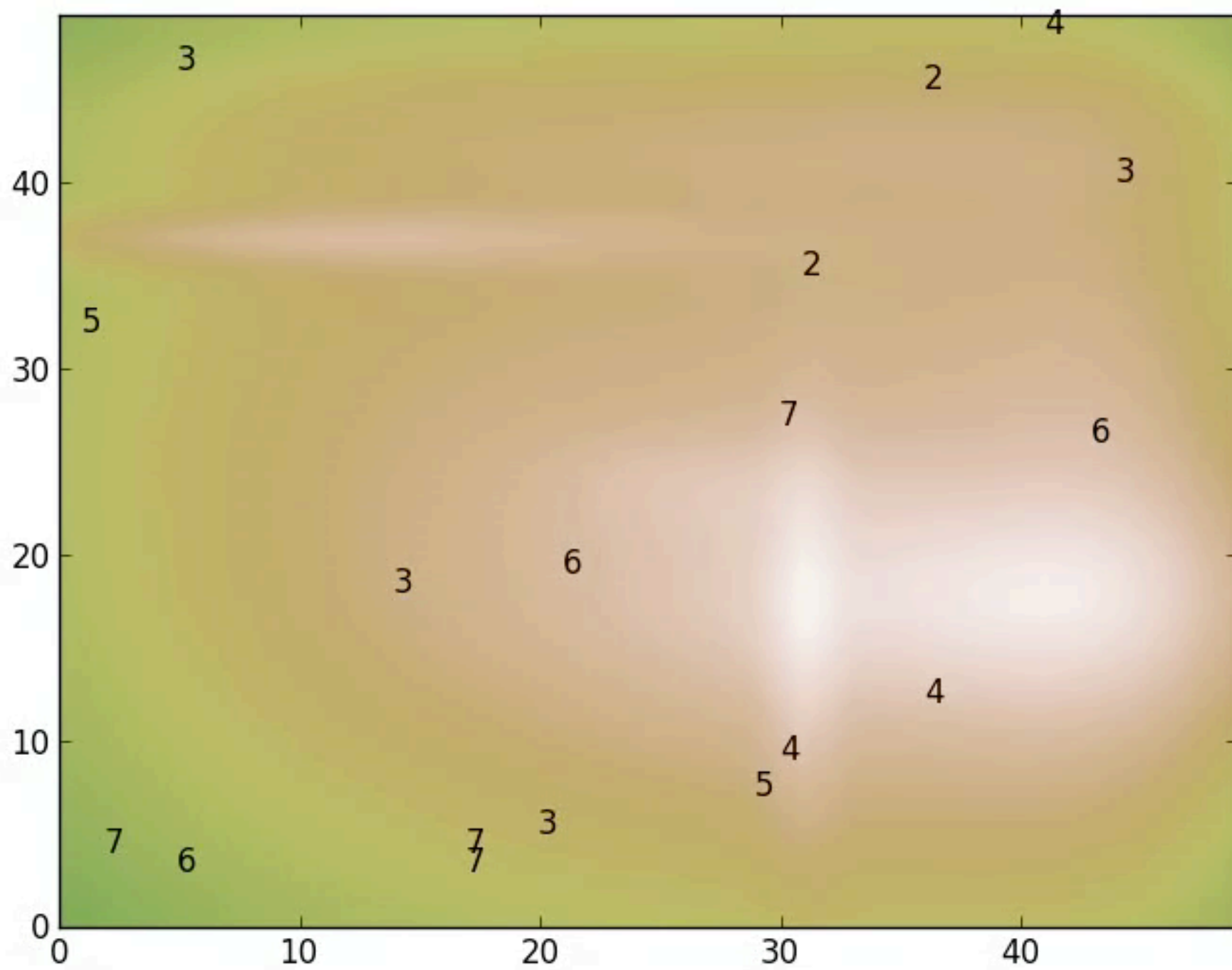
Avin (2017)

