



Distributed Innovation

Niki Kittur | kittur.org



Thanks to

Carnegie Mellon

Felicia Ng
Hyeonsu Kang
Robert Kraut

Lisa Yu



Dafna Shahaf
Tom Hope
Karni Gilon



Joel Chan



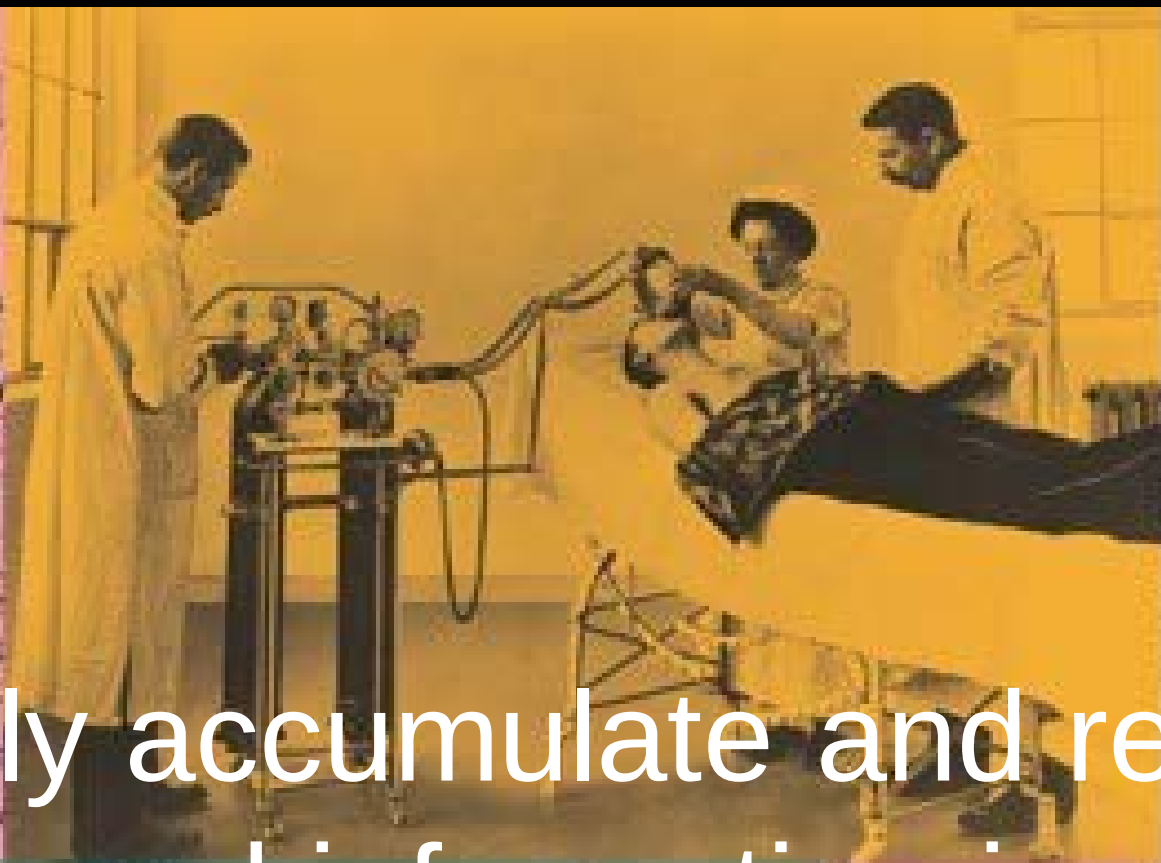
Hila Lifshitz-Assaf

Alex Deghan
Paul Bunje

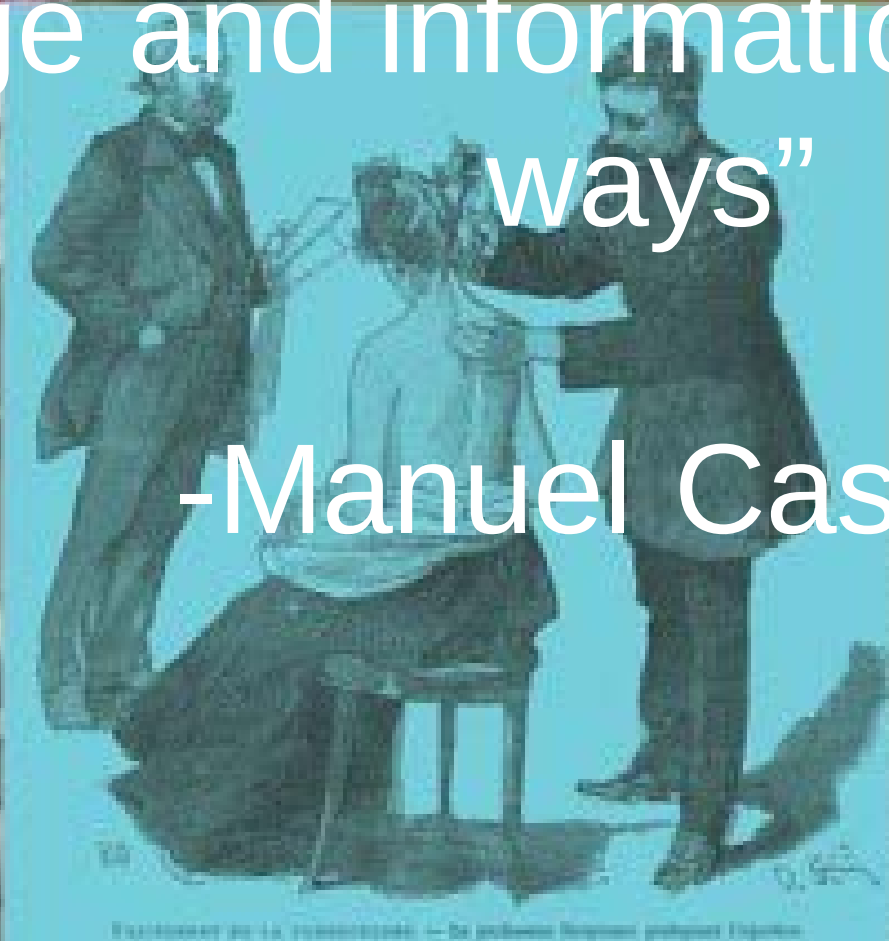
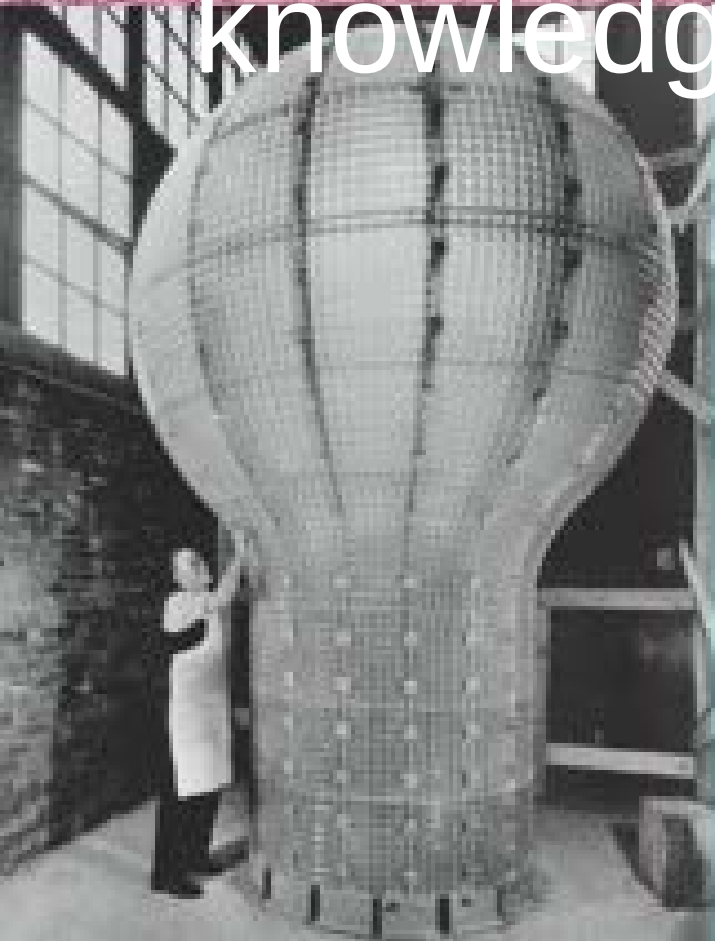


