Genetic research:
Long-term innovative potential & its suppression

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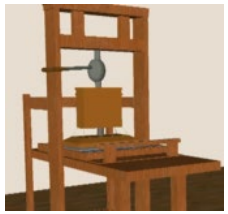
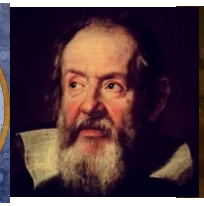
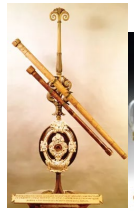
Scientific revolution





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Refs: http://en.chinaculture.org
https://www.britannica.com
https://www.worldhistory.org
https://www.heritage-print.com

Fitness landscape

Centralized: Rapid climbing, but near the local peak

Diversity-driven: Suboptimal exploration, but to the global peak

These days …

National Institutes of Health
Turning Discovery Into Health

National Science Foundation
WHERE DISCOVERIES BEGIN

Research Grants Council 研究資助局

nature

Science

Cell

PNAS

Commercial pressure:
Short-term returns & risk aversion

The Review of Financial Studies

Missing Novelty in Drug Development*

Joshua Krieger
Harvard Business School

Danielle Li
MIT Sloan and NBER

Dimitris Papanikolaou
Kellogg School of Management

Investigate Midwest

ENVIRONMENT

BP cuts funding for 'most promising' biofuel

by August 20, 2015 Why you can trust Investigate Midwest

Commercial pressure:
Short-term returns & risk aversion

How about the case of genetic research?

Ref: Depositphotos

Paper vs. Patent

Paper: Only few % company-funded for each gene

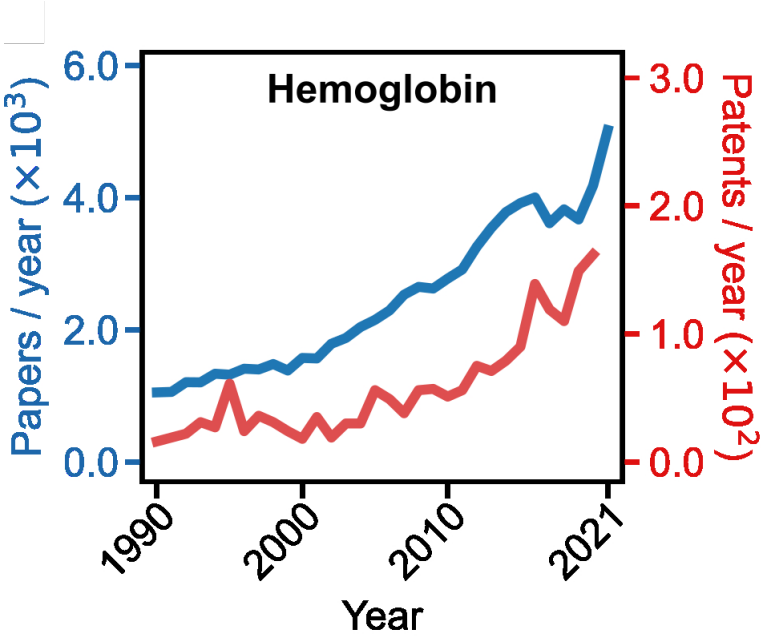
Patent: >70% company-assigned for each gene
→ Mostly driven by industry

