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# Down and Out in the Magic Kingdom:

Software citation as incentive mechanism design.

James Hetherington,  
Director of Research Engineering  
The Alan Turing Institute

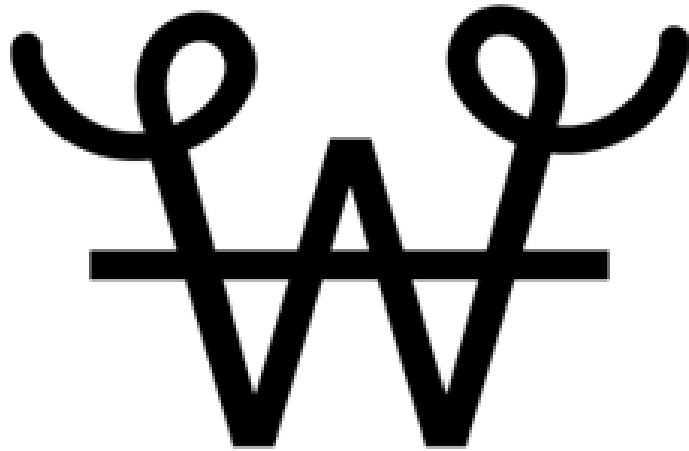
“In **Down and Out in the Magic Kingdom**, all society’s scarcities, even death and energy, have been overcome, and conflicts over resources – notably, who gets to run Walt Disney World and what they get to do there – are apportioned using a virtual currency called **Whuffie**.

Unlike other virtual currencies like Bitcoin, Whuffie isn’t something you buy and sell: it’s a score that a set of network services calculate by polling the minds of the people who know about you and your works, reducing their private views to a number.

**The characters in the novel generally love Whuffie, even though it’s destroying them...**



Whuffie has all the problems of money, and then a bunch more that are unique to it. Whuffie – despite its claims to being “meritocratic” – ends up pooling up around sociopathic jerks who know how to flatter, cajole, or terrorize their way to the top...



...Once a lot of people hold you to be reputable they bend over backwards to give you opportunities to do things that make you even more reputable, putting you in a position where you can speechify, lead, and generally take credit for everything that goes well. ”

Cory Doctorow – author of “Down and Out in the Magic Kingdom”.

-- now, who does that remind you of?

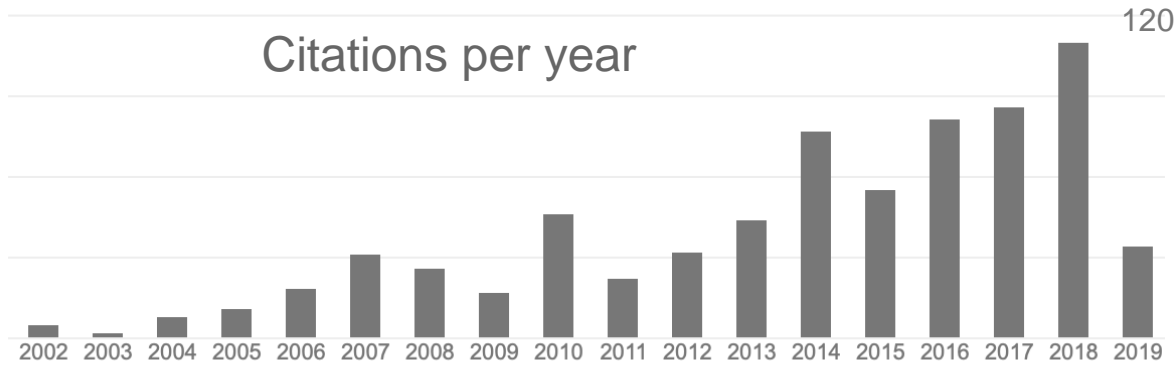


Academia is a reputation  
economy

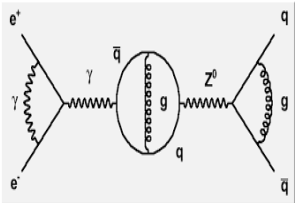
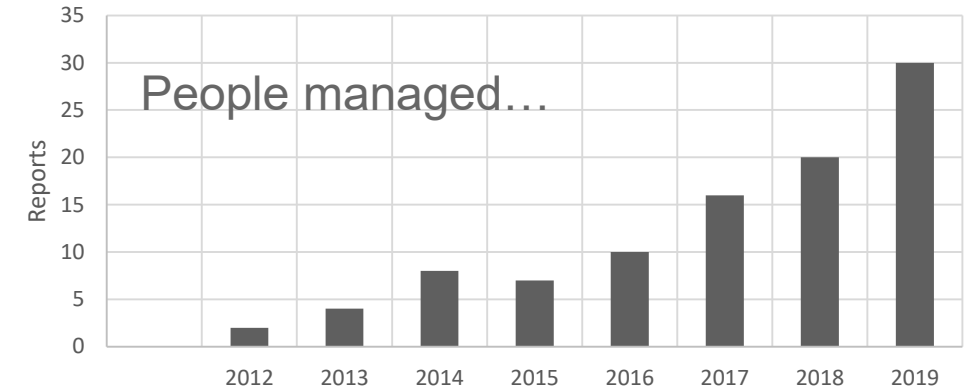
# One journey in the magic kingdom



