

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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Santa Fe Institute | University of Vermont



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References



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References

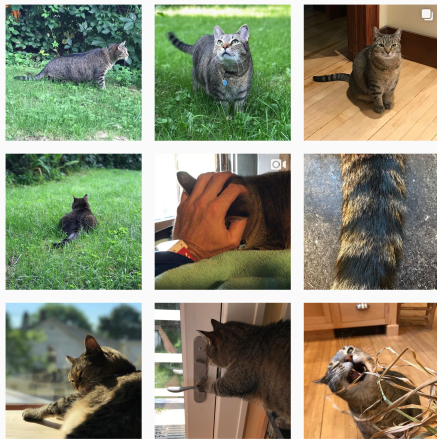


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 On Instagram at [pratchett_the_cat](https://www.instagram.com/pratchett_the_cat) 



Outline

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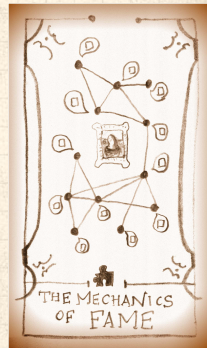
References

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Where do superstars come from?

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"The economics of superstars" 

S. Rosen,





Am. Econ. Rev., **71**, 845–858, 1981. [5]

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Examples:

-  Full-time Comedians (≈ 200)
-  Soloists in Classical Music
-  Economic Textbooks (the usual myopic example)
-  Highly skewed distributions again...



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'.

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"Stardom and Talent"


Moshe Adler,
American Economic Review, **75**, 208–212,
1985. ^[1]


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 "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'?)





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]





“Aggregating partial, local evaluations to achieve global ranking” ↗

Laureti, Moret, and Zhang,
Physica A, **345**, 705–712, 2004. [4]

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- 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.,
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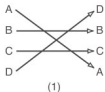
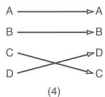
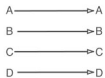
 The aggressive female *Metriaclima zebra*:



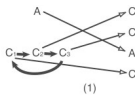
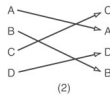
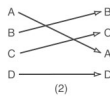
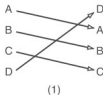
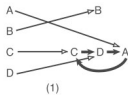
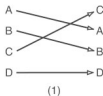
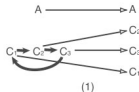
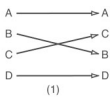
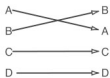
Dominance hierarchies

Fish forget—changing of dominance hierarchies:

1st Hierarchy \Rightarrow 2nd Hierarchy



1st Hierarchy \Rightarrow 2nd Hierarchy



22 observations: about 3/4 of the time, hierarchy changed

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Dominance hierarchies

| Methods of Forming Hierarchies | | |
|--------------------------------|--------------------------|---|
| Size of set | Group assembly | Round-robin competition |
| 4 | <p>(23) (2) n=25</p> | <p>(9) (3) (3) (1) n=16</p> |
| 5 | <p>(10) (1) n=11</p> | <p>(6) (1) (1) (2) (1) (1) n=12</p> |

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Group versus isolated interactions produce
different hierarchies



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BAND NAME

| [Help] | [Log off] | # of down loads |
|----------------|-----------|-----------------|
| GROWTH PEOPLE: | | 86 |
| "names" | | |
| ACCEPT THAT: | | 52 |
| "the people" | | |
| LISTFORPEOPLE: | | 45 |
| "no way out" | | |

SONG TITLE

NUMBER OF DOWNLOADS

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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?



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| | # of down loads | [Help] [Log off] | # of down loads | # of down loads | |
|---|-----------------------|---|-----------------------|--|----|
| HARTSFIELD: "enough is enough" | 20 | GO MOREICAL: "is does what its told" | 12 | UNDO: "while the world passes" | 24 |
| DEEP ENOUGH TO DIE: "for the sky" | 17 | PARKER THEORY: "she said" | 47 | UP FOR NOTHING: "in sight of" | 13 |
| THE THRIFT SYNDICATE: "2003 a tragedy" | 20 | MESS OCTOBER: "pink aggression" | 27 | SILVERFOX: "glow" | 17 |
| THE BROKEN PROMISE: "the end in hand" | 19 | POST BREAK TRAGEDY: "silence" | 14 | STRANGER: "one step" | 10 |
| THIS NEW DAWN: "the heli above the answer" | 12 | FORTHFADING: "leaf" | 24 | FAR FROM KNOWN: "outs of" | 18 |
| HOOMER AT NINE: "walk away" | 6 | THE CALEFACTION: "trapped in an orange peel" | 20 | STUNT MONKEY: "inside out" | 46 |
| MORAL HAZARD: "waste of my life" | 8 | SIMETRO: "lockdown" | 17 | DANTE: "Bis mystery" | 14 |
| NOT FOR SCHOLARS: "as seasons change" | 27 | SIMPLY WAITING: "meet with the count" | 16 | FADING THROUGH: "wish me luck" | 10 |
| SECRETARY: "three parties on the ballroom" | 5 | STAR CLIMBER: "hell no" | 38 | UNKNOWN CITIZENS: "falling over" | 34 |
| ART OF KAILY: "reductive 400, melodic breakdown" | 10 | THE FACTLANE: "if death do us part i dont" | 31 | BY NOVEMBER: "i could take you" | 20 |
| HYDRAULIC SANDWICH: "separation anxiety" | 20 | A BLINDING SILENCE: "pieces and pieces" | 17 | DRAWN IN THE SKY: "top the ride" | 12 |
| EMBER SKY: "this upcoming winter" | 25 | SUMRAMA: "the bobbeik boogie" | 15 | SELSAUS: "stars of the city" | 22 |
| SALUTE THE DAWN: "i am emor" | 13 | CAPE RENEWAL: "baseball workout v1" | 12 | SIBRIAN: "eye patch" | 14 |
| RYAN ESSMAKER: "demon, the still" | 14 | UP FALLS DOWN: "a bright burning star" | 11 | EVAN GOLD: "what doneya j" | 10 |
| BEESING: "father to son" | 12 | SUMMERSWASTED: "a plan behind destruction" | 17 | BENEFIT OF A DOUBT: "run away" | 38 |
| HALL OF FAME: "best mistakes" | 19 | SILENT FILM: "all i have to say" | 61 | SHIPWRECK UNION: "out of the woods" | 16 |