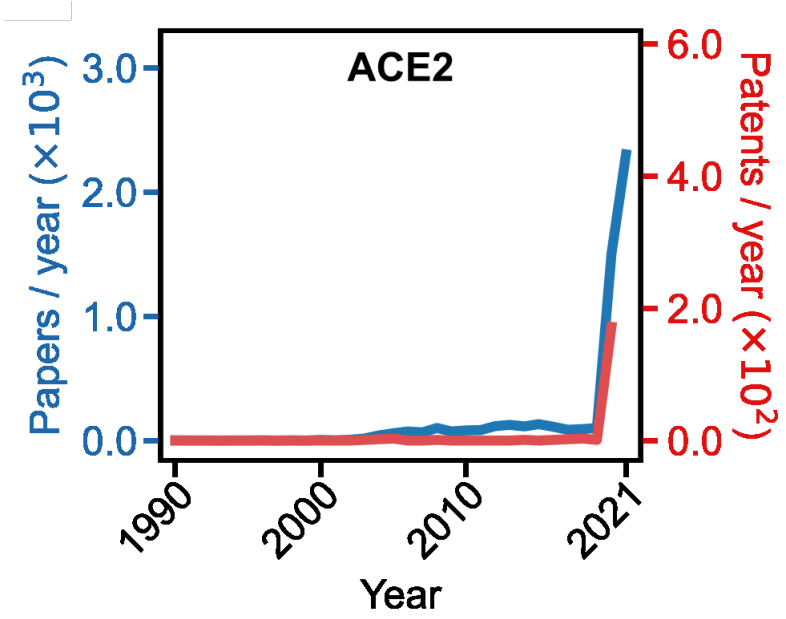
Datasets

Various bio- and medical areas, about 20M papers and patent families (US, China, Europe).

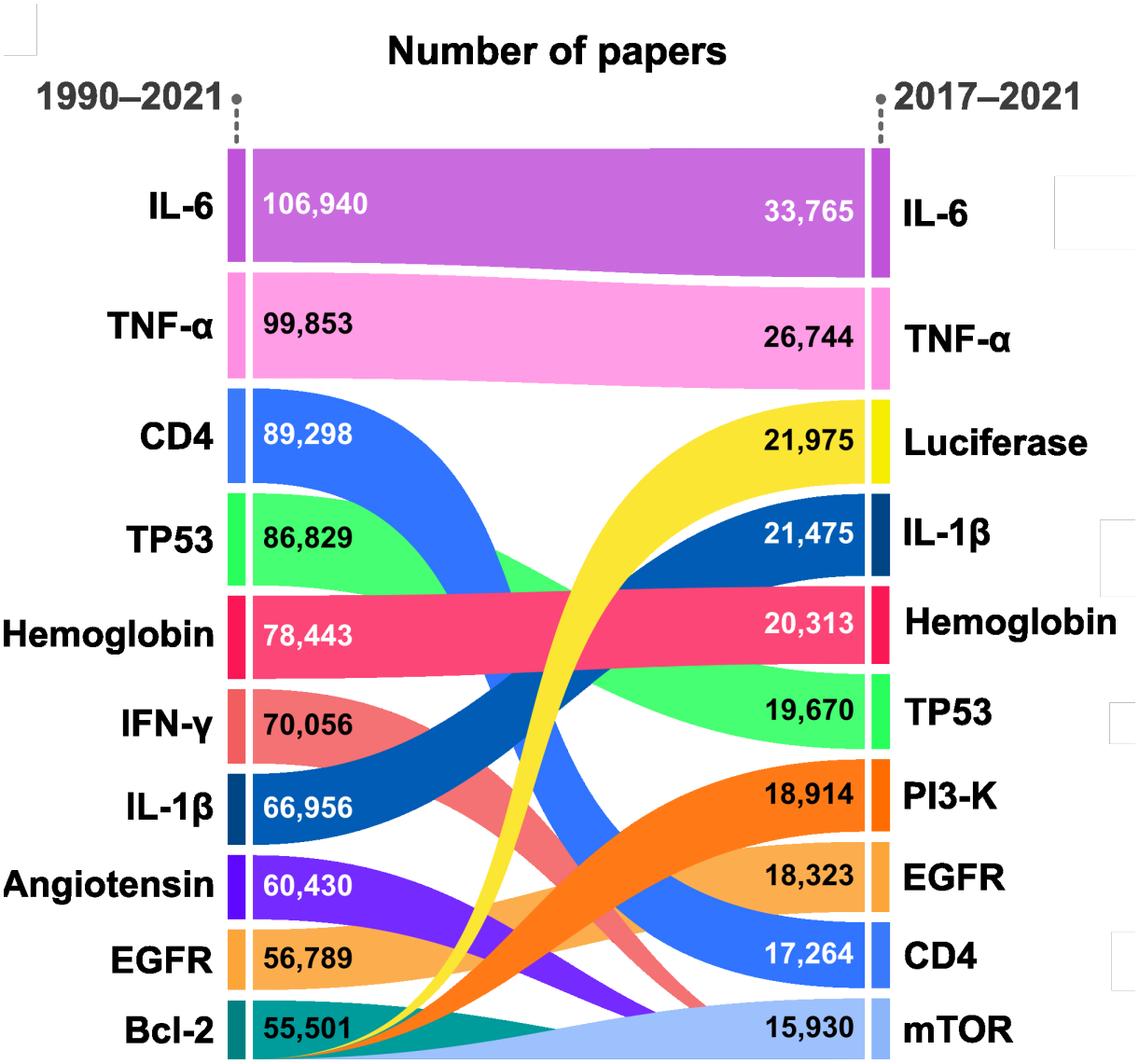
Genes for protein production (UniProtKB/Swiss-Prot)