- 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

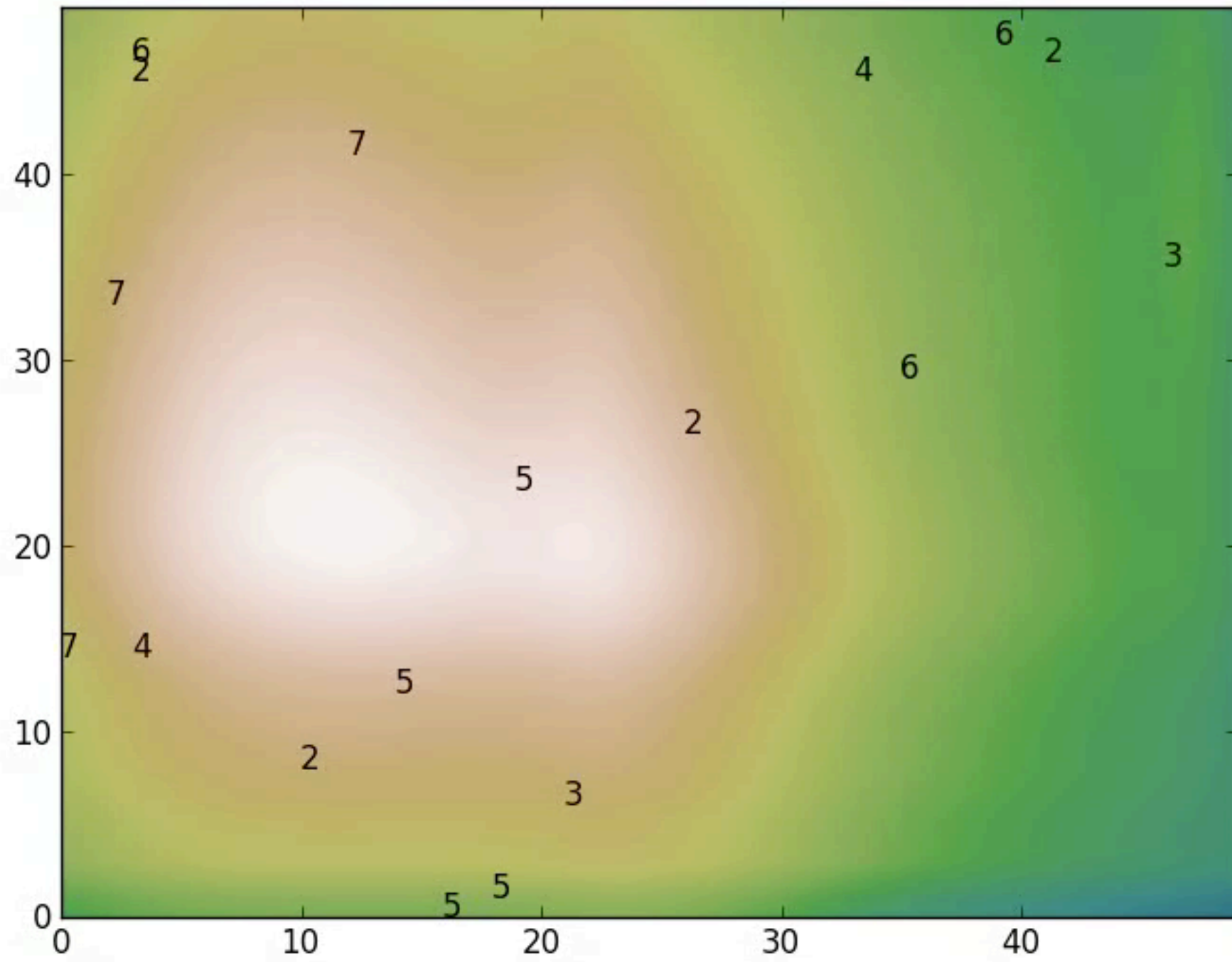
Old boys



Best visible



Lottery



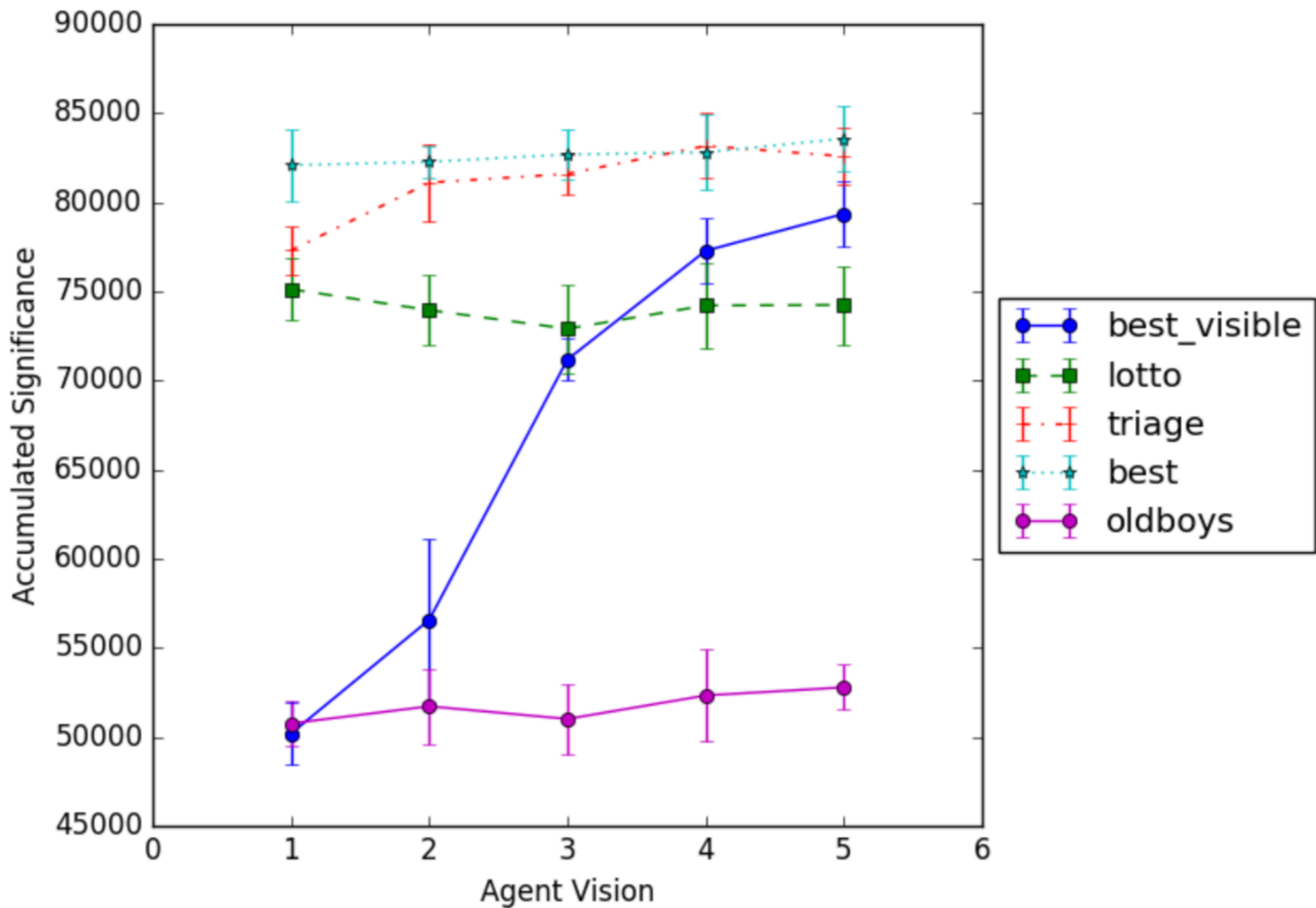


Figure 6: Comparison of significance accumulation under different funding mechanisms for different vision ranges.