Citations per year



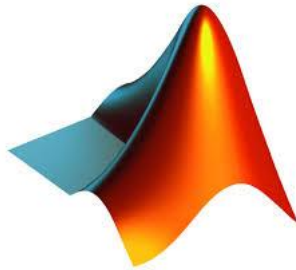
People managed...



1999-2002



2002-2007



2007-2008



2009-2011



2011-12



2012-17

The Alan Turing Institute

2017...

# GIGO, meet SIRO

~~Garbage in – Garbage out~~

Sensible input – reasonable output

“The graph looks about right”

## PhDWare

- Don't look if anyone's done it before
- Code till it works
- Generate a figure
- Throw it away

## ConsultantWare

- Little understanding of the science
- Overengineered
- Unmaintainable by the research group

## HPCWare

- Get a 5% improvement in performance
- On a particular architecture
- Publish a scaling graph

## LabWare

- Understood by one genius
- Implements great science, now
- FORTRAN in any language
- Code not engineered for readability
- Can't add new science

## MiddleWare

- Generalise a part of the research problem
- Publish at an eScience conference
- Have no users in the research community

- Selection against:
  - Readability
  - Maintainability
  - Adaptability



# Research software engineers

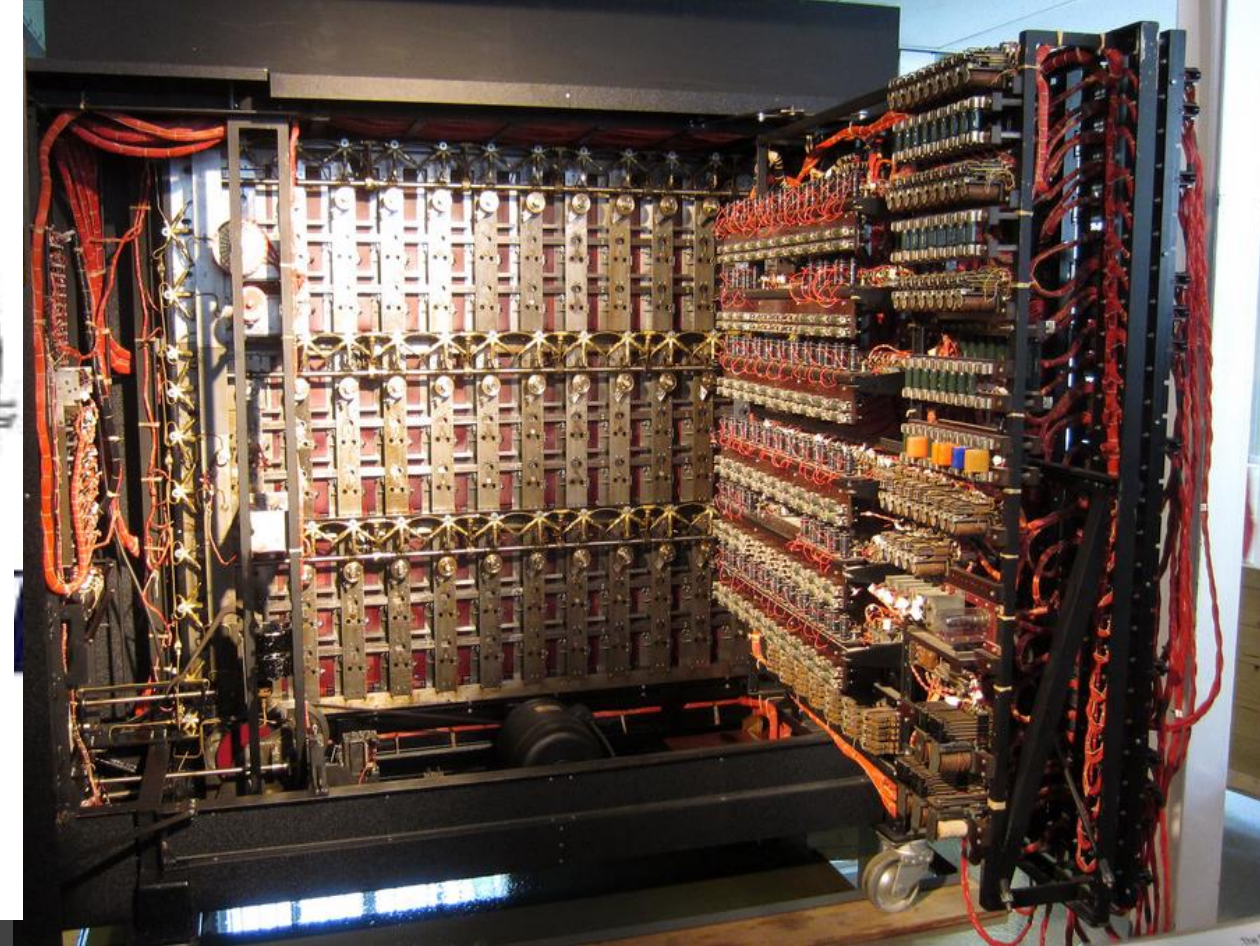
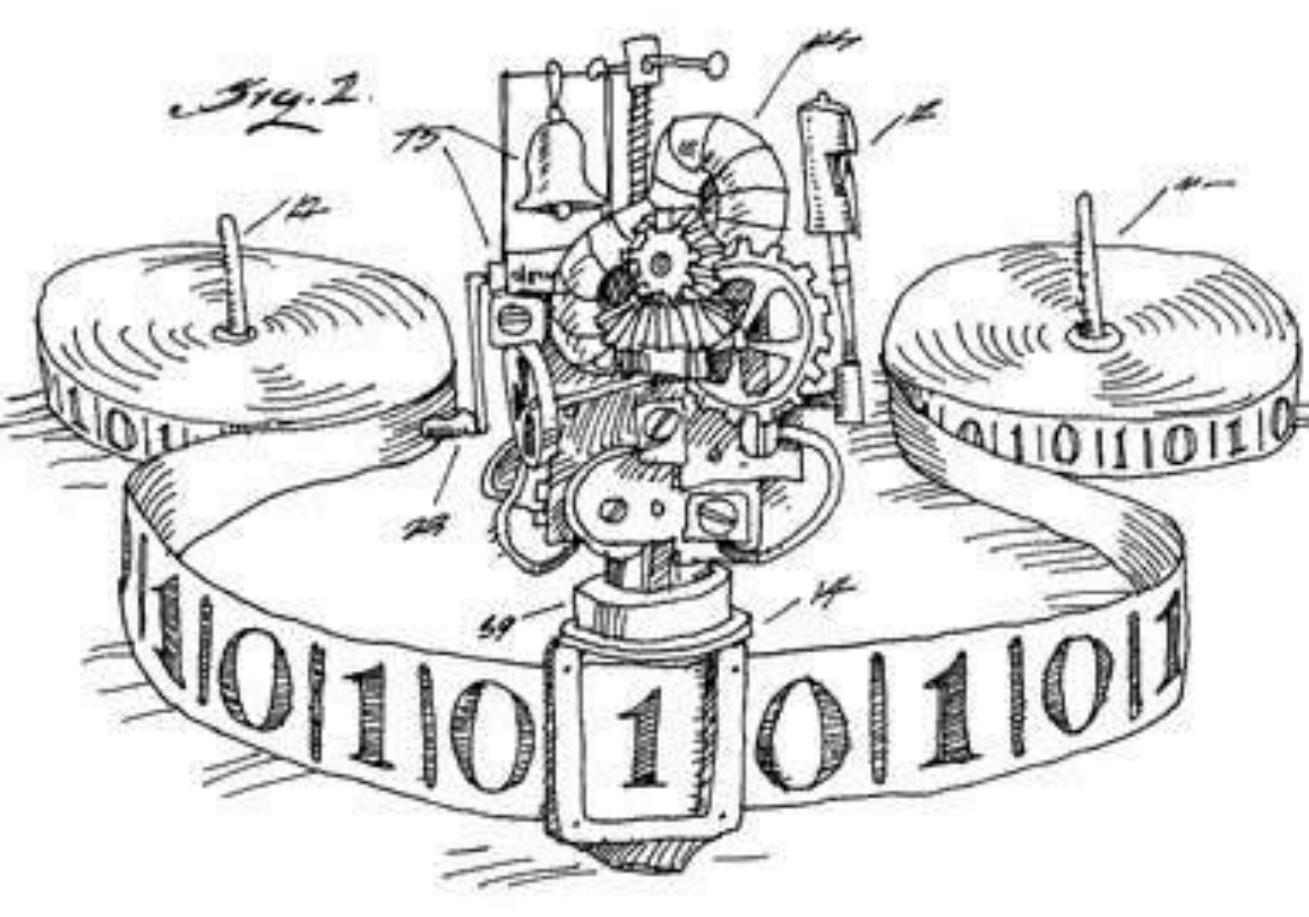