Paper vs. Patent

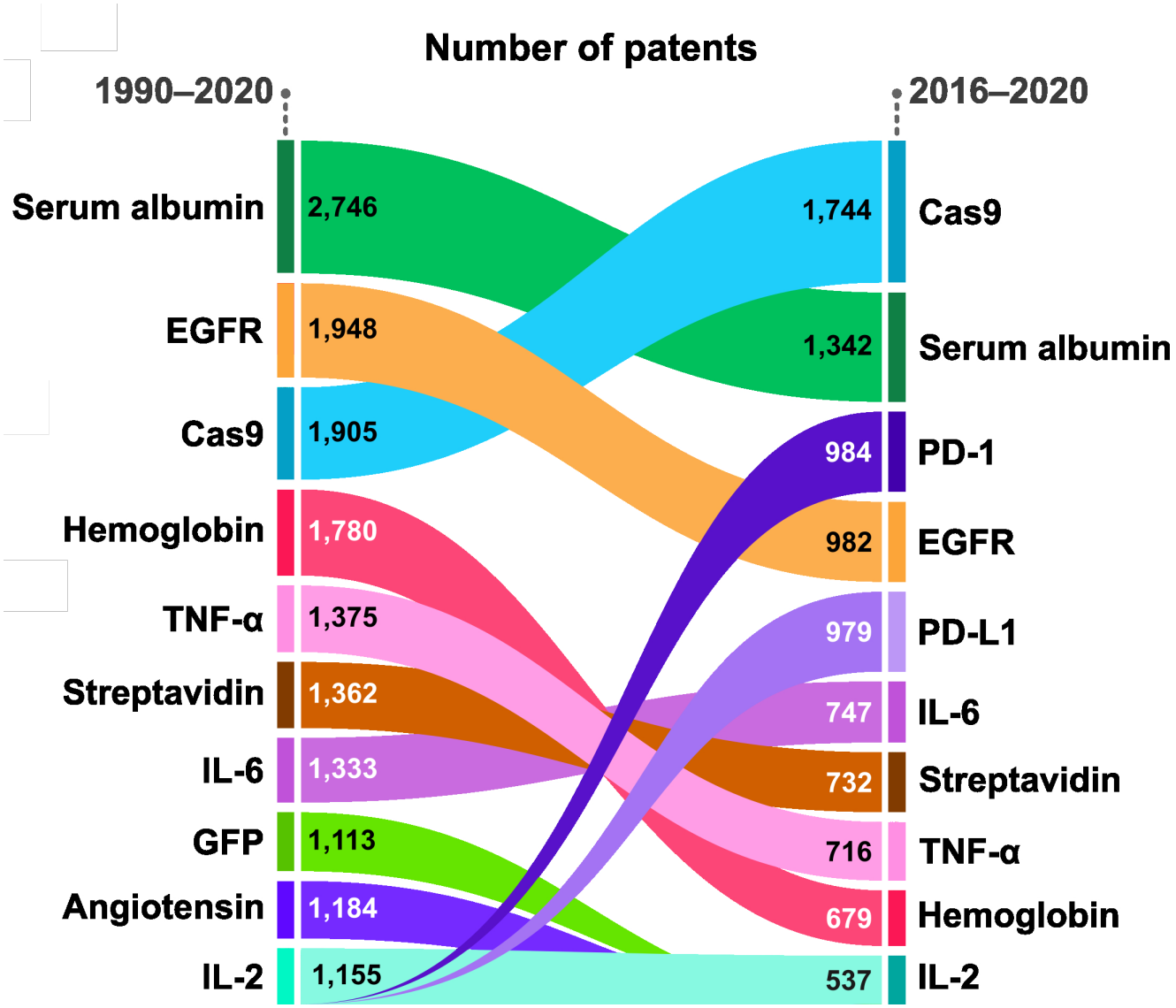




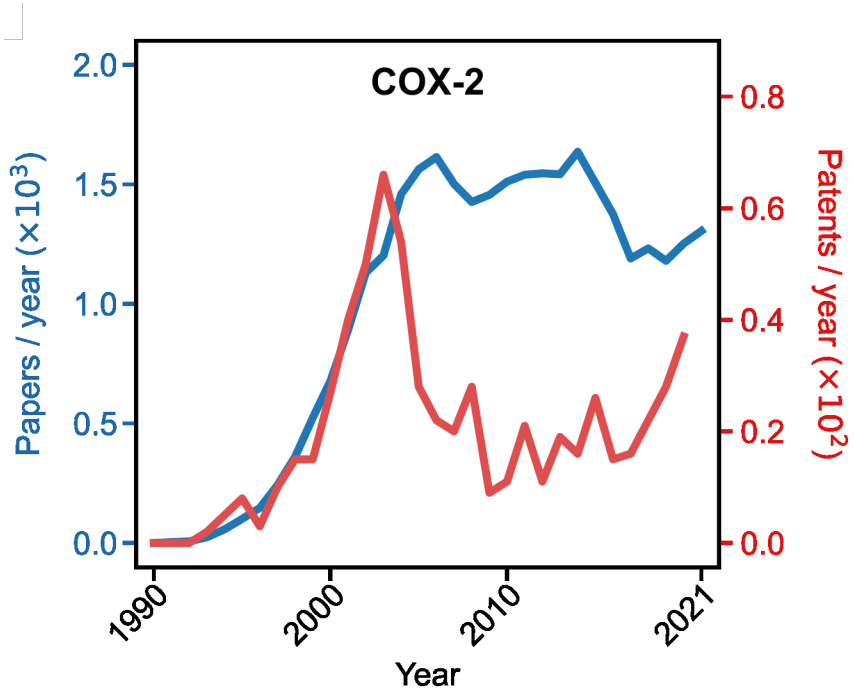
Top 10 genes in papers

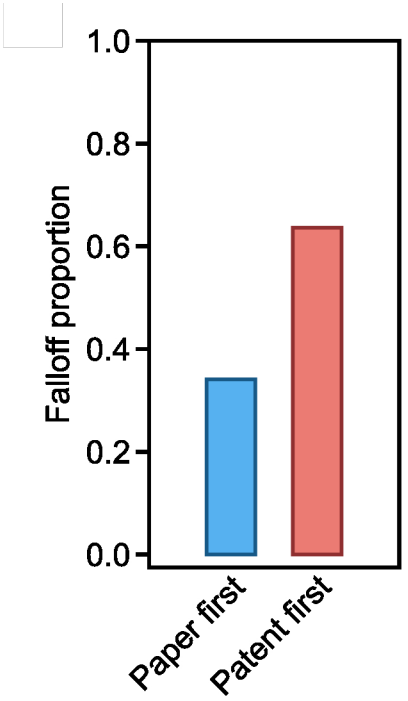