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"An experimental study of inequality and unpredictability in an artificial cultural market" ↗

Salganik, Dodds, and Watts,
Science, **311**, 854-856, 2006. [6]



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Experiment 1

| Rank | Artist | Song Title | # of Votes |
|------|-------------|---------------------|------------|
| 1 | WINTERFELDS | Through a Veil | 24 |
| 2 | CEYLAN | Don't You Ever Stop | 24 |
| 3 | DEEP | Don't You Ever Stop | 24 |
| 4 | DEEP | Don't You Ever Stop | 24 |
| 5 | THE SHARPS | Through a Veil | 23 |
| 6 | THE SHARPS | Through a Veil | 23 |
| 7 | THE SHARPS | Through a Veil | 23 |
| 8 | THE SHARPS | Through a Veil | 23 |
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| 35 | THE SHARPS | Through a Veil | 23 |
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| 37 | THE SHARPS | Through a Veil | 23 |
| 38 | THE SHARPS | Through a Veil | 23 |
| 39 | THE SHARPS | Through a Veil | 23 |
| 40 | THE SHARPS | Through a Veil | 23 |

Experiments 2-4

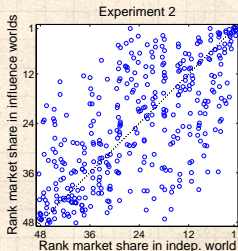
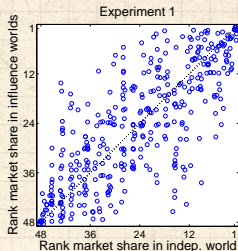
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Variability in final rank.

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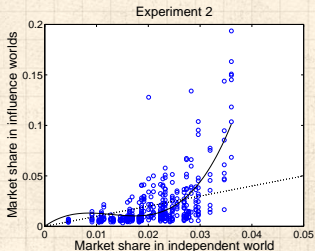
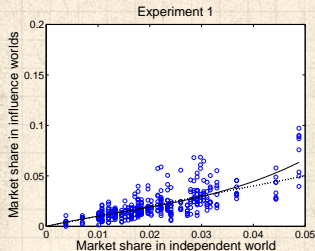
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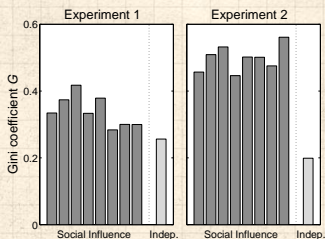
Variability in final number of downloads.



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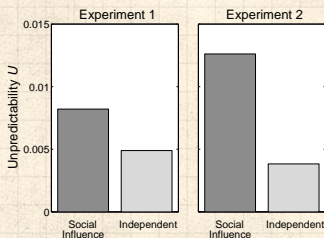
References



Inequality as measured by Gini coefficient:

$$G = \frac{1}{(2N_s - 1)} \sum_{i=1}^{N_s} \sum_{j=1}^{N_s} |m_i - m_j|$$





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Unpredictability

$$U = \frac{1}{N_s \binom{N_w}{2}} \sum_{i=1}^{N_s} \sum_{j=1}^{N_w} \sum_{k=j+1}^{N_w} |m_{i,j} - m_{i,k}|$$



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Sensible result:

- Stronger social signal leads to **greater following and greater inequality.**

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Peculiar result:

- Stronger social signal leads to greater **unpredictability.**

Very peculiar observation:

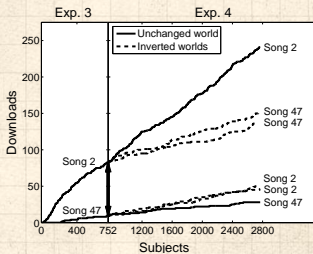
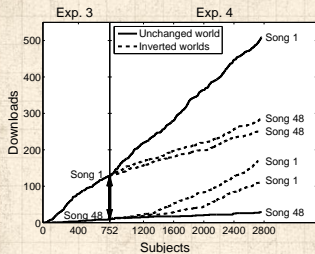
- The most unequal distributions would suggest the greatest variation in underlying 'quality.'
- But success may be due to social construction through **following.** (so let's tell a story... [8, 9])



Music Lab Experiment—Sneakiness [7]

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References

- 🧱 Inversion of download count
- 🧱 The pretend rich get richer ...
- 🧱 ... but at a slower rate



References I

- [1] M. Adler.
Stardom and talent.
[American Economic Review](#), pages 208–212, 1985.
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- [2] M. Balinski and R. Laraki.
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- [3] I. D. Chase, C. Tovey, D. Spangler-Martin, and
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Individual differences versus social dynamics in the
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[Proc. Natl. Acad. Sci.](#), 99(8):5744–5749, 2002. [pdf](#) 

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References II

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The economics of superstars.

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- [6] M. J. Salganik, P. S. Dodds, and D. J. Watts.
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[Science](#), 311:854-856, 2006. pdf ↗



References III

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- [8] C. R. Sunstein.
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Oxford University Press, New York, 2006.

- [9] N. N. Taleb.
The Black Swan.
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