

**THE TRANSFORMATION OF
TECHNOLOGY BY SCIENCE ---
IMPLICATIONS AND INTERROGATIONS**

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«Democritus (...) is the last of the Greek philosophers to be free from a certain fault which vitiated all later ancient and medieval thought (...).

Their attitude, in the main, was genuinely scientific whenever it did not merely embody the prejudices of their age. But it was not *only* scientific; it was imaginative and vigorous and filled with the delight of adventure. They were interested in everything --- meteors and eclipses, fishes and whirlwinds, religion and morality: with a penetrating intellect they combined the zest of children.

From this point onwards, there are first certain seeds of decay, in spite of previously unmatched achievement, and then a gradual decadence. What is amiss, even in the best philosophy after Democritus, is an undue emphasis on man as compared with the universe. First comes scepticism, with the Sophists, leading to a study of *how* we know rather than to the attempt to acquire fresh knowledge. Then comes, with Socrates, the emphasis on ethics; with Plato, the rejection of the world of sense in favour of the self-created world of pure thought; with Aristotle, the belief in purpose as the fundamental concept in science. (...) After their time, there was a decay of vigour, and a gradual recrudescence of popular superstition».

Bertrand Russell

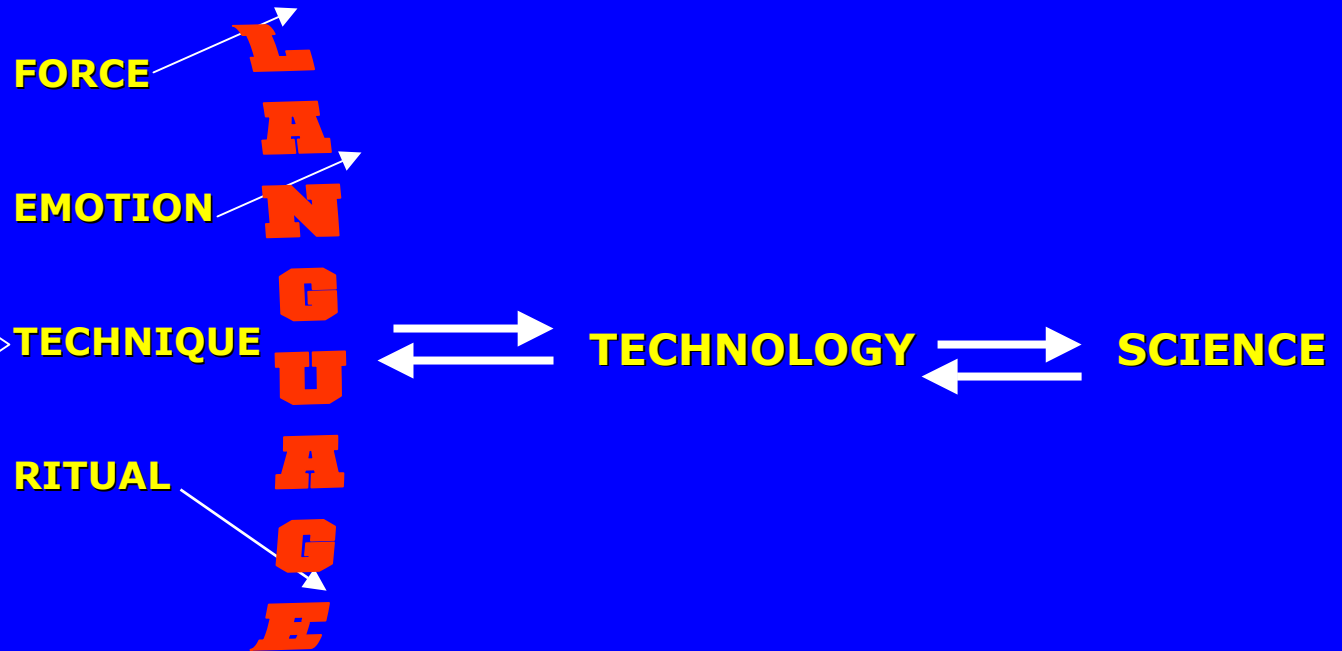
A History of Western Philosophy (1945).