Top 10 genes in patents

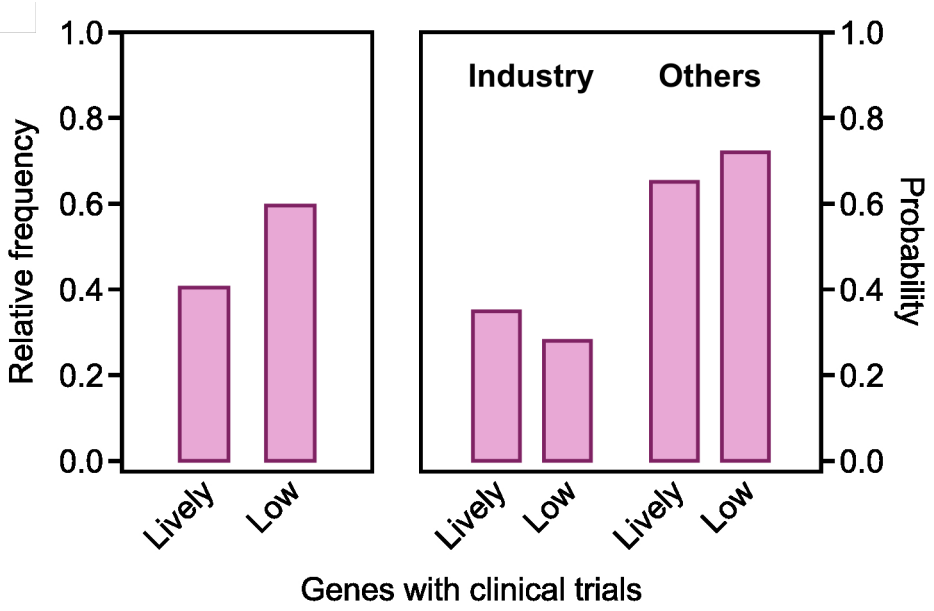


Industry interests vs. scientific research



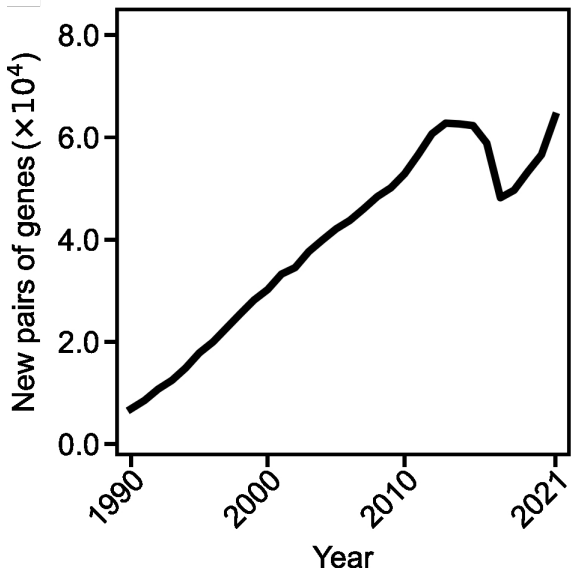


Industry interests vs. scientific research