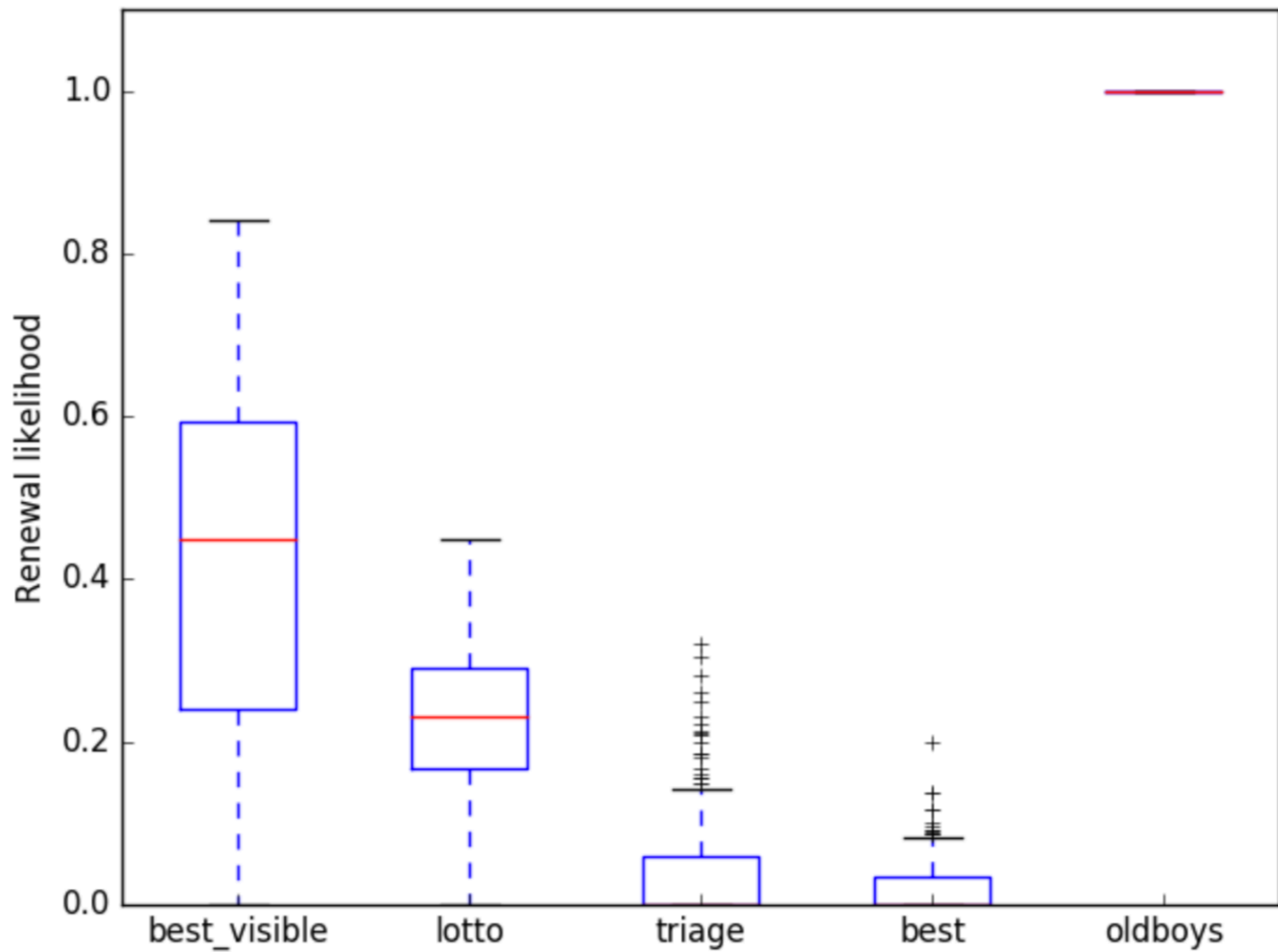
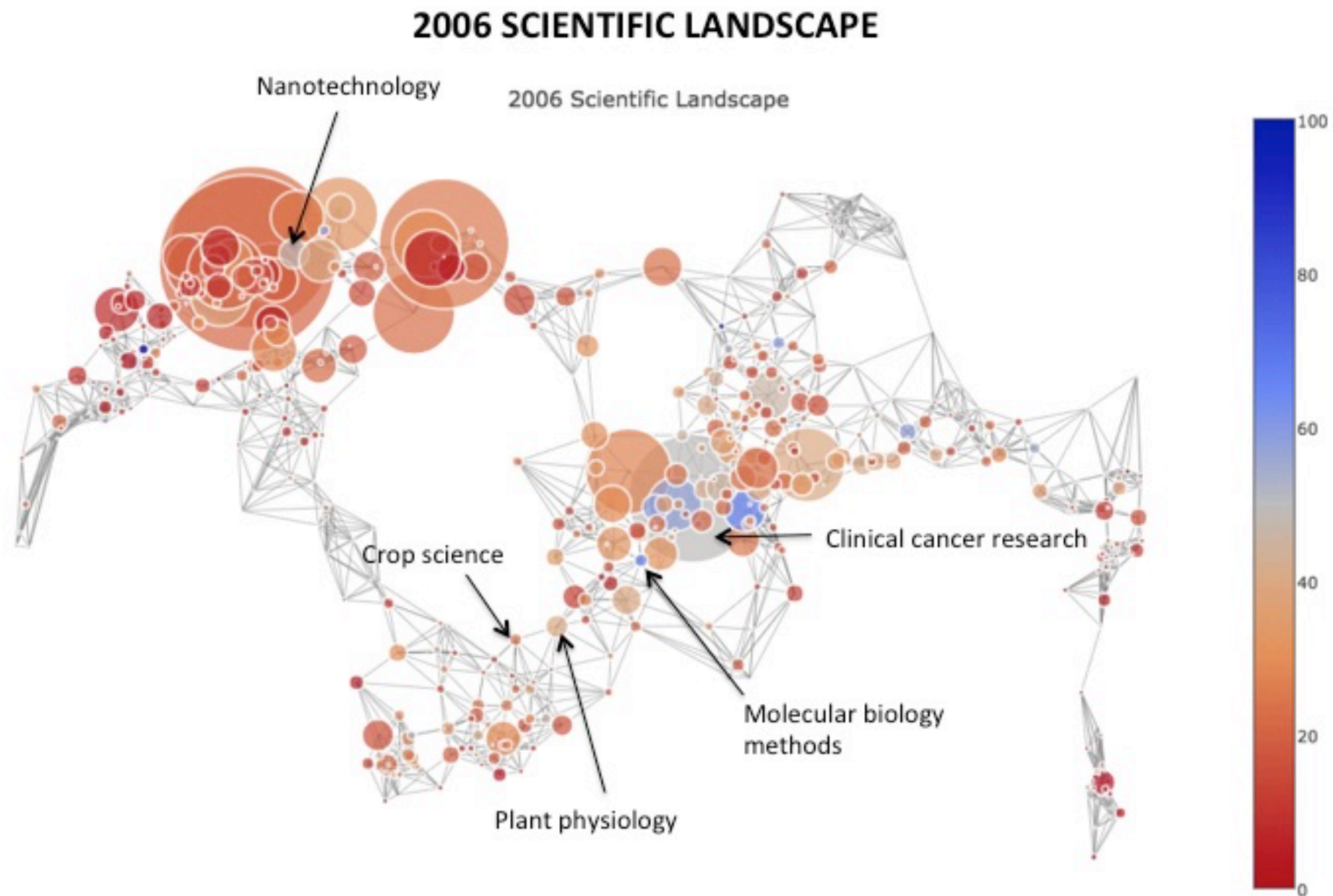
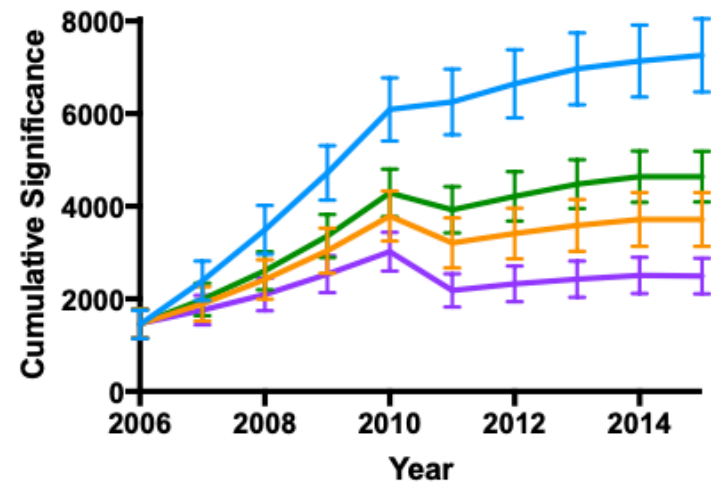
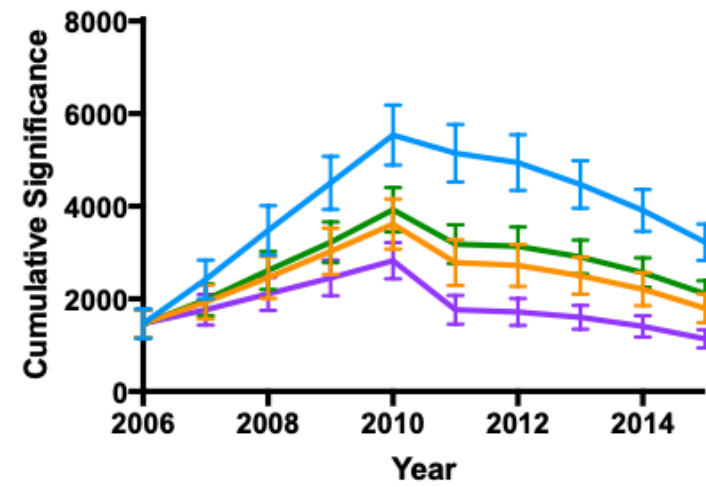
