Voting, Success, and Superstars

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Principles of Complex Systems, Vols. 1, 2, & 3D
CSYS/MATH 300, 303, & 394, 2022–2023| @pocsvox

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Computational Story Lab | Vermont Complex Systems Center
Santa Fe Institute | University of Vermont

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**Voting, Success,
and Superstars**

Winning: it's not
for everyone
  Superstars
  Musiclab

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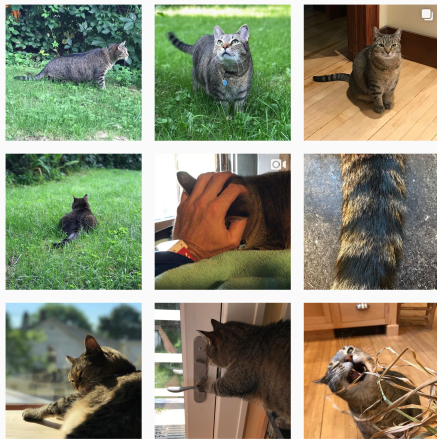## Special Guest Executive Producer

📷 On Instagram at pratchett_the_cat⬈

Outline

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**Voting, Success,
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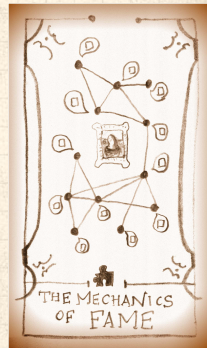
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THE MECHANICS OF FAME

Where do superstars come from?

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"The economics of superstars" ⟁
S. Rosen,
Am. Econ. Rev., **71**, 845–858, 1981. [5]

Examples:

- Full-time Comedians (≈ 200)
- Soloists in Classical Music
- Economic Textbooks (the usual myopic example)

- Highly skewed distributions again...

Superstars

Rosen's theory:

- Individual quality q maps to reward $R(q)$.

- $R(q)$ is 'convex' ($d^2 R/dq^2 > 0$).

- Two reasons:
  1. **Imperfect substitution:**
     A very good surgeon is worth many mediocre ones
  2. **Technology:**
     Media spreads & technology reduces cost of reproduction of books, songs, etc.

- Joint consumption versus public good.

- No social element—success follows 'inherent quality'.

Superstars

"Stardom and Talent" ⧉
Moshe Adler,
American Economic Review, **75**, 208–212,
1985. [1]

- 🧊 "Consumption capital": "Appreciation [of music] increases with knowledge. But how does one know about music? By listening to it, *and discussing it with other persons who know about it.*"

- 🧊 Assumes extreme case of equal 'inherent quality'

- 🧊 Argues desire for coordination in knowledge and culture leads to differential success

- 🧊 Success can be purely a social construction

- 🧊 (How can we measure 'inherent quality'?)

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Evidence from the web suggestions (Huberman et al.)

1. Easy decisions (yes/no) lead to bandwagoning
   - 📦 e.g. jyte.com

2. More costly evaluations lead to oppositional votes
   - 📦 e.g. amazon.com

📦 **Self-selection:** Costly voting may lower incentives for those who agree with the current assessment and increase incentives for those who disagree.

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Score-based voting versus rank-based voting:

"A theory of measuring, electing, and
ranking" ↗
Balinski and Laraki,
Proc. Natl. Acad. Sci., **104**, 8720–8725,
2007. [2]

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"Aggregating partial, local evaluations to achieve global ranking" 🗗
Laureti, Moret, and Zhang,
Physica A, **345**, 705–712, 2004. [4]

- 🎲 Model: participants rank n objects based on underlying quality q
- 🎲 Assume evaluation of object i is a random variable with mean q_i
- 🎲 Choose objects based on votes:

$$p_i(t) \propto v_i(t)^{\alpha} \text{ or } p_i(t) \propto q_i v_i(t)^{\alpha}.$$

- 🎲 If $\alpha < 1$, correct quality ordering is uncovered
- 🎲 If $\alpha > 1$, some objects are never evaluated and mistakes are made...
- 🎲 Related to Adler's approach