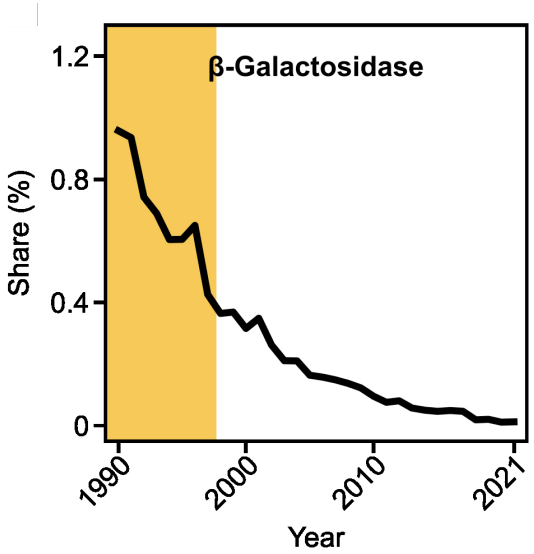
Genes with clinical trials:

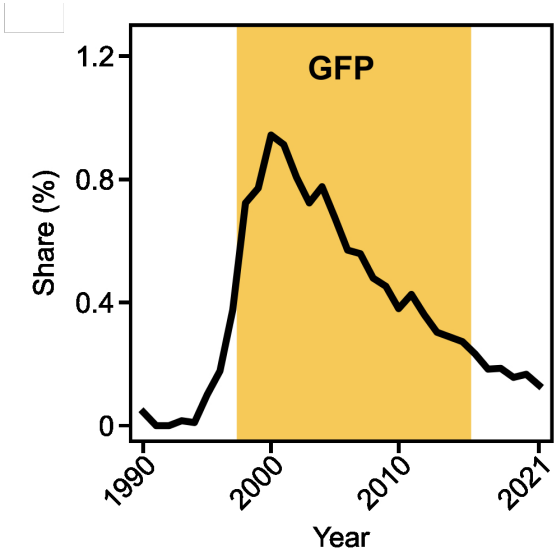
Example of the pursuit of impactful works

