

Voting, Success, and Superstars

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

Prof. Peter Sheridan Dodds | @peterdodds

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



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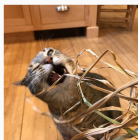
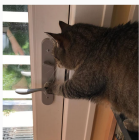
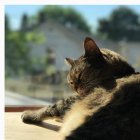
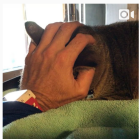
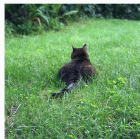
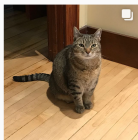
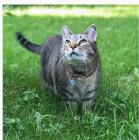
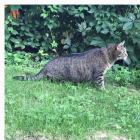
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 On Instagram at [pratchett_the_cat](https://www.instagram.com/pratchett_the_cat) 

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Where do superstars come from?

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"The economics of superstars" 

S. Rosen,

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Examples:



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Examples:

 Full-time Comedians (≈ 200)



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-  Highly skewed distributions again...



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Rosen's theory:

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



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A very good surgeon is worth many mediocre ones



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- 🧱 Joint consumption versus public good.



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 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]



"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.*"

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Assumes extreme case of equal 'inherent quality'





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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





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-  Success can be purely a social construction





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-  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.



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]



Model: participants rank n objects based on underlying quality q





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- 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*:



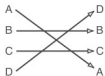
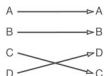
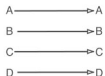
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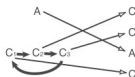
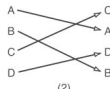
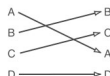
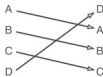
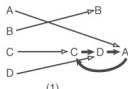
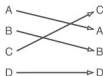
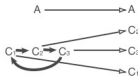
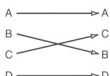
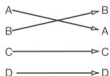
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Fish forget—changing of dominance hierarchies:

1st Hierarchy \Rightarrow 2nd Hierarchy



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Dominance hierarchies

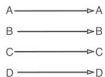
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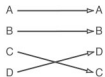
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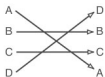
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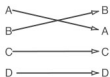


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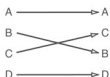


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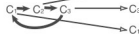
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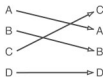
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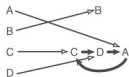
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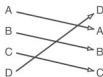
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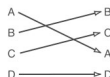
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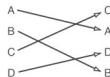
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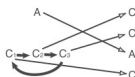
(1)



(2)



(2)



(1)



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



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		Methods of Forming Hierarchies			
Size of set	Group assembly	Round-robin competition			
4	<p>A A</p> <p>B</p> <p>C C₁ → C₂ → C₃</p> <p>D</p> <p>(23) (2)</p> <p>n=25</p>	<p>A A → B</p> <p>B A → B</p> <p>C C → D</p> <p>D C → D</p> <p>(9) (3)</p>	<p>A</p> <p>C₁ → C₂ → C₃</p> <p>D</p> <p>(3) (1)</p> <p>n=16</p>	<p>B₁ → B₂ → B₃</p> <p>D</p> <p>(1)</p>	
5	<p>A A</p> <p>B B</p> <p>C C</p> <p>D D</p> <p>E E</p> <p>(10) (1)</p> <p>n=11</p>	<p>A A → B</p> <p>B A → B</p> <p>C C → D</p> <p>D C → D</p> <p>E</p> <p>(6) (1)</p>	<p>A</p> <p>B B → C</p> <p>D D → E</p> <p>E</p> <p>(1) (1)</p> <p>n=12</p>	<p>B₁ → B₂ → B₃</p> <p>D</p> <p>E</p> <p>(2) (1)</p>	<p>A A</p> <p>B B</p> <p>C₁ → C₂ → C₃</p> <p>D₁ → D₂ → D₃</p> <p>E</p> <p>(1) (1)</p>



Group versus isolated interactions produce different hierarchies



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BAND NAME

SONG TITLE

NUMBER OF
DOWNLOADS

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

48 songs
30,000 participants

multiple 'worlds'
Inter-world variability



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How probable is the world?



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Can we estimate variability?



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Inter-world variability

- How probable is the world?
- Can we estimate variability?
- Superstars dominate but are unpredictable. Why?



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HARTSFIELD: "enough is enough"	20	GO MORECAL: "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 helix above the answer"	12	FORTHFADING: "leaf"	24	FAR FROM KNOWN: "outsy?"	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: "Bles mystery"	14
NOT FOR SCHOLARS: "as seasons change"	27	SIMPLY WAITING: "meet with the coast"	16	FADING THROUGH: "wish me luck"	10
SECRETARY: "three post-its on the hallway"	5	STAR CLIMBER: "hell no"	38	UNKNOWN CITIZENS: "falling over"	34
ART OF KAMLY: "reductive 400, melodic breakdown"	10	THE FACTLANE: "if death do us part i don't"	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 doremy j"	10
BEESBING: "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

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

Salganik, Dodds, and Watts,
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Experiment 1