HOW KNOWLEDGE EVOLVES

SURVIVAL



- food
- transport
- tools & materials
- processes
- culture & organization



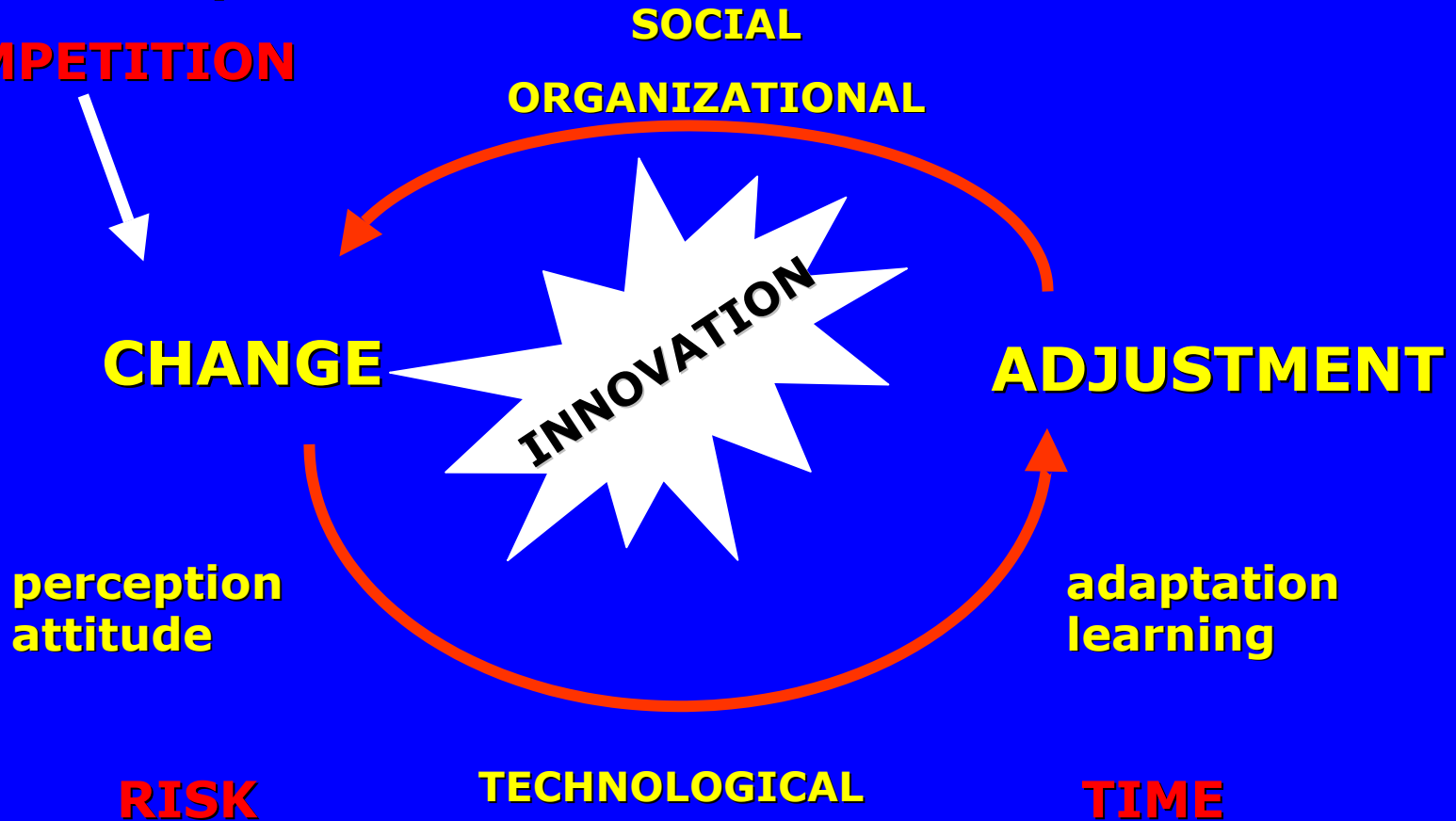
TACIT

EXPLICIT

DISCIPLINARY

TRANSFORMATIONS IN SOCIETY

**(SURVIVAL)
COMPETITION**



Source: Polanyi 1944

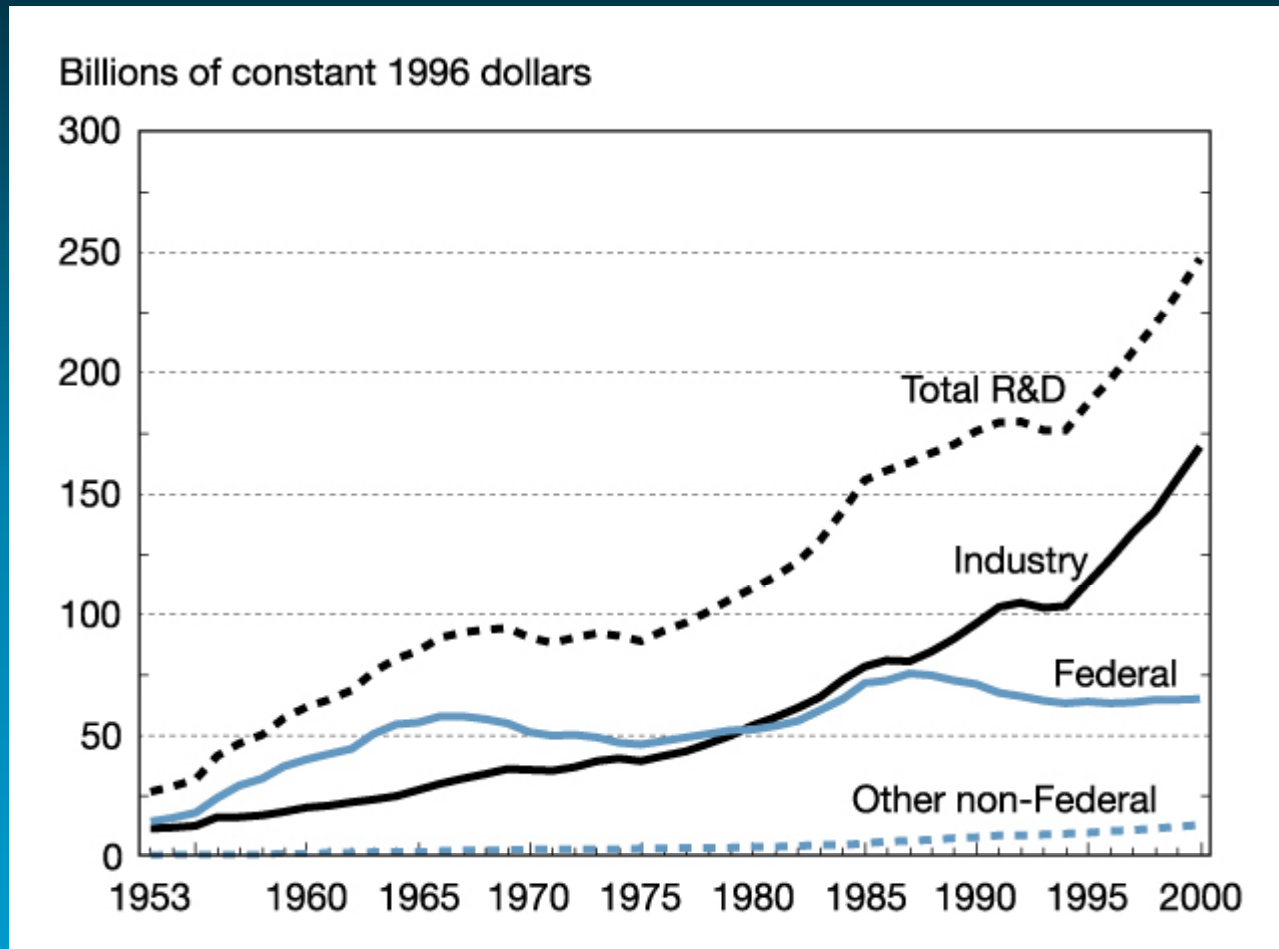
IMPLICATIONS OF THE NEW PROCESS OF TECHNOLOGICAL DEVELOPMENT (S → T) - I

- 1. New sectors of economic activity (hi-tech)**
- 2. A new discipline (science policy / STS)**
- 3. A new political need (diffusion, pus, pas, pes)**
- 4. New concepts (S&T; R&D)**
- 5. New societal relationships (university/industry)**
- 6. A new structure (S&T system)**