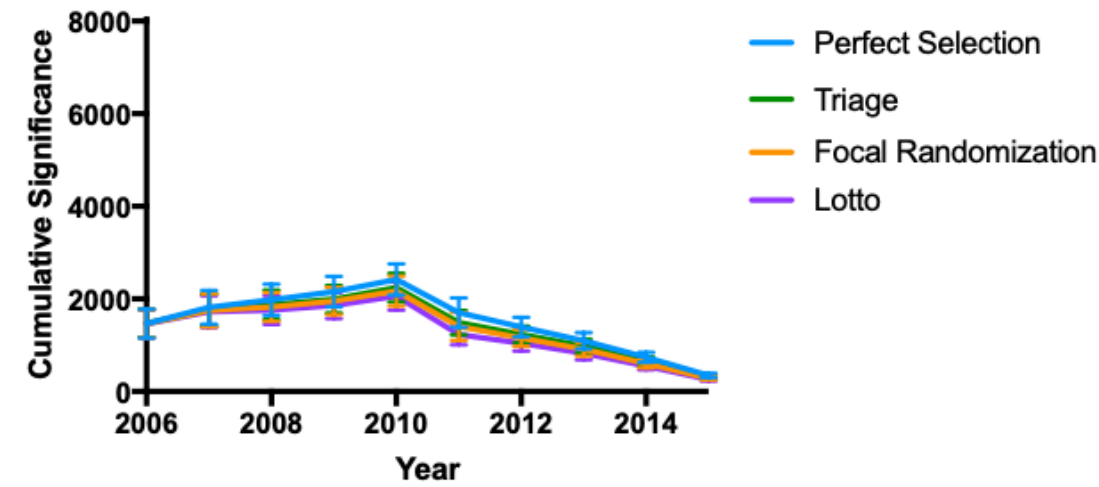
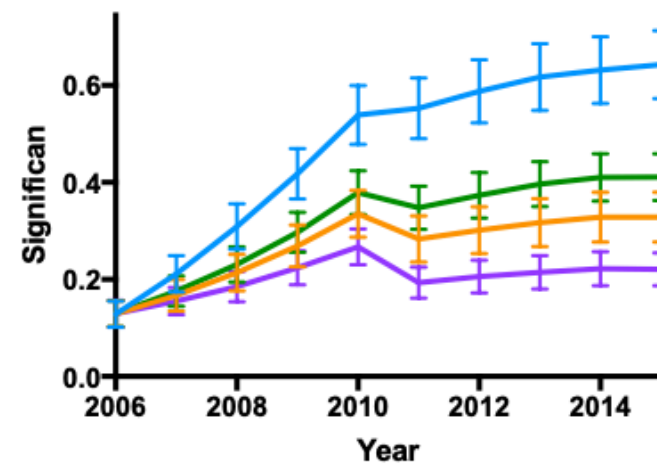
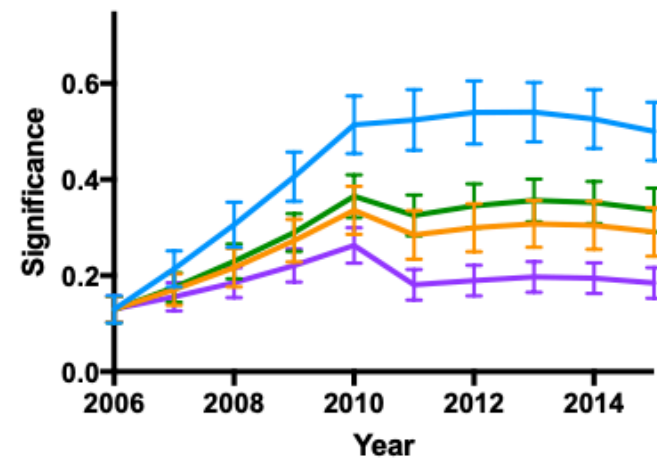
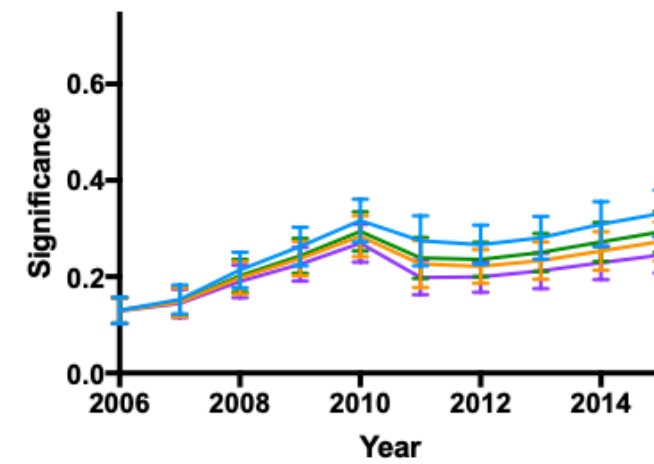