Cassie Hoffman
Tom Quigley

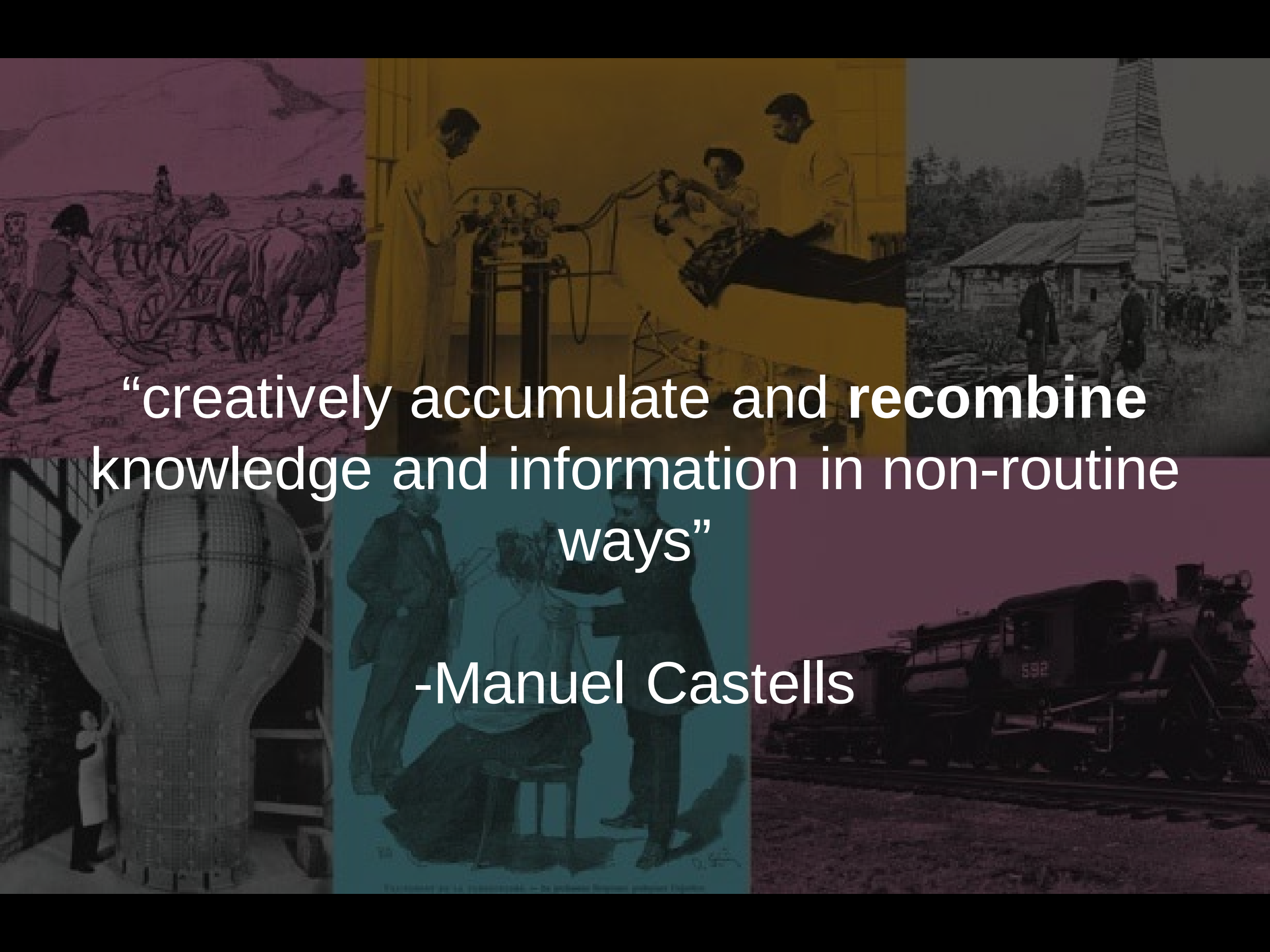
*Thanks to generous funding support from: NSF,
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“creatively accumulate and recombine
knowledge and information in non-routine
ways”