IMPLICATIONS OF THE NEW PROCESS OF TECHNOLOGICAL DEVELOPMENT (S → T) - II

- 7. New universities (the research university)**
- 8. A new academic degree (the research Ph.D)**
- 9. A new profession (scientific researcher)**
- 10. A new skill/craft (technology management)**
- 11. The two Cultures**
- 12. A new mode of knowledge creation (Mode 2)**

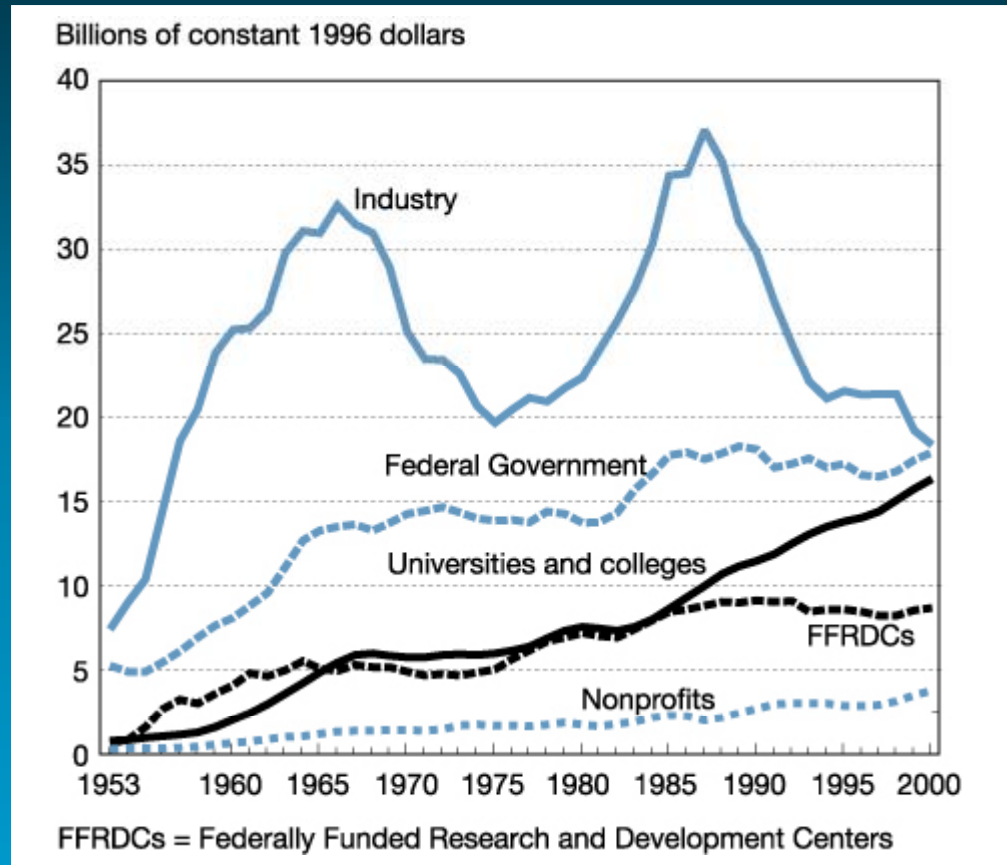
U.S. R&D funding, by source



SOURCE: National Science Board, *Science and Engineering Indicators-2002*



Federal R&D support, by performing sector: 1953-2000



SOURCE: National Science Board, *Science and Engineering Indicators-2002*



CHANGING RELATIONS BETWEEN SCIENCE, TECHNOLOGY, THE ECONOMY & SOCIETY

- globalization of the markets** → **global opportunities/
greed/institutions ?**
- mutation in work and
employment** → **communicating/
analysing/deciding ?**
- a more technological
society** → **new skills/learning/
citizenship ?**
- more science-based
technology** → **“commodization” or
emancipation ?**