Figure 8: Comparison of renewal likelihood under different funding mechanisms.

Harnage (2018)



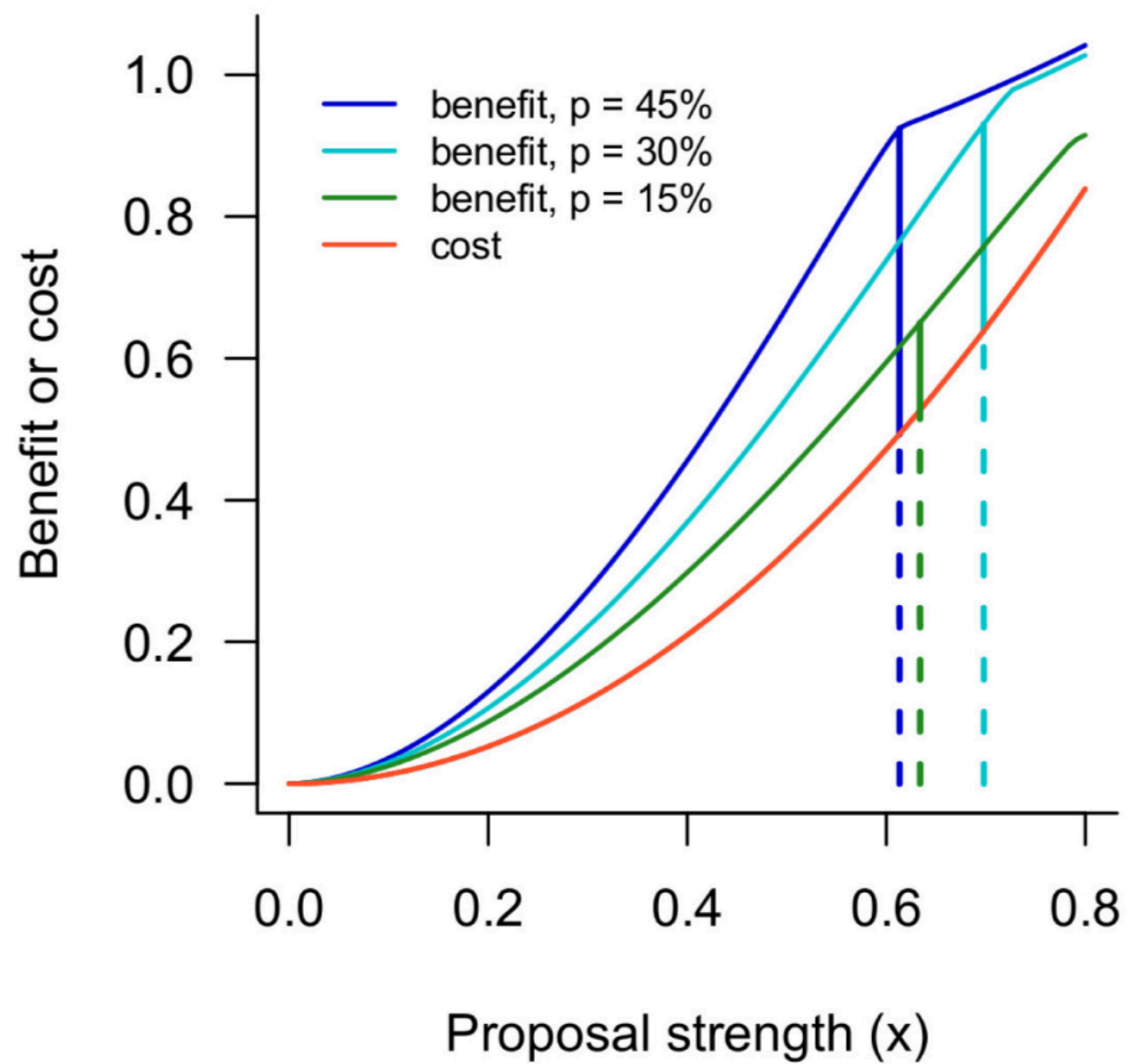
A**Static landscape****B****Ex Ante = Ex Post Landscape****C****Ex Ante \neq Ex Post Landscape****Normalized Static Landscape****Normalized Ex Ante = Ex Post Landscape****Normalized Ex Ante \neq Ex Post Landscape**