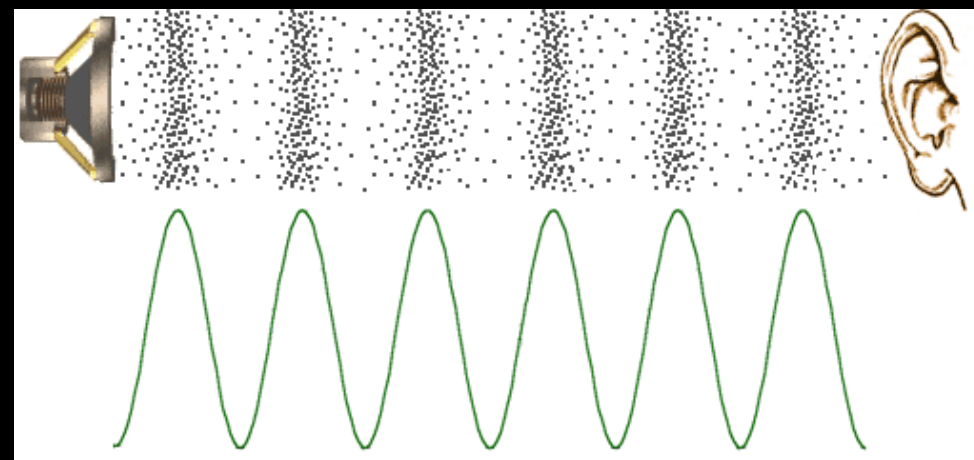
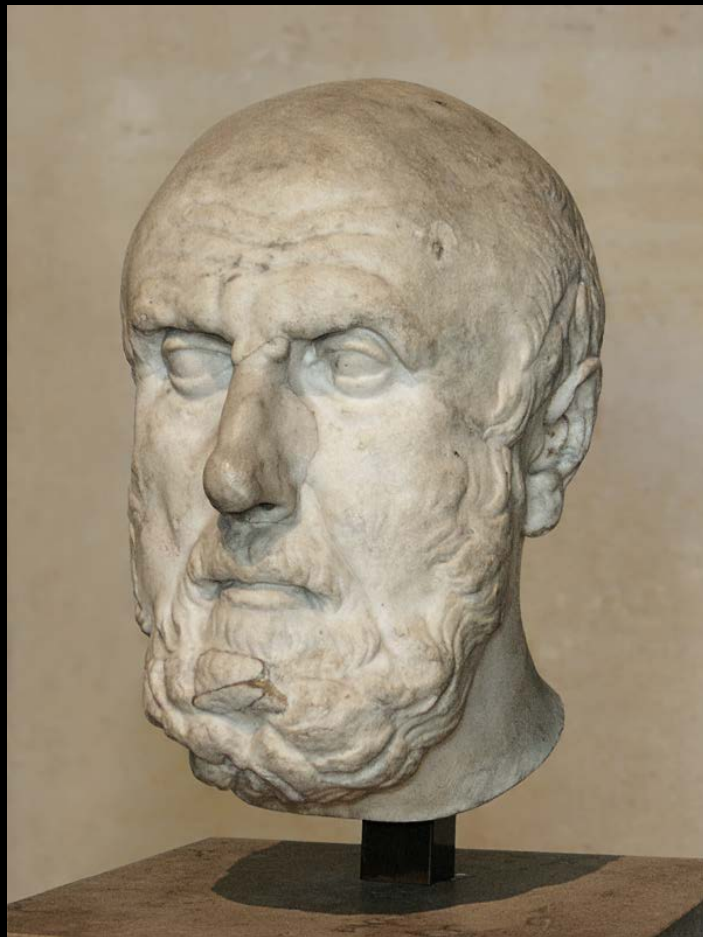
-Manuel Castells



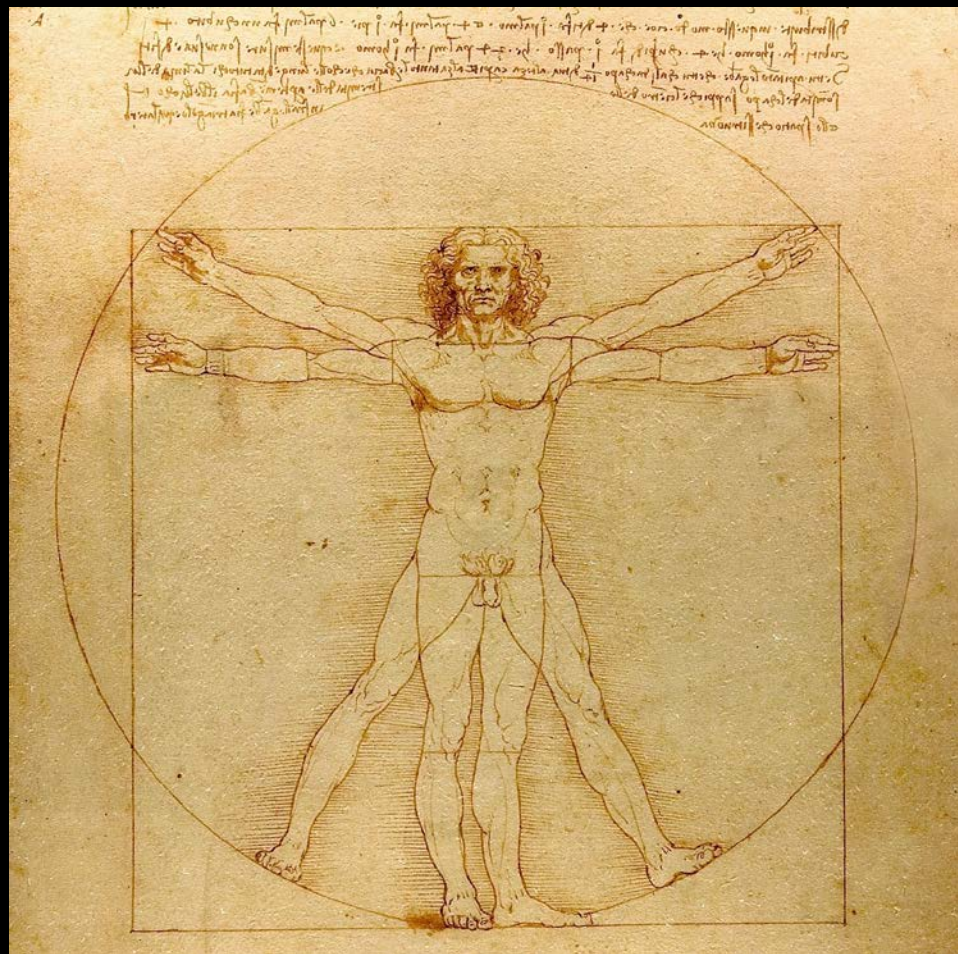
“creatively accumulate and **recombine** knowledge and information in non-routine ways”