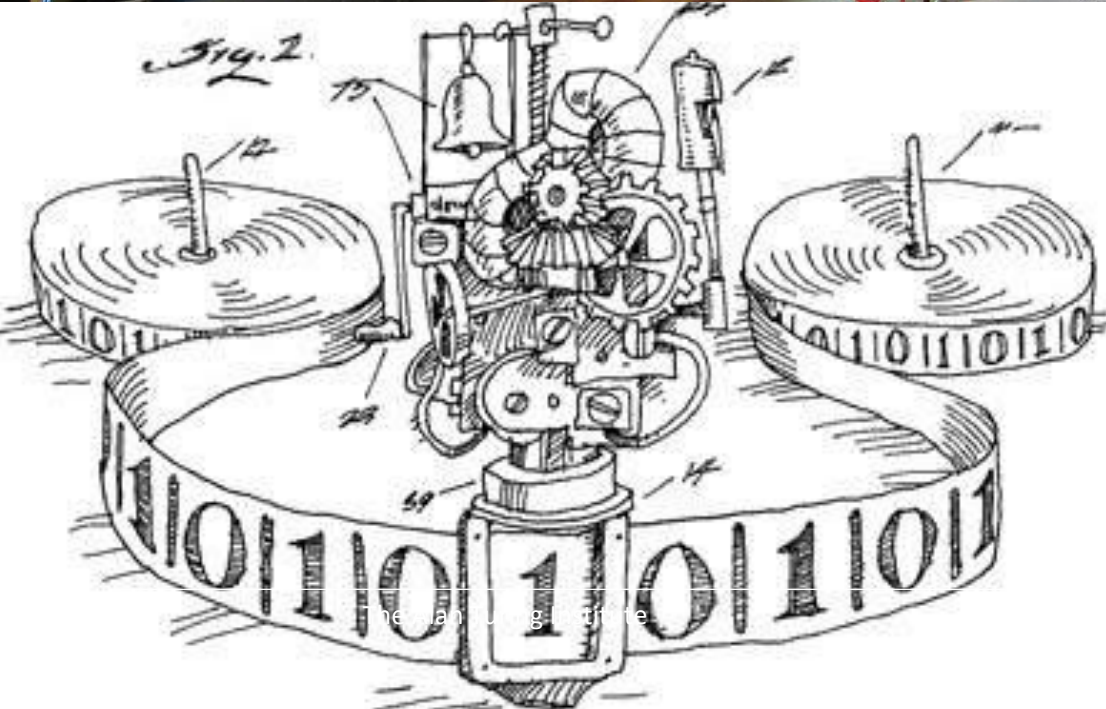
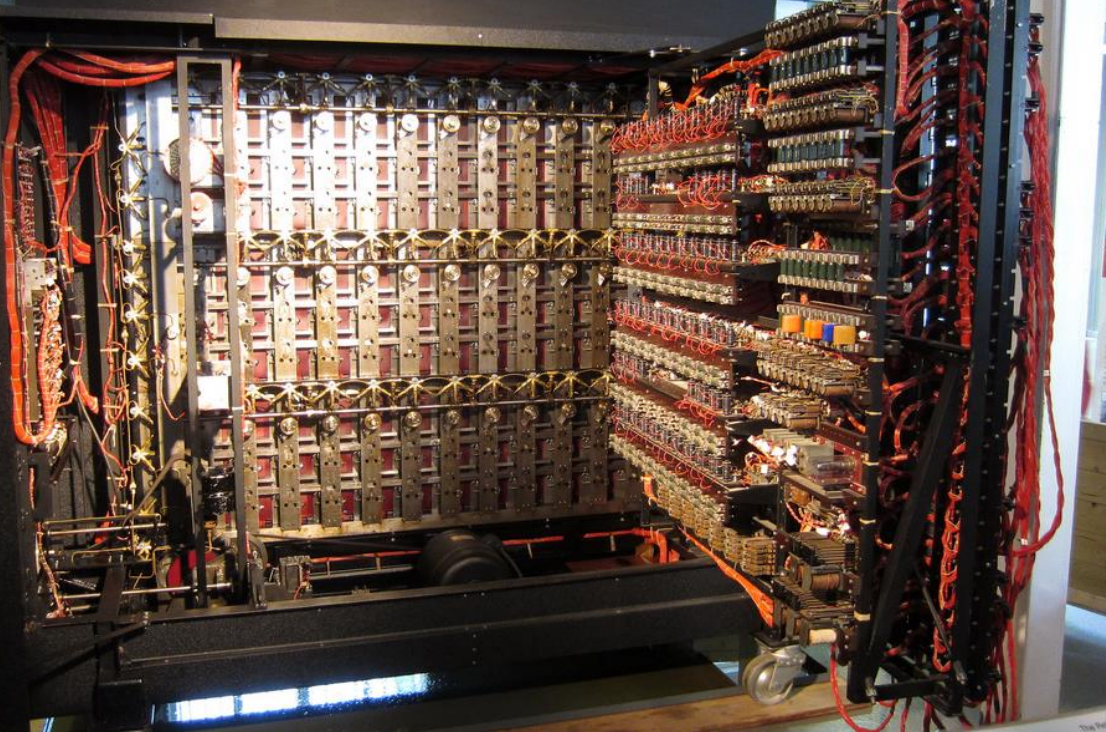
[rse.ac.uk](http://rse.ac.uk)





