

Panel on Outcomes and Impacts of Convergence

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The Challenge



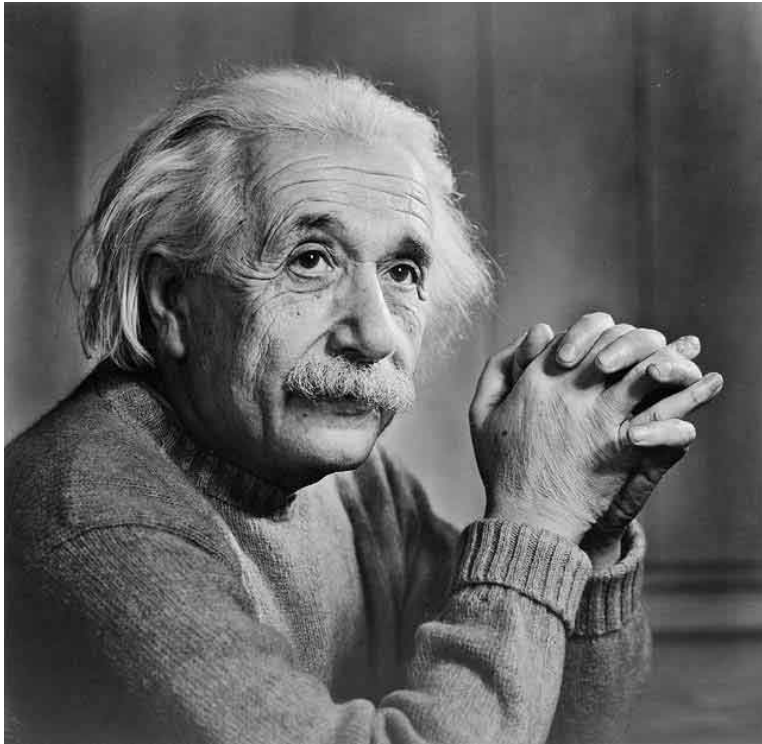
The pond still seems full of big fish

- Health & longevity; energy; AI; quantum computing; AV; education tech; space travel; cosmology...

But it's getting hard to catch them

The Burden of Knowledge

A challenge not with the fish, but with the fishermen (Jones 2009)

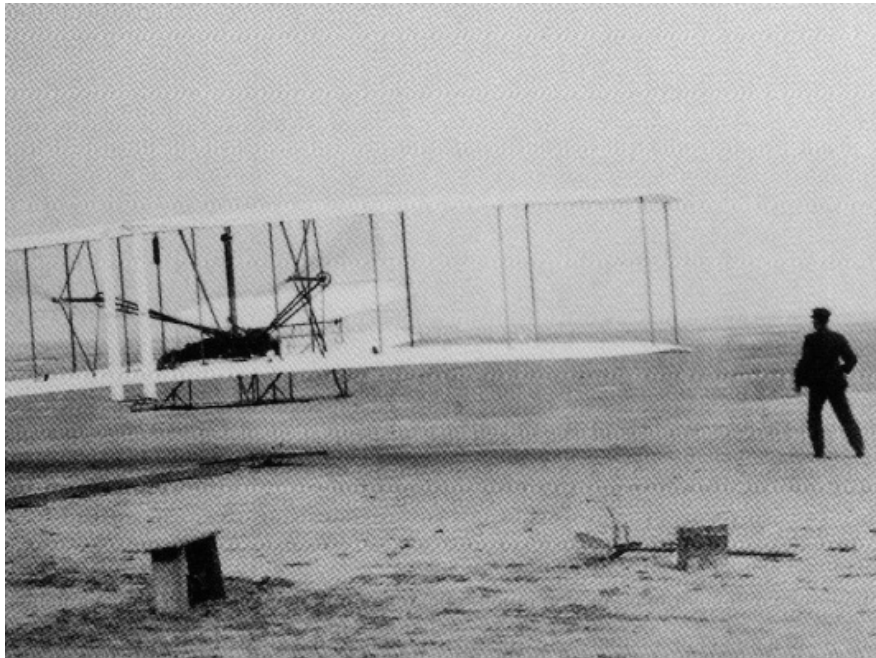


"...knowledge has become vastly more profound in every department of science. But the assimilative power of the human intellect is and remains strictly limited. Hence it was inevitable that the activity of the individual investigator should be confined to a smaller and smaller section..."