-Manuel Castells

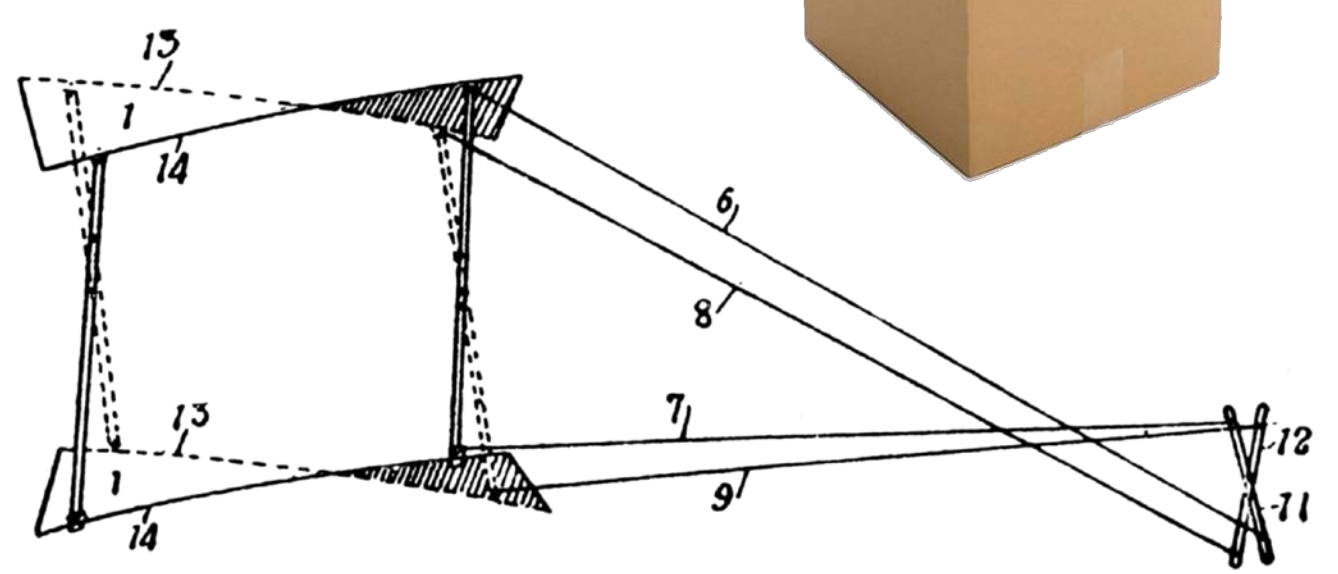
Chrysippus (279 B.C.)



Leonardo da Vinci (1490)

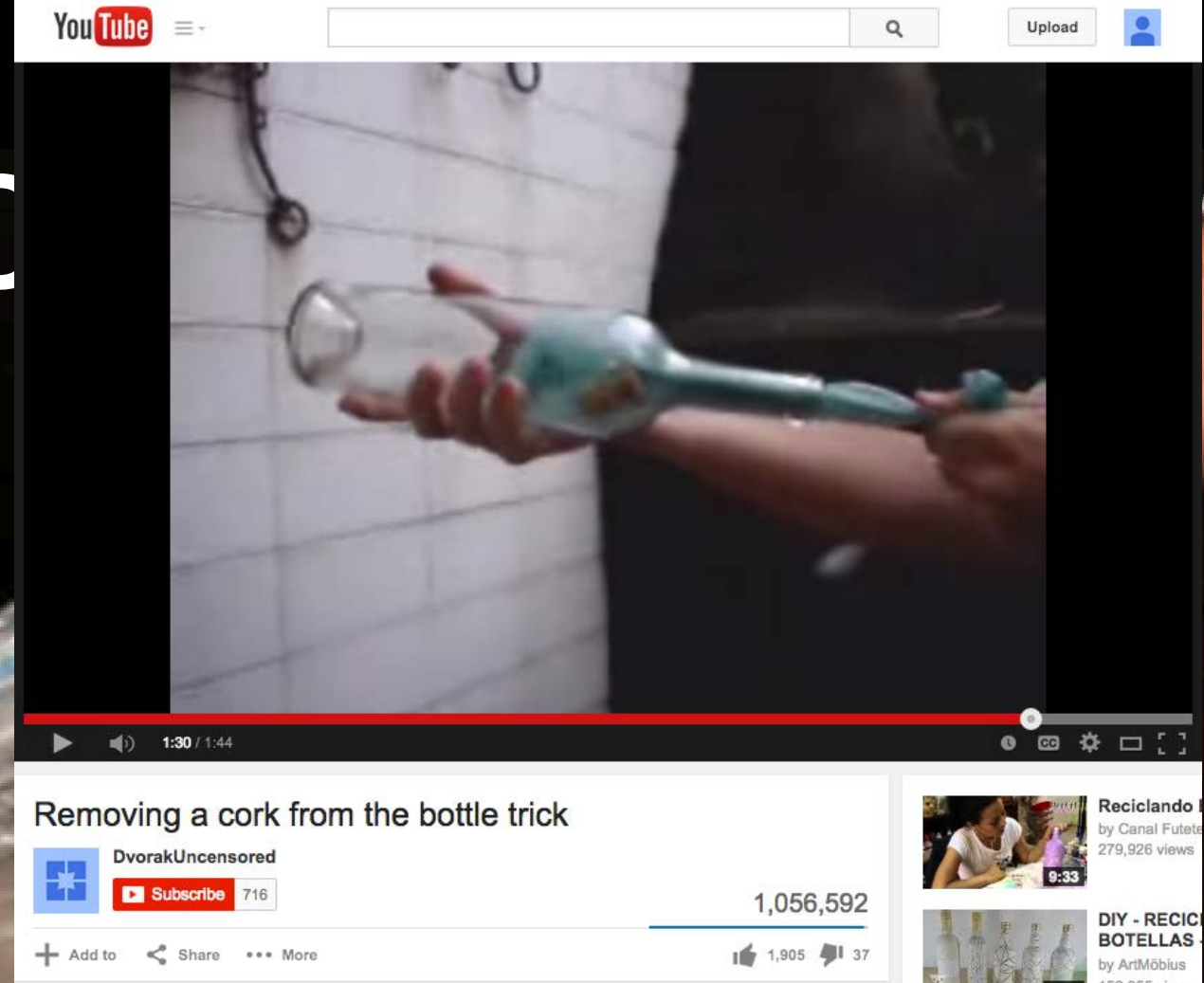


Wright Brothers (1903)





n device



“for many years, almost centuries, there has
been no innovation in this area of work” -
WHO