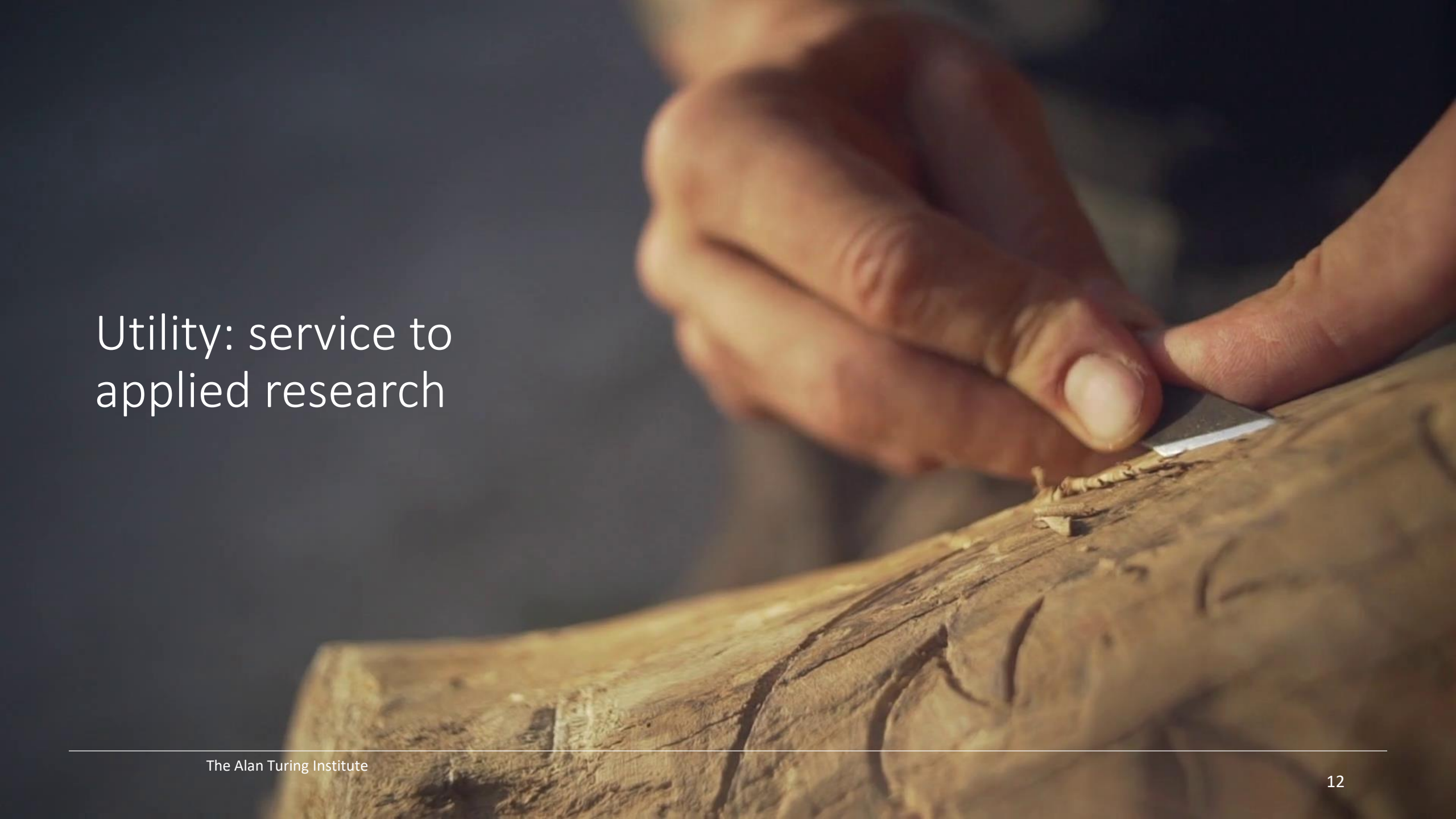
# The craftsman and the scholar





Interdisciplinarity





Utility: service to  
applied research



Curiosity:  
Research in its  
own right



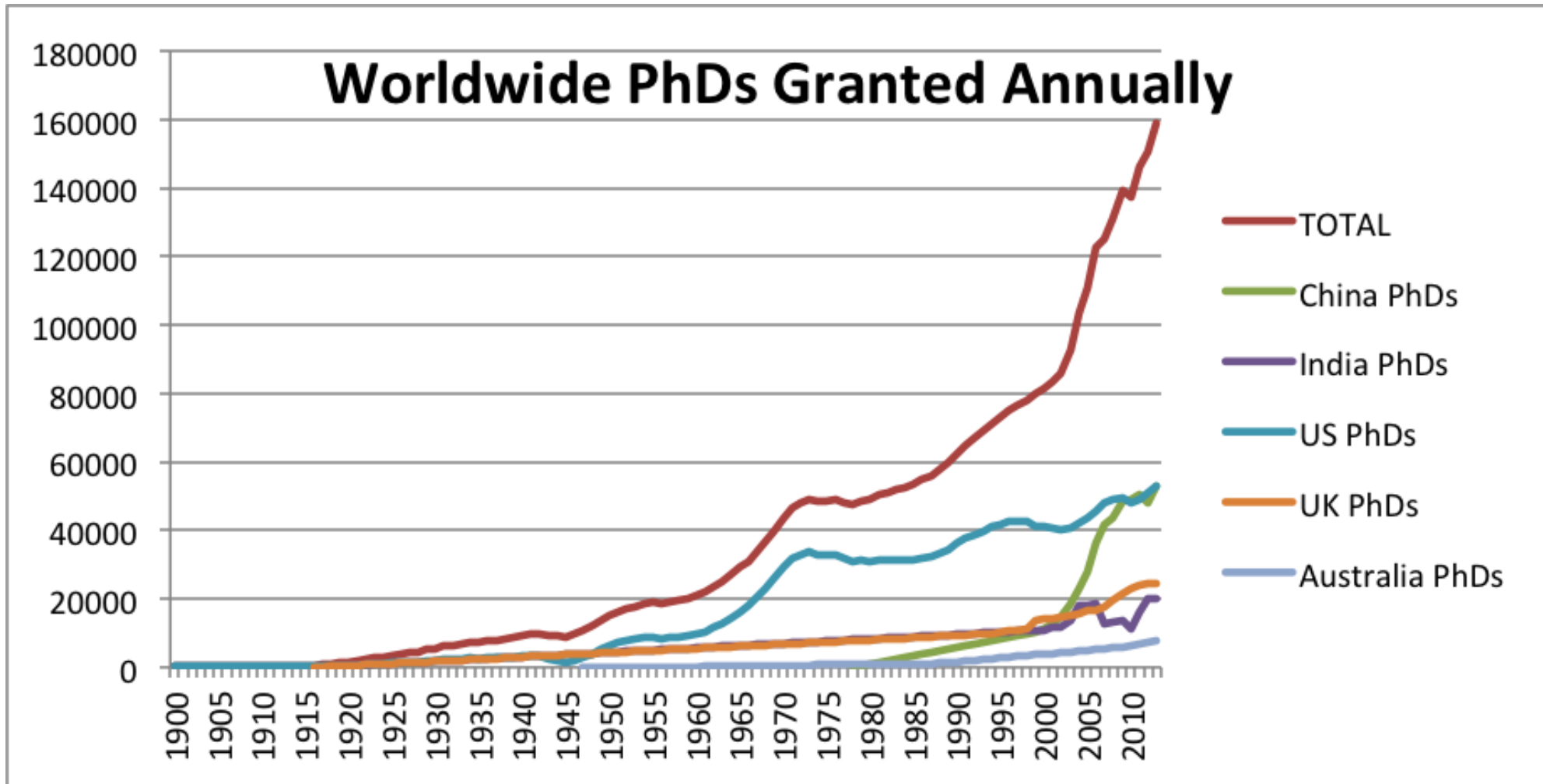




# Academia is a reputation economy

... this probably worked better when there were a lot less scientists.  
(Or if you are a rich white guy.)

The number of scientists in any given research field now far exceeds Dunbar's number. ;-)





... so, we defined research metrics as a **scalable** proxy for reputation.

$$h \approx \text{W}$$

h-index:

My 14th-most cited paper is cited 18 times

My 15th-most cited paper is cited 15 times

My 16th-most cited paper is cited 13 times

$$h_{\text{James}} = 15$$

## An index to quantify an individual's scientific research output

J. E. Hirsch\*

Department of Physics, University of California at San Diego, La Jolla, CA 92093-0319

Communicated by Manuel Cardona, Max Planck Institute for Solid State Research, Stuttgart, Germany, September 1, 2005 (received for review August 15, 2005)

Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes

- Charles Goodheart - 1975

The more any quantitative [social indicator](#) is used for social decision-making, the more subject it will be to corruption pressures and the more apt it will be to distort and corrupt the social processes it is intended to monitor.