Rank	Song Title	# of Votes
1	WINTERFELDS Through a Storm	24
2	CEY MOPACIAN I have come to you	24
3	DEEP BREATH TO GO The Way	23
4	THE SHUFFY SUGARBE SUGARBE	22
5	THE SHUFFY SUGARBE SUGARBE	22
6	THE SHUFFY SUGARBE SUGARBE	22
7	THE SHUFFY SUGARBE SUGARBE	22
8	THE SHUFFY SUGARBE SUGARBE	22
9	THE SHUFFY SUGARBE SUGARBE	22
10	THE SHUFFY SUGARBE SUGARBE	22
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12	THE SHUFFY SUGARBE SUGARBE	22
13	THE SHUFFY SUGARBE SUGARBE	22
14	THE SHUFFY SUGARBE SUGARBE	22
15	THE SHUFFY SUGARBE SUGARBE	22
16	THE SHUFFY SUGARBE SUGARBE	22
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18	THE SHUFFY SUGARBE SUGARBE	22
19	THE SHUFFY SUGARBE SUGARBE	22
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22	THE SHUFFY SUGARBE SUGARBE	22
23	THE SHUFFY SUGARBE SUGARBE	22
24	THE SHUFFY SUGARBE SUGARBE	22
25	THE SHUFFY SUGARBE SUGARBE	22
26	THE SHUFFY SUGARBE SUGARBE	22
27	THE SHUFFY SUGARBE SUGARBE	22
28	THE SHUFFY SUGARBE SUGARBE	22
29	THE SHUFFY SUGARBE SUGARBE	22
30	THE SHUFFY SUGARBE SUGARBE	22

Experiments 2-4

Rank	Song Title	# of Votes
1	WINTERFELDS Through a Storm	24
2	CEY MOPACIAN I have come to you	24
3	DEEP BREATH TO GO The Way	23
4	THE SHUFFY SUGARBE SUGARBE	22
5	THE SHUFFY SUGARBE SUGARBE	22
6	THE SHUFFY SUGARBE SUGARBE	22
7	THE SHUFFY SUGARBE SUGARBE	22
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15	THE SHUFFY SUGARBE SUGARBE	22
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18	THE SHUFFY SUGARBE SUGARBE	22
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20	THE SHUFFY SUGARBE SUGARBE	22
21	THE SHUFFY SUGARBE SUGARBE	22
22	THE SHUFFY SUGARBE SUGARBE	22
23	THE SHUFFY SUGARBE SUGARBE	22
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27	THE SHUFFY SUGARBE SUGARBE	22
28	THE SHUFFY SUGARBE SUGARBE	22
29	THE SHUFFY SUGARBE SUGARBE	22
30	THE SHUFFY SUGARBE SUGARBE	22



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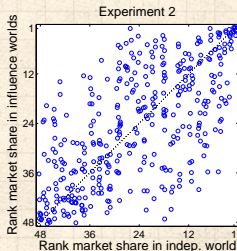
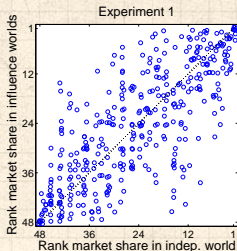
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Variability in final rank.



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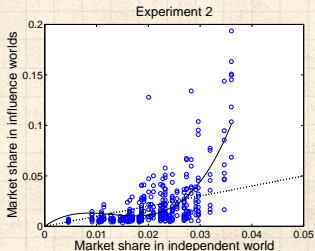
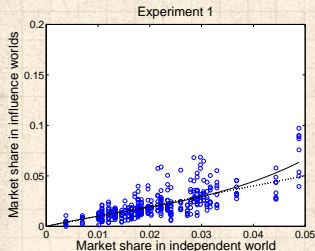
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Variability in final number of downloads.



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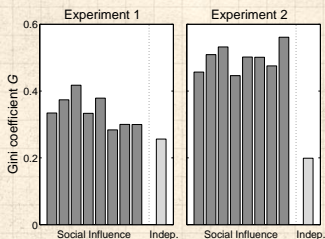
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Inequality as measured by Gini coefficient:

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



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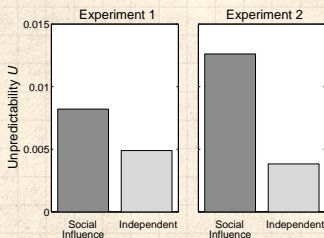
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Unpredictability

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



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Sensible result:

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

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Music Lab Experiment

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Peculiar result:

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Very peculiar observation:



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Very peculiar observation:

 The most unequal distributions would suggest the
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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])



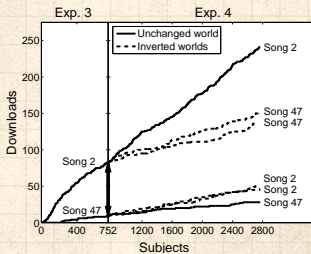
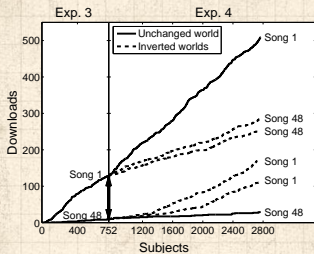
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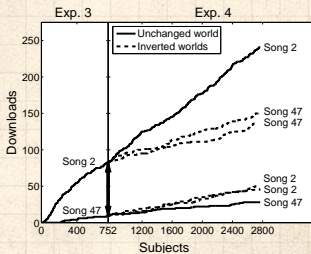
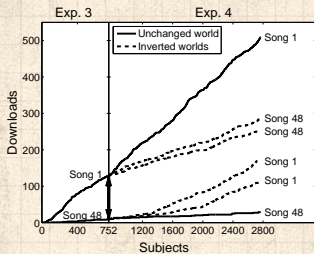
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 The pretend rich get richer ...



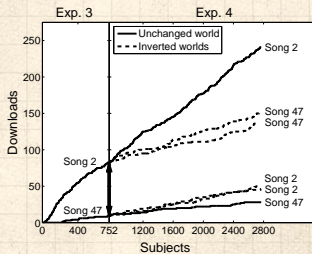
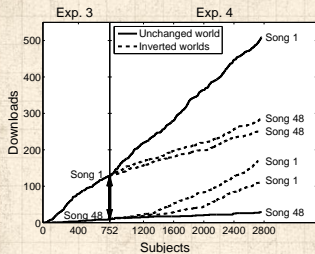
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-  The pretend rich get richer ...
-  ... but at a slower rate






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