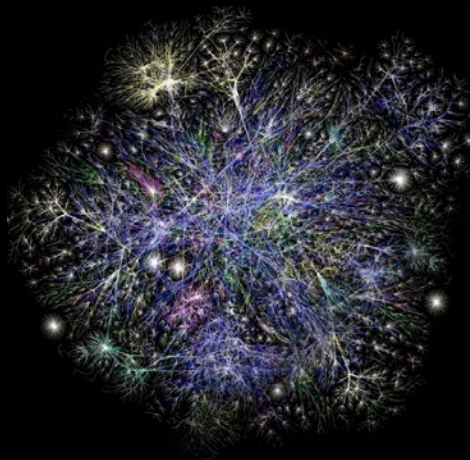
Design repositories



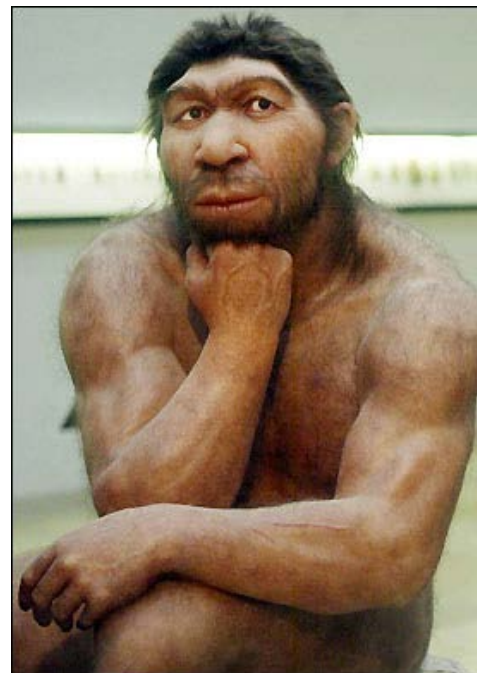
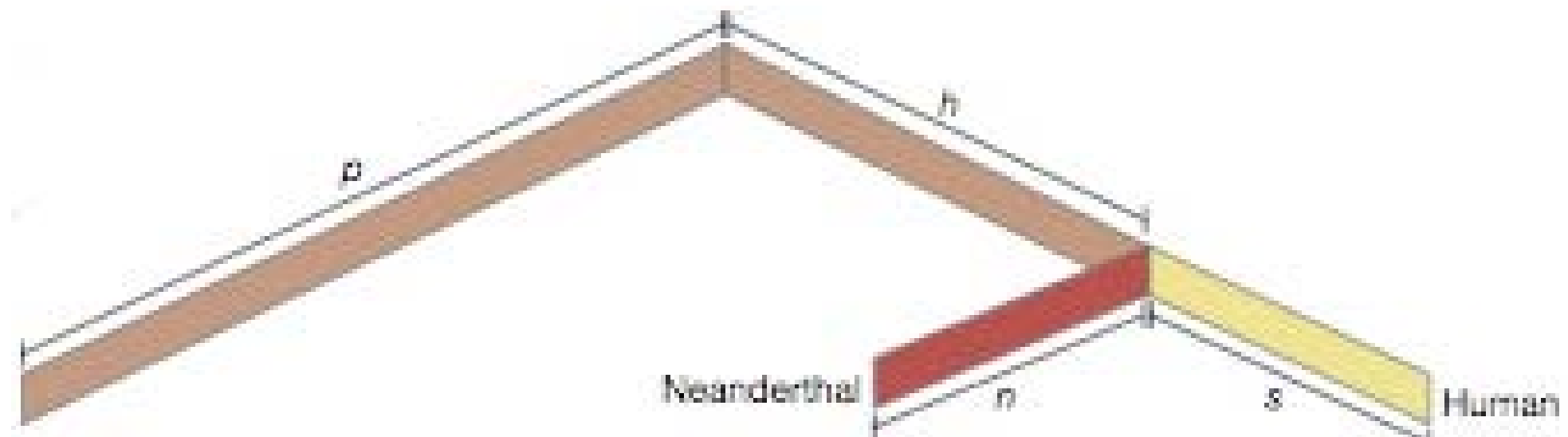
>40,000 ideas



millions



billions



Inefficient



~400/~25,000



~300/~300,000

Incremental



<http://justcreative.com/2008/02/20/graphic-design-plagiarism-rip-offs/>

Koh, 2012; Smith et al., 1993



Designing more effective contests through distributing innovation

Fixation

Expertise

Community







What **purpose** and **mechanism** do these share?

They **detach two objects**

by **using a movable slider**



Transfer to new domain

In what other situations
might you need to detach
two objects from each
other?

Generate new ideas

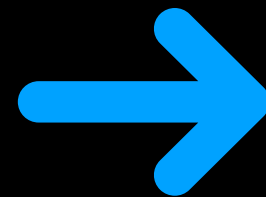
Can you solve this
problem by using a
movable slider?



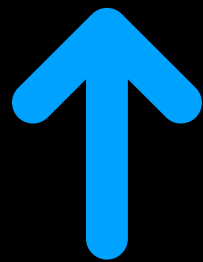
Glide (clip-on knife cleaner)

Analogical processing

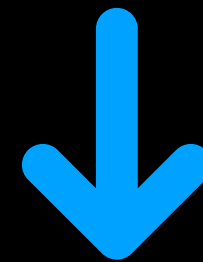
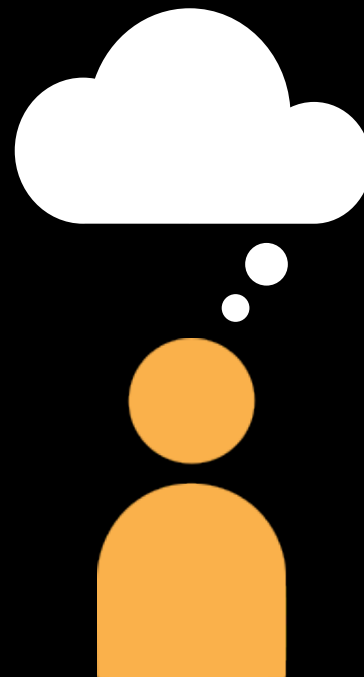
Abstract purpose
and mechanism