- Donald T. Campbell - 1979

Bad money drives out good – Thomas Gresham - 1558

It has often struck our notice that the course our city runs  
Is the same towards men and money. She has true and worthy sons:  
She has good and ancient silver, she has good and recent gold.  
These are coins untouched with alloys; everywhere their fame is told;  
Not all Hellas holds their equal, not all Barbary far and near.  
Gold or silver, each well minted, tested each and ringing clear.  
Yet, we never use them! Others always pass from hand to hand.  
Sorry brass just struck last week and branded with a wretched brand.  
So with men we know for upright, blameless lives and noble names.  
Trained in music and palaestra, freemen's choirs and freemen's games,  
These we spurn for men of brass... -- Aristophanes -- -405

# MIÉRCOLES HOY **NO** CIRCULA

ENGOMADO  
ROJO

TERMINACIÓN  
DE PLACAS

3-4



CDMX  
CIUDAD DE MÉXICO

BASTA!

[www.diariobasta.com](http://www.diariobasta.com)



/DiarioBasta



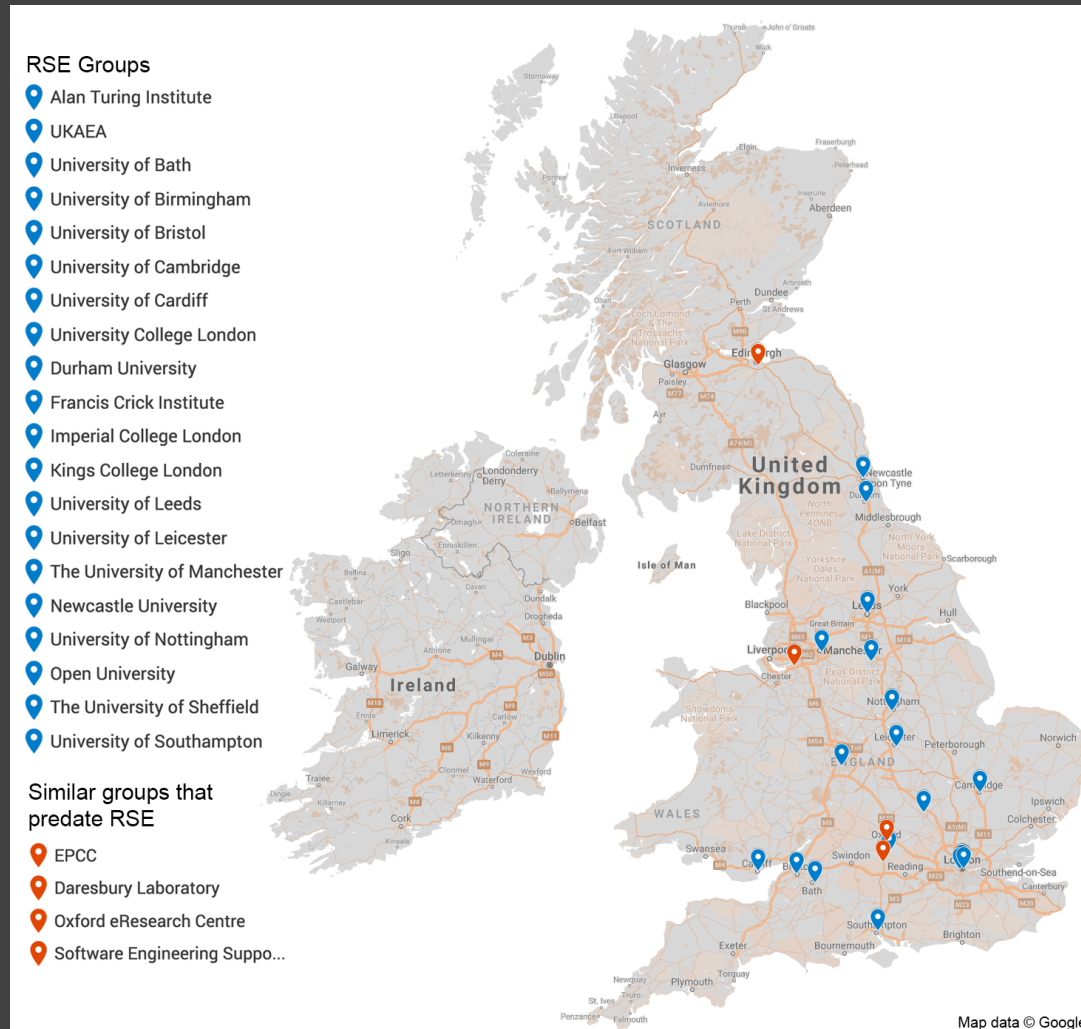
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# The number of RSEs now exceeds Dunbar's number.