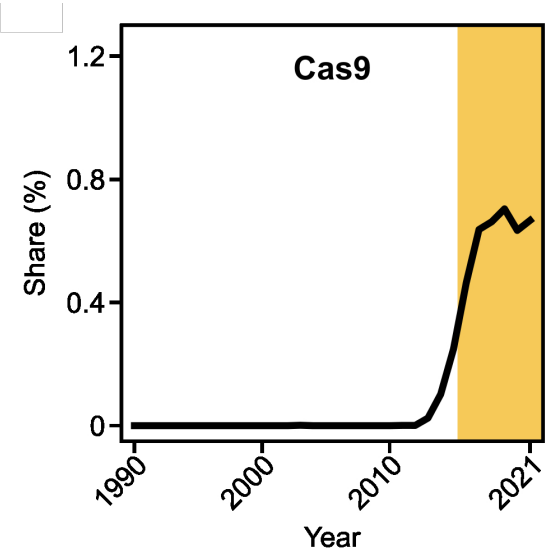


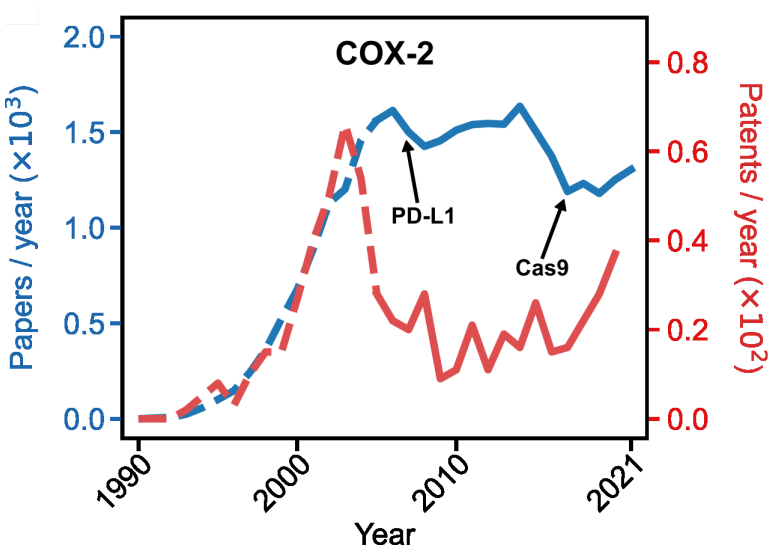
New combinations of genes

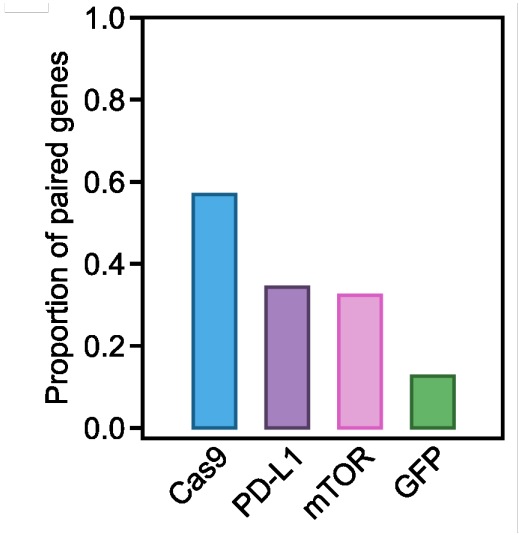
→ Innovative attempts.









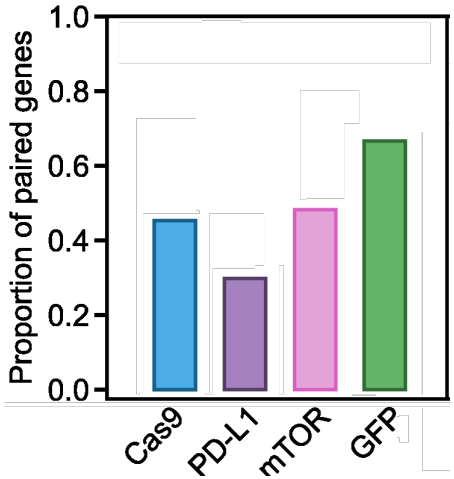


Long-term exploration continues after the patent falloff.