Transfer to
new domain



Examples



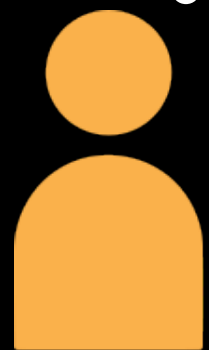
Generate
new ideas

Analogical processing

Abstract purpose
and mechanism



Transfer to
new domain



Examples



Generate
new ideas

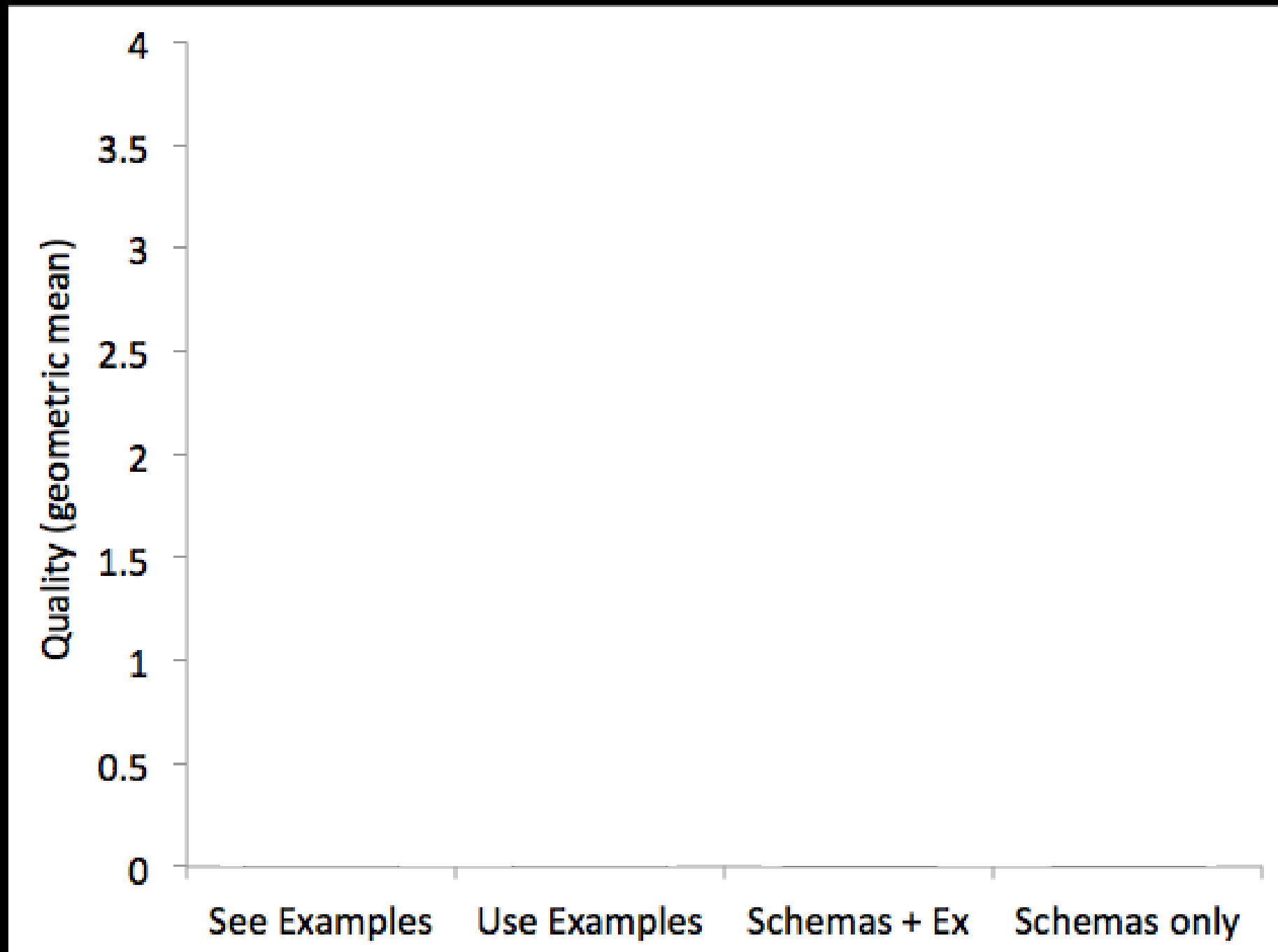
Gentner, 1983; Gick & Holyoak, 1980, 1983; Hummel & Holyoak, 2003; Linsey et al., 2008

Fixation



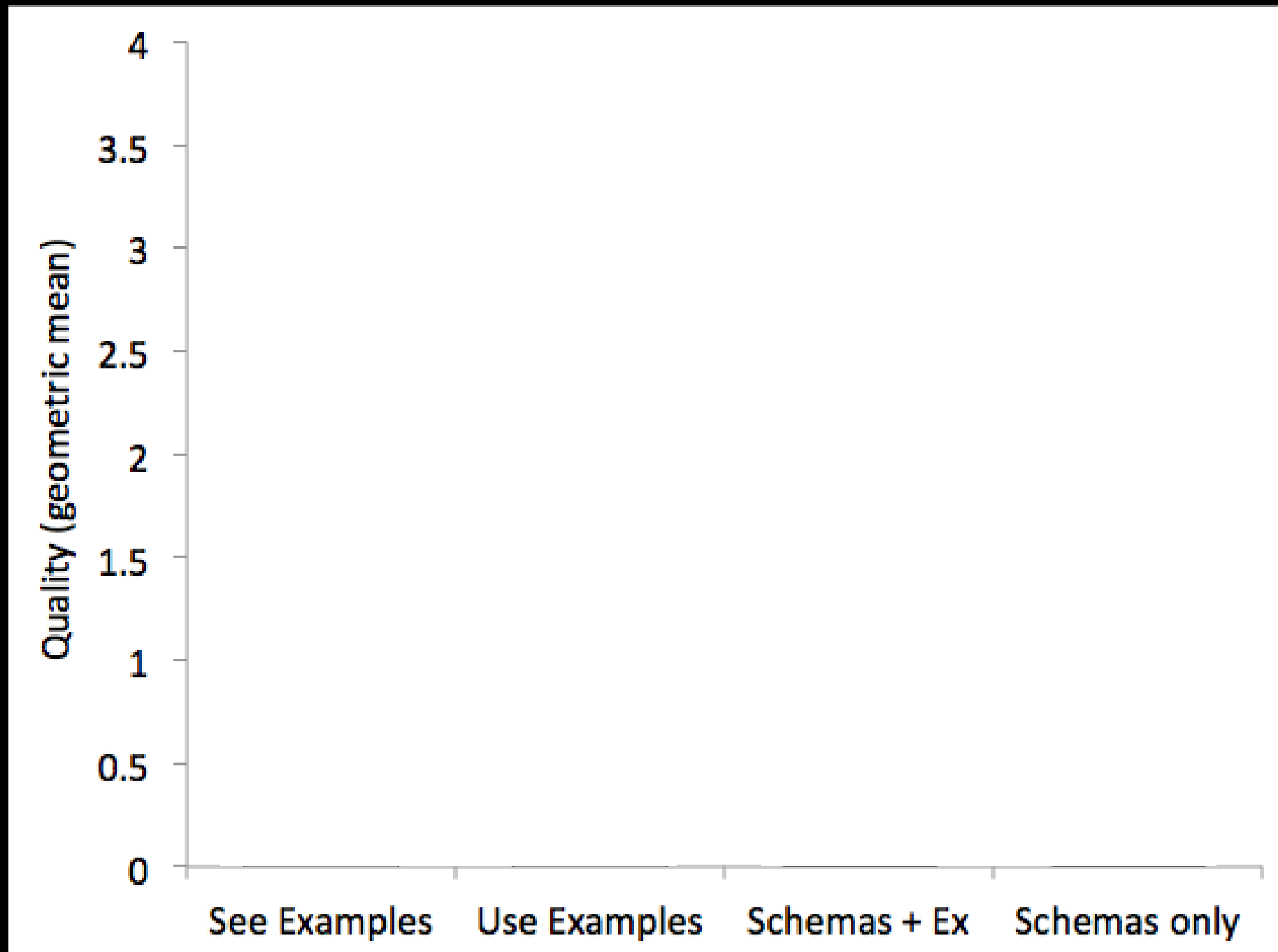
<http://justcreative.com/2008/02/20/graphic-design-plagiarism-rip-offs/>