Gross & Bergstrom (2019)

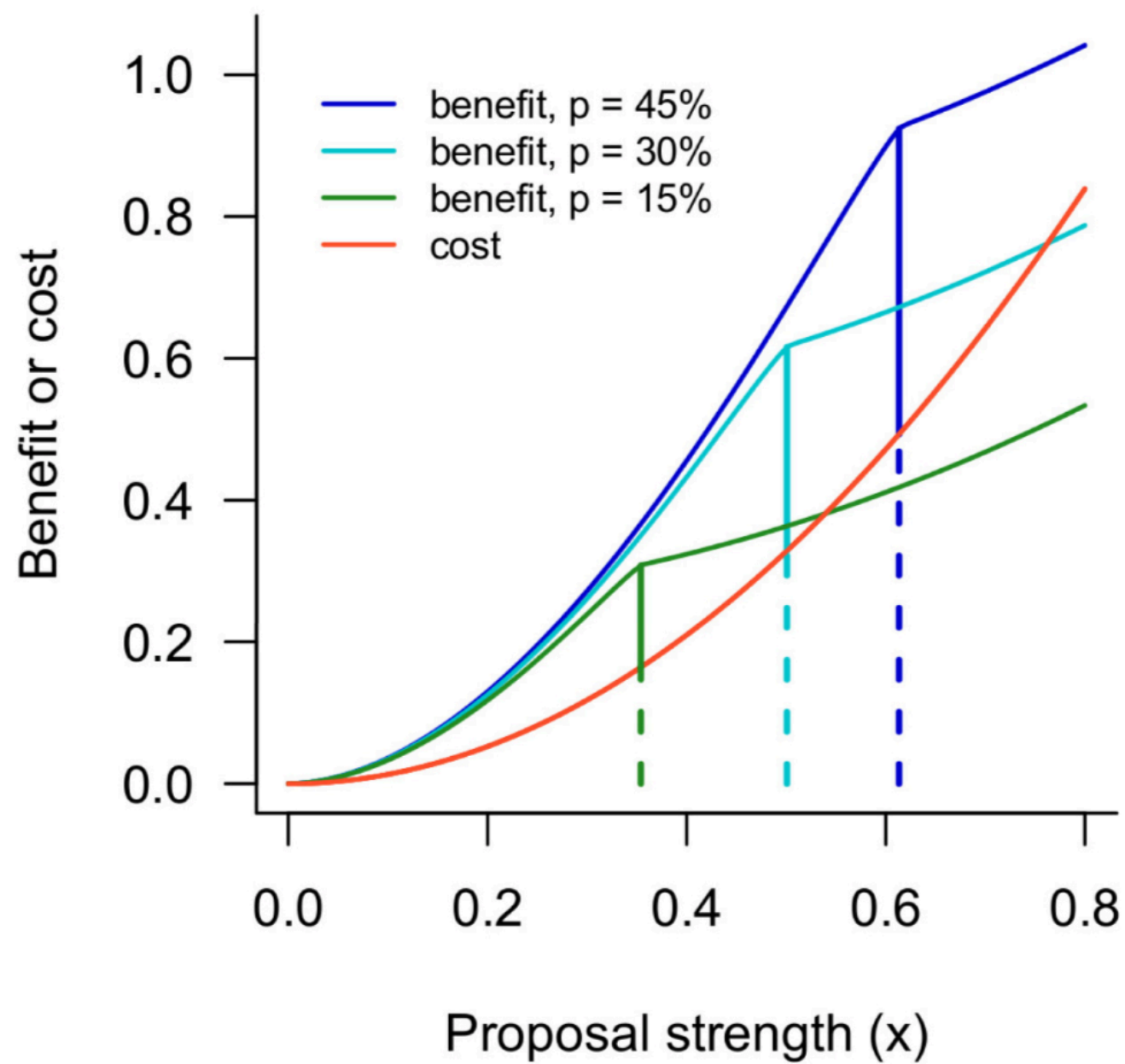
$$b(v) = \arg \max_x \{ (v_0 + v)\eta(x) - (1 - k)c(v, x) \}.$$

$$\text{Investigator's ROI} = \frac{(v_0 + v)\eta(b(v)) - (1 - k)c(v, b(v))}{c(v, b(v))}.$$