Dominance hierarchies

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"Individual differences versus social dynamics
in the formation of animal dominance
hierarchies"🔗
Chase et al.,
Proc. Natl. Acad. Sci., **99**, 5744-5749, 2002. [3]
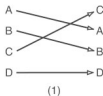
The aggressive female Metriaclima zebra:

Dominance hierarchies

Fish forget—changing of dominance hierarchies:
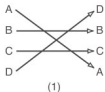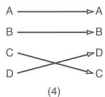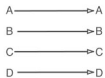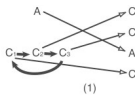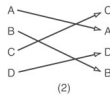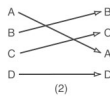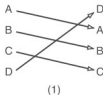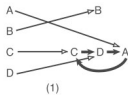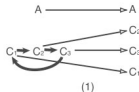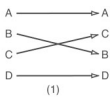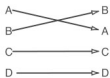
22 observations: about 3/4 of the time, hierarchy changed

Dominance hierarchies

Methods of Forming Hierarchies

Group versus isolated interactions produce
different hierarchies

Music Lab Experiment

48 songs
30,000 participants

multiple 'worlds'
Inter-world variability

🎲 How probable is the world?

🎲 Can we estimate variability?

🎲 Superstars dominate but are unpredictable. Why?

Music Lab Experiment

"An experimental study of inequality and unpredictability in an artificial cultural market" [link]
Salganik, Dodds, and Watts,
Science, **311**, 854–856, 2006. [6]

Music Lab Experiment

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Experiment 1

Experiments 2–4

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Experiment 1

Experiment 2

Variability in final rank.

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Experiment 1 / Experiment 2

Market share in influence worlds vs. Market share in independent world

Variability in final number of downloads.

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Inequality as measured by Gini coefficient:

$$G = \frac{1}{(2N_{\mathsf{s}} - 1)} \sum_{i=1}^{N_{\mathsf{s}}} \sum_{j=1}^{N_{\mathsf{s}}} |m_i - m_j|$$
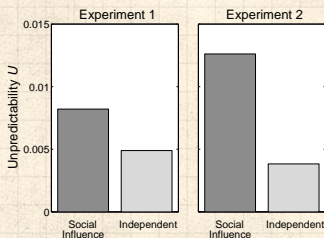
Music Lab Experiment

🐾 Unpredictability

$$U = \frac{1}{N_{\mathsf{s}} \binom{N_{\mathsf{w}}}{2}} \sum_{i=1}^{N_{\mathsf{s}}} \sum_{j=1}^{N_{\mathsf{w}}} \sum_{k=j+1}^{N_{\mathsf{w}}} |m_{i,j} - m_{i,k}|$$

Music Lab Experiment

Sensible result:

🎲 Stronger social signal leads to greater following and greater inequality.

Peculiar result:

🎲 Stronger social signal leads to greater unpredictability.

Very peculiar observation:

🎲 The most unequal distributions would suggest the greatest variation in underlying 'quality.'

🎲 But success may be due to social construction through following. (so let's tell a story... [8, 9])

Music Lab Experiment—Sneakiness [7]

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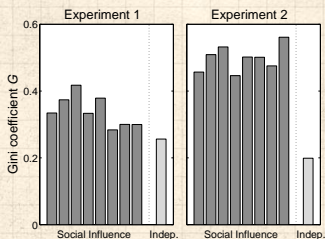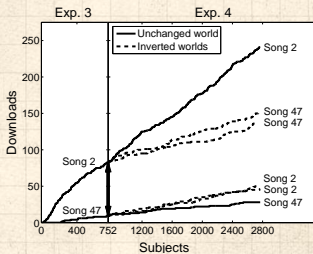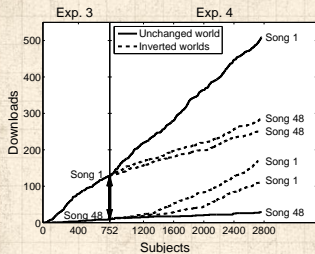Winning: it's not
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- Inversion of download count
- The pretend rich get richer …
- … but at a slower rate

References I

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Stardom and talent.
American Economic Review, pages 208–212, 1985.
pdf🖸

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