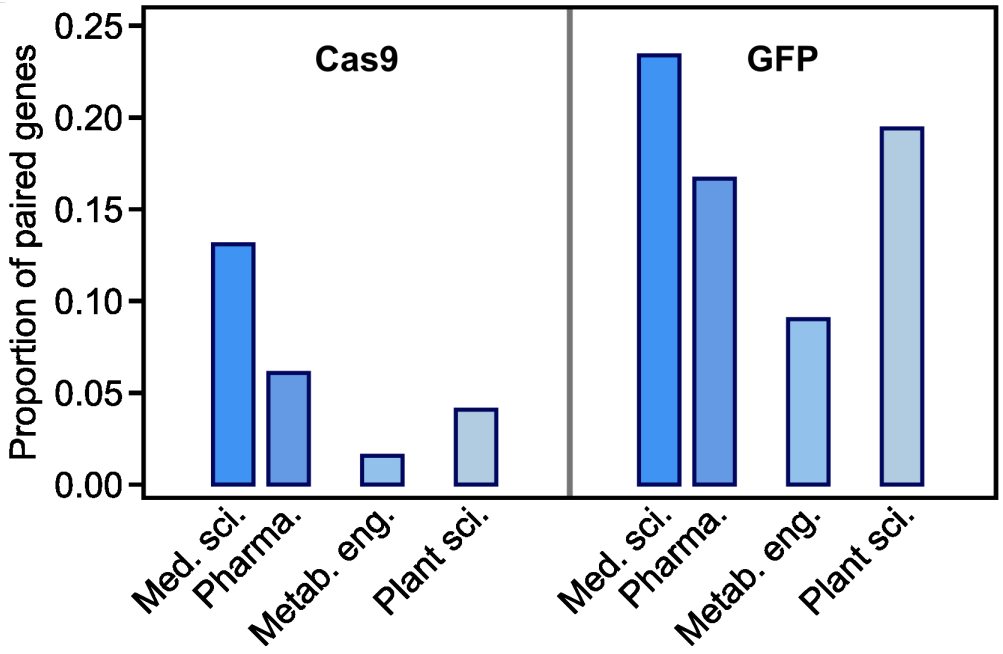
What if commercial pressure propagates from industry to scientific activities outside?

→ **Movel gene pairs lost.**

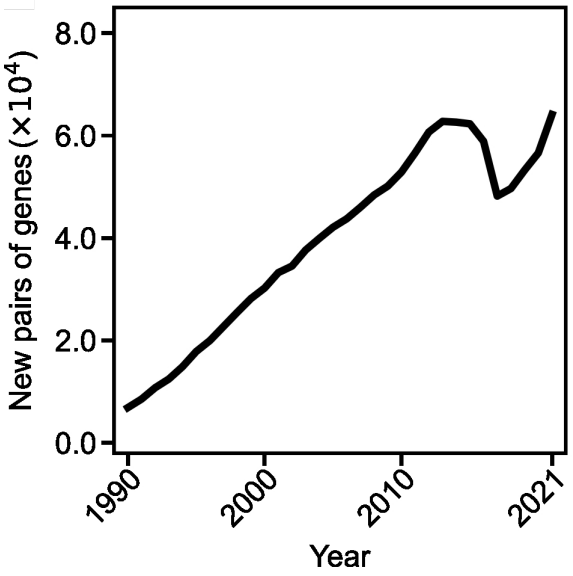
→ **Cost of over-reliance on commercially-driven research.**

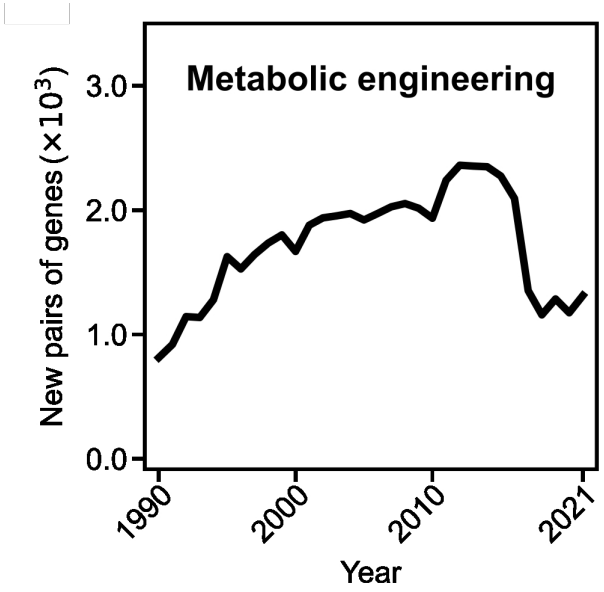


Fields of highly commercial focus



Proportion of genes in each thematic category, paired in the early stage





New pairs of all genes

→ Warning for low innovation vitality

Despite the perceived positive role of commercial pressure in technology progress …

POLICY FORUM

ARTIFICIAL INTELLIGENCE

The growing influence of industry in AI research

Industry is gaining control over the technology's future

By Nur Ahmed[1,2], Muntasir Wahed[3], Neil C. Thompson[1,2]

of talent, we see that industry is winnin
contest. Data on North American uni

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Any implications?