Koh, 2012; Smith et al., 1993



n = 209

t = 3.34, p < .001



n = 209

t = 3.34, p < .001

Idea 1 (score 4.40)

"Lens Cap Leaves" doubles as a lens hood and a lens cap. Imagine that the lens hood for a lens, rather than be one solid piece, is made up of interlocking leaves, like a vegetable steamer (here's an amazon link to what I'm talking about). When you're done shooting, these leaves close up to seal the end of the lens, forming a cap that's permanently attached to the end of the lens. This will not only give the lens a permanently mounted lens hood, but will also give the lens a permanently

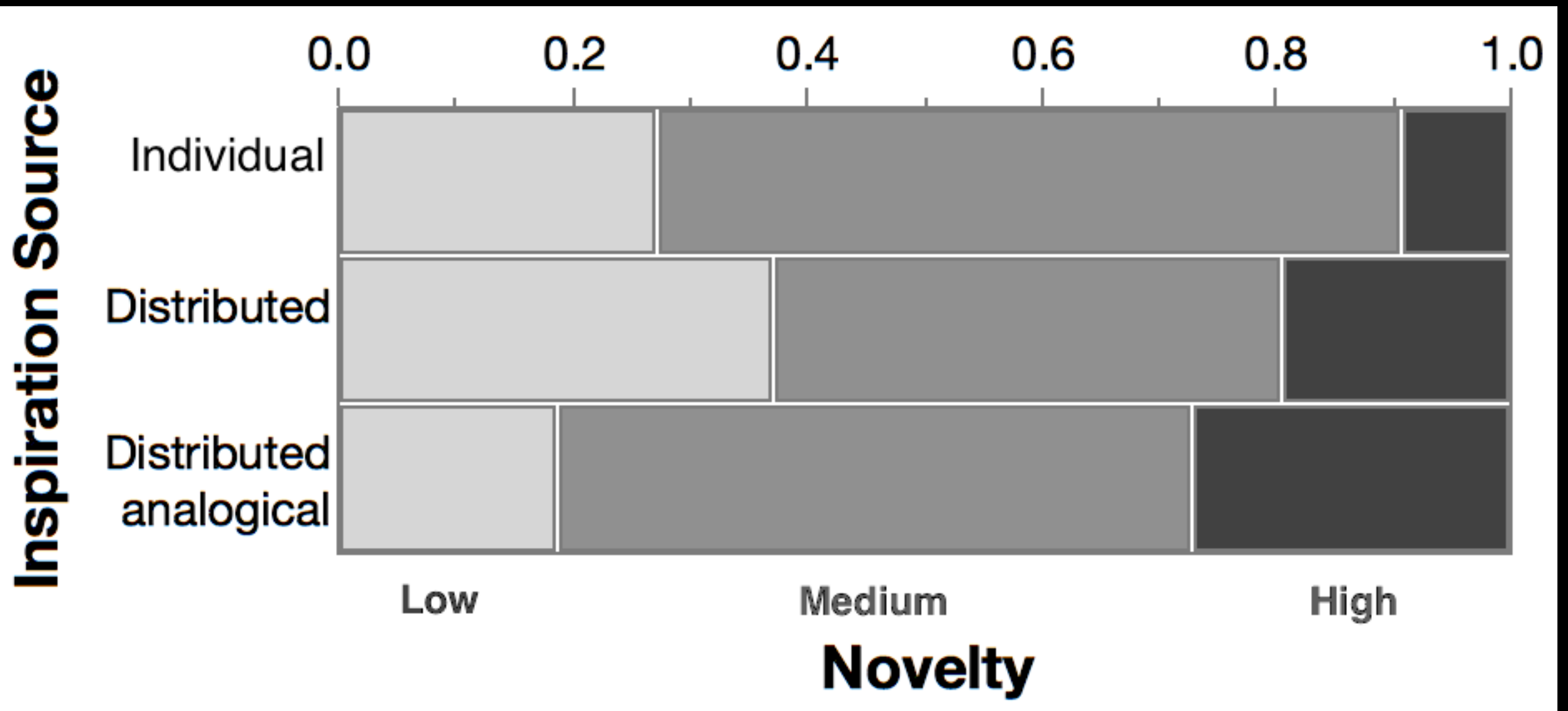


Expertise





R&D experts



Lifshitz-Assaf, Ng, Kraut, Kittur, under review

Community



ANNOUNCING THE FINALISTS FOR THE CON X TECH PRIZE

These twenty projects are changing the future of conservation.

We're proud to announce the finalists for the [Con X Tech Prize](#), our microgrants program to bring revolutionary ideas from blueprint to prototype. From cargo shipments to machine learning to microfinance, we've selected twenty innovations that have the potential for exponential impact and help end human-induced extinction.

Can we re-engage non-winners?

