

Voting, Success, and Superstars

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Principles of Complex Systems, Vol. 1 | @pocsvox
CSYS/MATH 300, Fall, 2020

Prof. Peter Sheridan Dodds | @peterdodds

Computational Story Lab | Vermont Complex Systems Center
Vermont Advanced Computing Core | University of Vermont



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References



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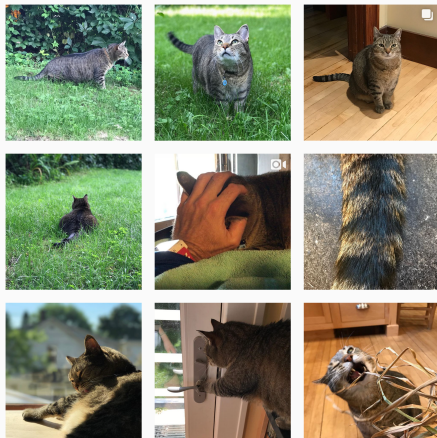
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 On Instagram at [pratchett_the_cat](https://www.instagram.com/pratchett_the_cat) 



Outline

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Where do superstars come from?



"The economics of superstars" 

S. Rosen,





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

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References

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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References





"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]





“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

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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]

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References

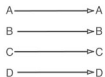
 The aggressive female *Metriaclima zebra*:



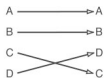
Dominance hierarchies

Fish forget—changing of dominance hierarchies:

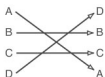
1st Hierarchy \Rightarrow 2nd Hierarchy



(6)

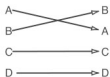


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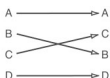


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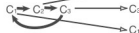
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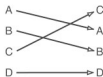
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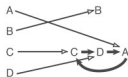
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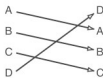
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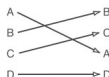
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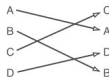
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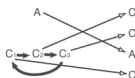
(1)



(2)



(2)



(1)



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

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Dominance hierarchies

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Methods of Forming Hierarchies																					
Size of set	Group assembly Round-robin competition																				
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Group versus isolated interactions produce different hierarchies



Music Lab Experiment



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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References

48 songs

30,000 participants

multiple 'worlds'

Inter-world variability



How probable is the world?



Can we estimate variability?



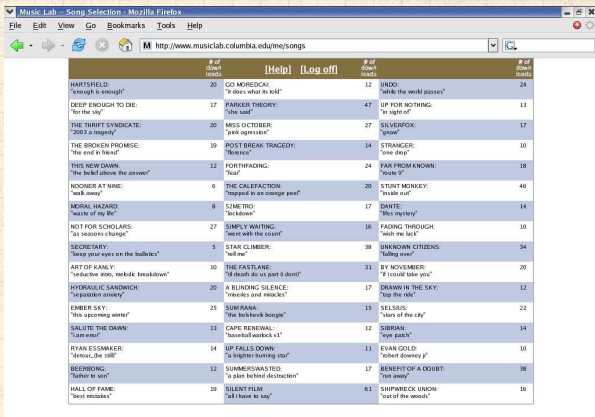
Superstars dominate but are unpredictable. Why?



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Music Lab - Song Selection - Mozilla Firefox
http://www.musiclab.columbia.edu/me/songs

	# of down loads	[Help] [Log off]	# of down loads	# of down loads	
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: "love deep"	10
THIS NEW DAWN: "the label 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 coast"	16	FADING THROUGH: "wish me luck"	10
SECRETARY: "three post-its on the bulletin"	5	STAR CLIMBER: "hell no"	38	UNKNOWN CITIZENS: "falling over"	34
ART OF KAMLY: "radioactive 400, melodic breakdown"	10	THE FACTLANE: "if death do us part 9 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: "short doney 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

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References



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

Salganik, Dodds, and Watts,
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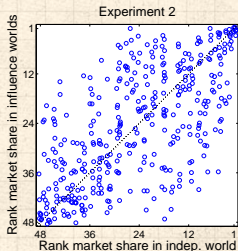
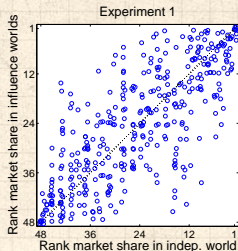



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 Variability in final rank.

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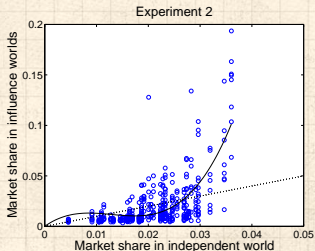
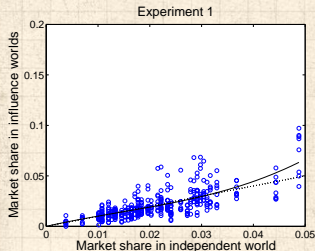
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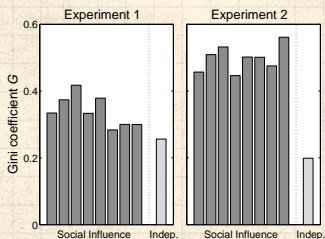
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Variability in final number of downloads.





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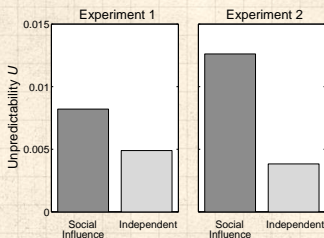
References



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

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



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])

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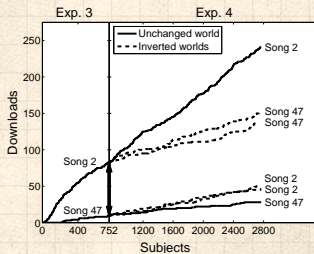
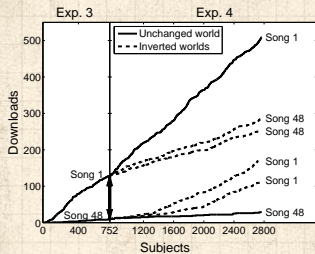
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-  Inversion of download count
-  The pretend rich get richer ...
-  ... but at a slower rate



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