-- Einstein (1932)

The Rise of Teams

With narrowing expertise, teams become increasingly essential to drive advances/breakthroughs



First airplane

Wright brothers



787

30 different disciplines just to design engines

The Team Impact Advantage Today

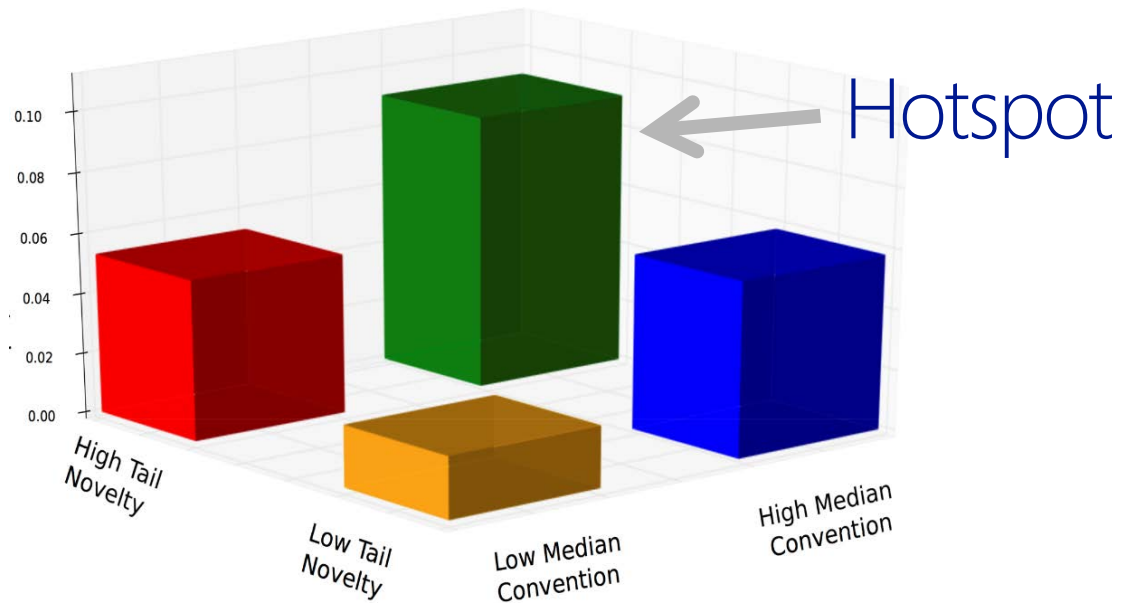
	Probability > 100 citations		
	Team	Solo	Team/Solo
Science and Engineering	1.21%	0.28%	4.25
Social Sciences	0.59%	0.13%	4.57
Patents	0.025%	0.015%	1.65

Teams have a large and increasing advantage in producing the highest impact ideas (Source: Wuchty, Jones, Uzzi 2007; Jones 2011)

Combinations of Existing Knowledge

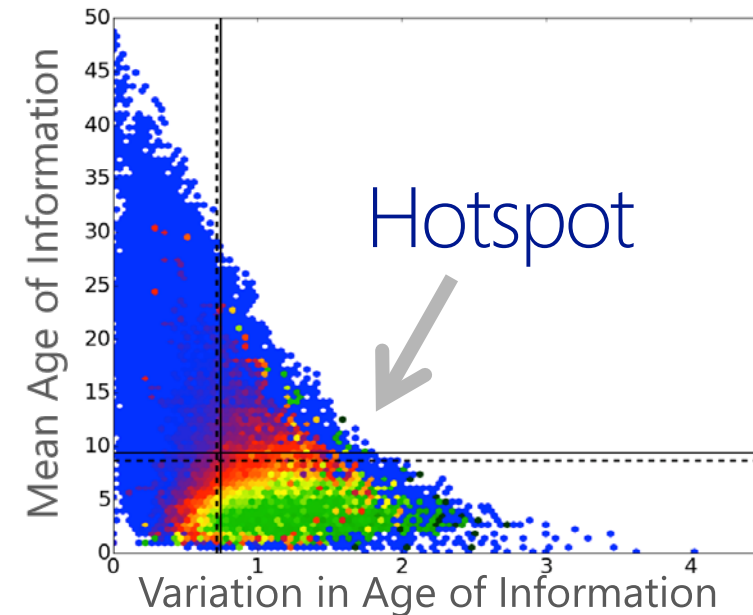
Probability of a “Home Run”

Novel & Conventional Combinations



Source: Uzzi et al. 2013 (papers); He and Luo 2017 (patents)

Combining Old & New



Source: Mukherjee et al. 2017

Teams far more likely to hit these “hotspot” combinations

How To Make Good Combinations Happen?



Hard question!

- R&D outcomes very hard to predict
- Expertise narrows for funders/reviewers, too
- Get people out of silos, but with whom?
- Set of potential combinations is effectively infinite, and most are likely useless

Some Design Principles for High Impact

1) Demand side is key, and relatively easy

- Define problems to solve (c.f., design thinking, lean startup)
- For basic research, funding agencies are the “market”

2) Cultivate convergence, but let teams self-assemble

- Solve social network and funding constraints
- But teams have to work organically

3) Expect failure, and design for it

- Manage portfolio of diverse avenues
- Coordinate, rather than predict

Thank you!