ANNOUNCING THE FINALISTS FOR THE
CON X TECH PRIZE

85%

**of CXTP participants (N=136) indicated interest
in being a Peer Advisor.**

48%

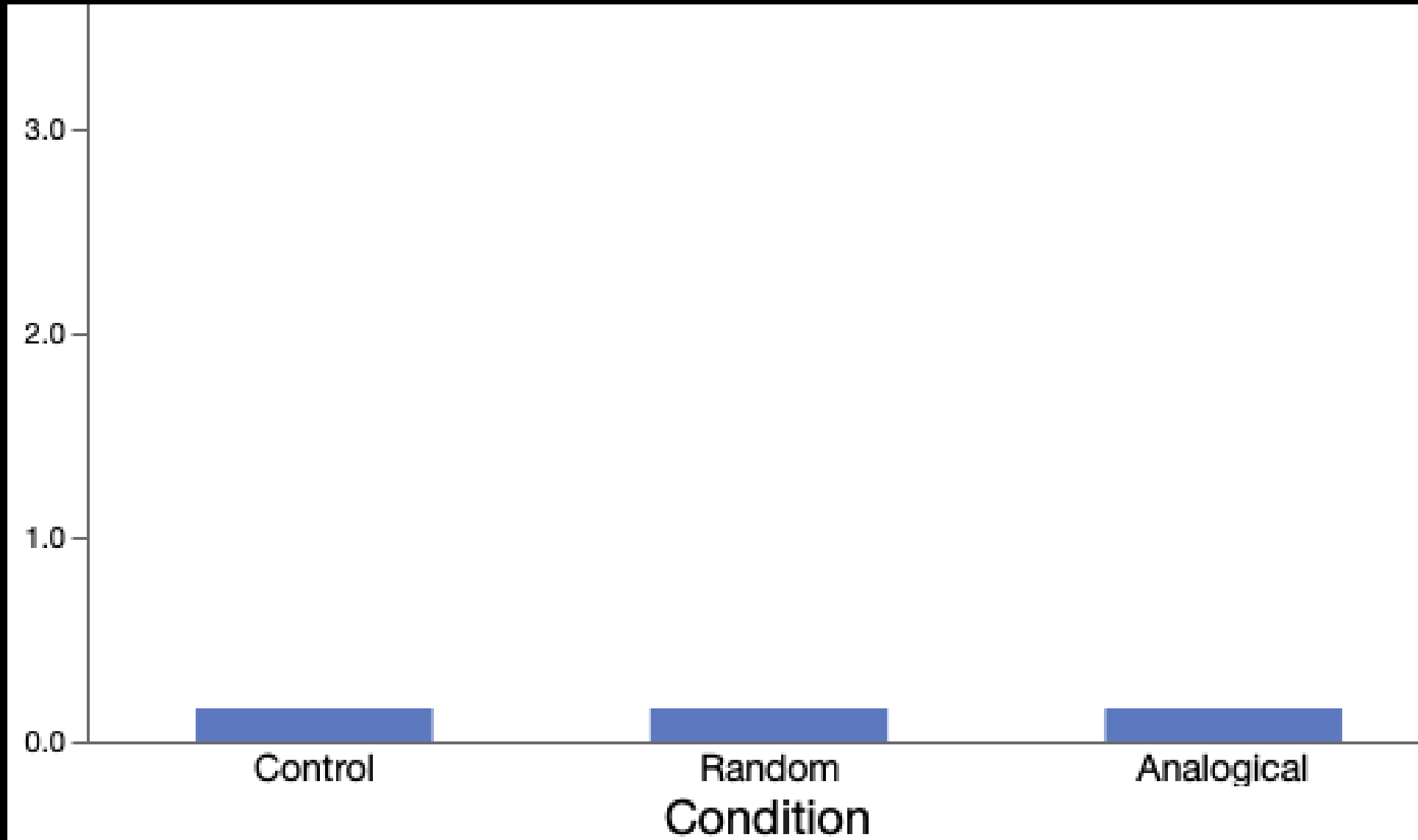
**of invited Peer Advisors (N=27) engaged with
their assigned team.**

We're proud to announce the finalists for the **Con X Tech Prize**, our microgrants program to bring revolutionary ideas from blueprint to prototype. From cargo shipments to machine learning to microfinance, we've selected twenty innovations that have the potential for exponential impact and help end human-induced extinction.

100% of interviewed
Program
participants
(N=10)

- **saw personal or professional benefits to peer advising** (e.g., networking, learning about other conservation innovations, advancing conservation passions), and
- **reported interest in being a Peer Advisor in the future** if well-matched to a team.

projects given
feedback



Designing more effective contests through distributing innovation

Fixation

Expertise

Community



Scaling up analogical innovation with crowds and AI

Aniket Kittur^{a,1}, Lixiu Yu^b, Tom Hope^c, Joel Chan^d, Hila Lifshitz-Assaf^e, Karni Gilon^c, Felicia Ng^a, Robert E. Kraut^a, and Dafna Shahaf^c

^aHuman–Computer Interaction Institute, Carnegie Mellon University, Pittsburgh, PA 15213; ^bRobert Bosch, Research and Technology Center, Division 3, Pittsburgh, PA 15222; ^cSchool of Computer Science and Engineering, The Hebrew University of Jerusalem, 9190401 Jerusalem, Israel; ^dCollege of Information Studies, University of Maryland, College Park, MD 20742; and ^eDepartment of Information, Operations and Management Sciences, Leonard N. Stern School of Business, New York University, New York, NY 10012

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Analogy—the ability to find and apply deep structural patterns across domains—has been fundamental to human innovation in science and technology. Today there is a growing opportunity to accelerate innovation by moving analogy out of a single person’s mind and distributing it across many information processors, both human and machine. Doing so has the potential to overcome cognitive fixation, scale to large idea repositories, and support complex problems with multiple constraints. Here we lay out a perspective on the future of scalable analogical innovation and first steps using crowds and artificial intelligence (AI) to augment creativity that quantitatively demonstrate the promise of the approach, as well as core challenges critical to realizing this vision.

analogy | innovation | crowdsourcing | AI | machine learning

Wide Web. Here we describe initial steps toward a future where people, augmented by machines, can search through billions of sources based on deep structural similarity rather than simple keywords to solve important societal problems. For example, scientists or designers might find potential solutions in other fields to the problems they are trying to solve, and lawyers or legal scholars might find legal precedents sharing similar systems of relations to a contemporary case.

The key insight from this paper is that instead of considering analogy as the province of a single mind (e.g., a “lone genius”), one can disaggregate the analogical processing typically done by a single individual into discrete steps assigned to different sets of individuals and/or machine agents. This approach has several potential advantages, including leveraging each agent’s complementary strengths while ameliorating their weaknesses; scaling up the number of agents to increase the number of potential