When we design systems for software citation, we are trying to meet three purposes:

- To make a social statement that software is a scholarly activity worth recognizing
- To create stable references for code, for information management and preservation
- To design an incentive mechanism to influence the kind of research software activity that occurs



Signal



Storage



Stimulus

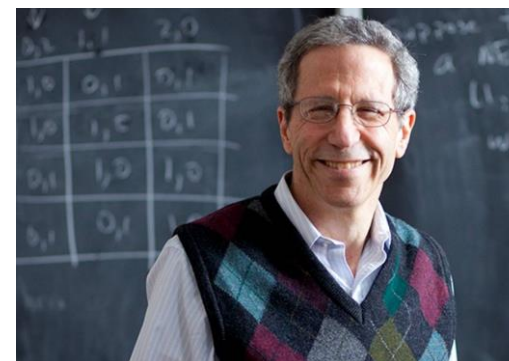
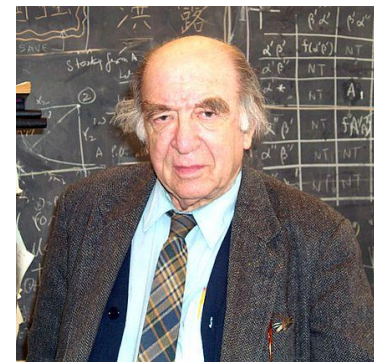


There is a field of economics called “Mechanism Design”.

... it deals with the design of incentive systems.

“Reverse game theory”

... it sometimes works a little too well...



Nobel prize, Maskin, Myerson, Hurwicz, 2007.



*The Economic Journal*, **112** (March), C74–C96. © Royal Economic Society 2002. Published by Blackwell Publishers, 108 Cowley Road, Oxford OX4 1JF, UK and 350 Main Street, Malden, MA 02148, USA.

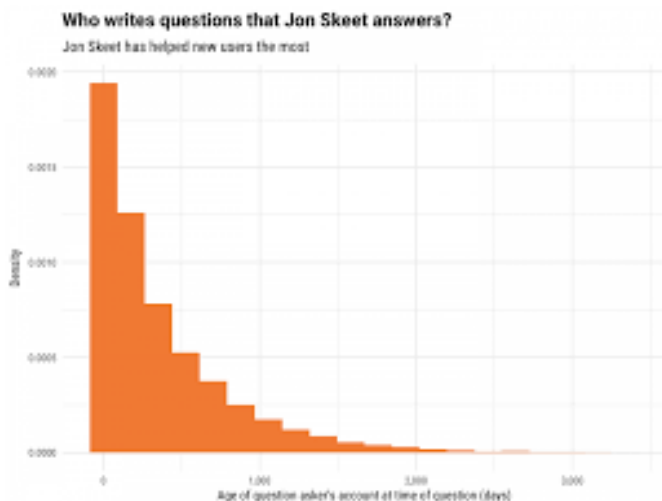
# THE BIGGEST AUCTION EVER: THE SALE OF THE BRITISH 3G TELECOM LICENCES\*

*Ken Binmore and Paul Klemperer*

This paper reviews the part played by economists in organising the British third-generation mobile-phone licence auction that concluded on 27 April 2000. It raised £22½ billion (\$34 billion or 2½% of GNP) and was widely described at the time as the biggest auction ever. We discuss the merits of auctions versus ‘beauty contests’, the aims of the auction, the problems we faced, the auction designs we considered, and the mistakes that were made.



Spolsky and Atwood used incentive theory heavily when designing the stackoverflow reputation mechanism.



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modified May 6 at 12:52 Ihsan Haikal 292

-1  
votes2  
answers137  
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javascript excel formatting js-xlsx sheetjs

modified yesterday Fabrizio Bertoglio 3,612

The theory of economic games has some surprising old results...



George Akerlof - 1970

When sellers know product quality

... and buyers do not ...

Only the worst products get sold.



If you want an electoral system which:

- Doesn't have one dictator
- Deterministically results in an outcome ranking in which:
  - The result doesn't change if you add a spoiler candidate
  - If every individual prefers an outcome, so does the overall outcome

You can't have one!

Kenneth Arrow - 1950



Herman Daly – 1973

Growth is more of the same stuff.  
Development is the same amount of better stuff.

Sustainable growth is impossible.

Growth is an artefact of externalizing ecosystem costs.

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Three constraints for the design of software citation schemes which might be used as a metric

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# 1: Independence to irrelevant division

Division of code into modular sub-projects  
should not be disincentivized



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## 2: Incentivization of weakly-coupled collaboration.

Importing libraries should reward both the citer and the cited.

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### 3: Incentivization of sustainable community curation.

Accepting a good pull request should not be disincentivized.