



**Political Influence, Societal Demands, and
the Expectation of Economic Returns:
Threats or Possibilities for Research?**

László Lovász
Hungarian Academy of Sciences

Two types of research

Basic Research

Applied research

Curiosity driven

Agenda driven

Bottom-up

Top-down

Time scale:

years

weeks

Results:

uncertain

planned

published

classified, patented



Top down problems

Global warming, migration, cancer, water supply, biodiversity, self-driving cars, ...



Bottom-up problems

How can bacteria survive under extremely adverse conditions in hot springs?

Can we improve the error term in the Prime Number Theorem from $o(n)$ to $O(n^{1/2})$?

Did the Hungarian army requisite bells of catholic, orthodox or protestant churches in Transsylvania to cast cannons during the 1948/49 revolutionary war?



Bottom-up problems

Basic Research: „Miracle machine”

(Eric Lander)

How can bacteria survive under extremely adverse conditions in hot springs?

> PCR

Evolution: antibiotics-resistant bacteria

> defense?



Bottom-up problems

Can we improve the error term in the Prime Number Theorem from $o(n)$ to $O(n^{1/2})$?

„No one has yet discovered any warlike purpose to be served by the theory of numbers or relativity, and it seems unlikely that anyone will do so for many years.”

Godfrey Harold Hardy

> Cryptography, computer security



Bottom-up problems

Did the Hungarian army requisite bells of catholic, orthodox or protestant churches in Transsylvania to cast cannons during the 1948/49 revolutionary war?

> Reconciliation between nations?!



Even within one type...

Can the requested grant funding be reduced?

Biologist (medical doctor, chemist, experimental physicist, geologist): *How could it? You must plan your project carefully. If you'r willing to accept a smaller grant, you should not get anything!*

Mathematician (historian, phylosopher, theoretical physicist): *Why not? I want to get enough for my salary, 2-3 conference participations, laptop... I promise I will study good problems, but I don't know what will interest me in 4 years... If I get 2-3 PhD students or postdocs, I will gladly introduce them to research, but their number is not important for my research.*



Connecting

Basic research

- > incubators, venture capital
- > innovations

Social demand

> ???

- > curiosity-driven research



Connecting

How to orient bottom-up research to support top-down goals?

How to kindle the curiosity of researchers in questions relevant for societal challenges?

How to allow time for basic research about pressing problems?



Examples

Bell Labs (transistor, Unix, C, interior point methods for loinear programming...)

IBM Research Center (fractals, information complexity, graph spectral theory...)

Microsoft Research (topological quantum computation, graph limit theory...)



Examples

Convergence:

physics ↔ mathematics (18th century)

computer science ↔ network science,
discrete mathematics
(20th century)

biology ↔ chemistry (21st century)



Examples

Long-term research programs

Methodology of education ~ 10-15 groups,
8-10 years

Kodály method in music

Vargha method in mathematics

Water management, pollution, utilization

Drought resistant crops

Sustainable medical care



Politics and research

Lamar Smith (R-Texas): “The academic community forgets that federal science funding should be in the national interest.”

William Proxmire (D-Wisconsin): Golden Fleece Award ridiculing basic research, like „The sex life of screwworms”.

\$ billions in agriculture!



Politics and research

„The Academy should stick to science, don't interfere with politics!”

Small country: focus on applying results of basic science to our needs.

community, connections, information, education



Science advice mechanisms

Should give all our support to do it right!

How to do it in a small country?

Fear of science



What could ALLEA do?

- Facilitate exchange of ideas about such problems, topics and areas
- Recommend to the EU research centers bringing together agenda-driven and curiosity driven researchers
- Recommend university programs for interdisciplinary research capabilities and interests





Thank you!