A: Proposal competition



B: Qualifying lottery



The scientists'
perspective



Ferroelectric and Antiferroelectric Liquid Crystals

Author: SVEN LAGERWALL¹

Source: *Ferroelectrics*, Volume 301, Number 1, 2004 , pp. 15-45(31)

Publisher: Taylor and Francis Ltd

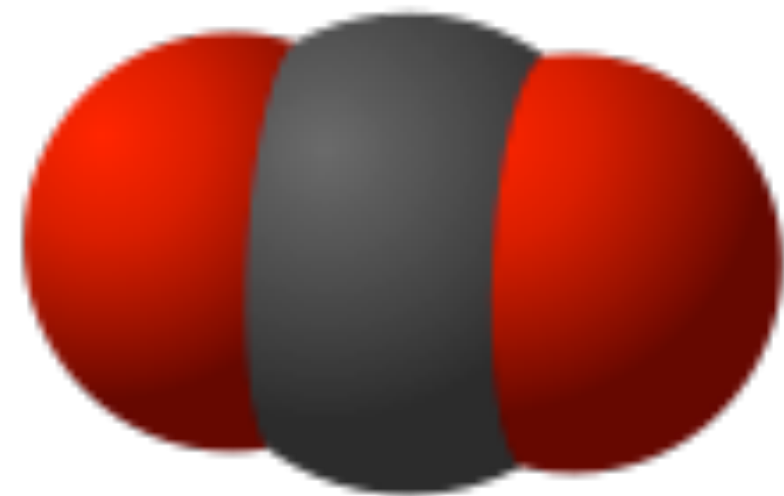
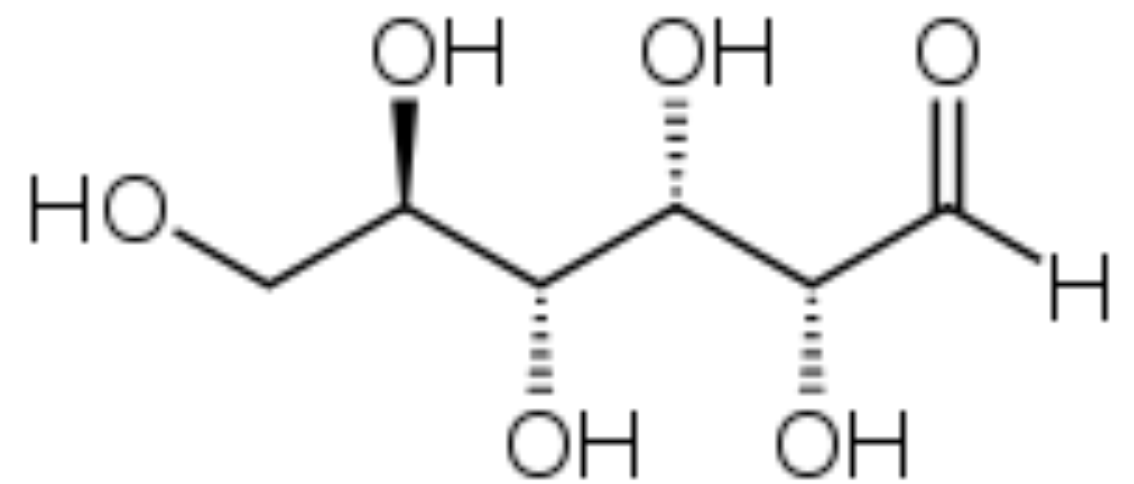
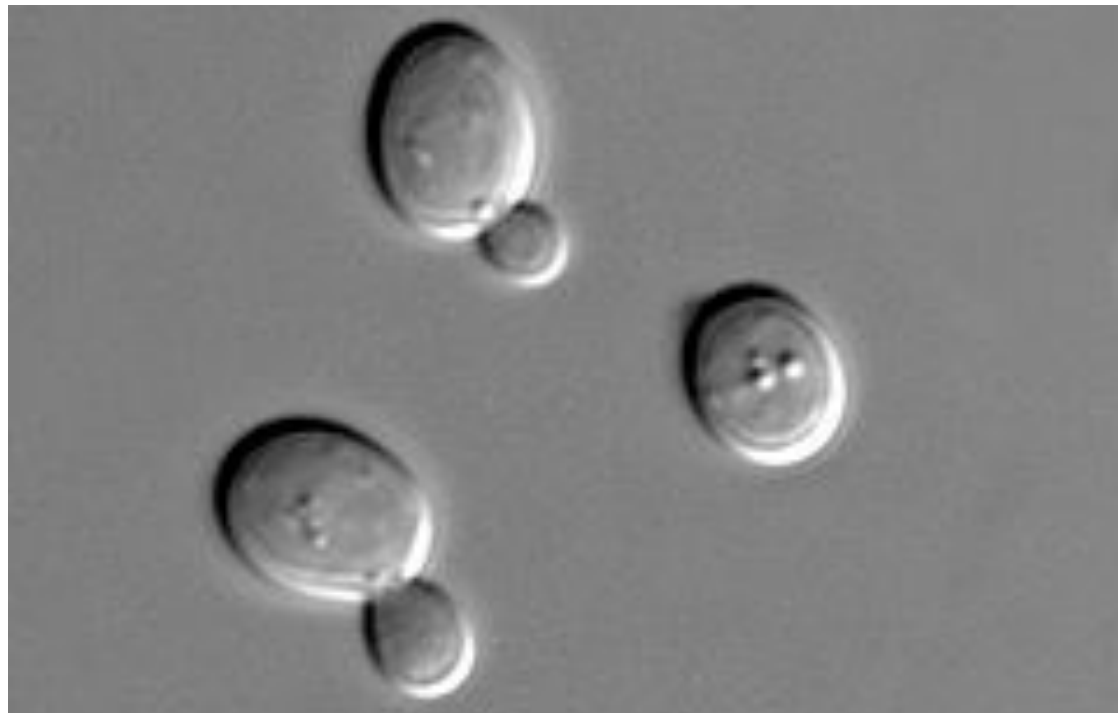
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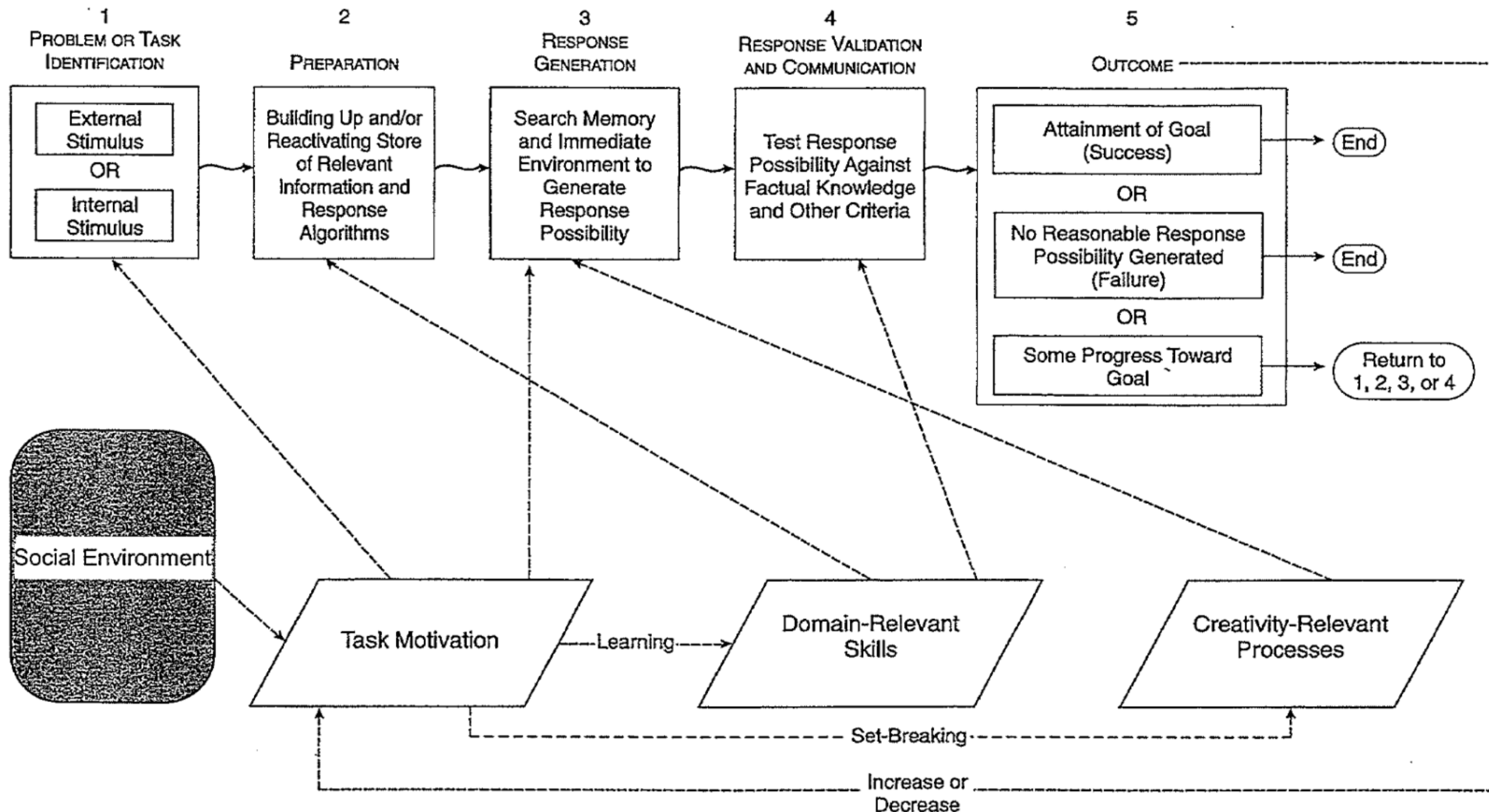
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Abstract:

Ferroelectric liquid crystals have been a major research topic since 30 years. However, when it comes to liquid crystals, the term is ambiguous and frequently not only leads to confusion and misunderstanding but also obscures the basic concepts. The proper term for ferroelectric liquid crystals was first claimed in 1975. Five years later so-called surface-stabilized ferroelectric liquid crystals were described, which gained interest because of their promising electro-optical applications, in particular for high-resolution liquid crystal displays. The considerable activity in synthesizing new compounds with the desired properties. In the course of this materials development ferroelectric liquid crystals were then also sought for and was 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 parallel to this, ferroelectric materials were announced. Moreover, in 1995, a new phenomenon, the "thresholdless antiferro-electricity" was advertised. In light of a certain lack of comfort in adopting terms and definitions taken from the field of solid state phenomena. Therefore, it might be questioned whether liquid crystal materials really qualify to be called "ferroelectric, anti-ferroelectric and ferroelectric." My own answer to this is to be least, no liquid crystal so far is 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 the



Amabile (1996)



Turn: 25

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Research

Work in Progress (0)

Unpublished (1)

Published (6)

apply for funding



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...



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Some Strange Plants
in Of Puddle Water
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Can Lick My Other

Some of Strange Plants
Water

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- Beni (0)

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Equipment:

- 1 PCR (0)
- 1 epMotion

buy new equipment

“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

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