

# Voting, Success, and Superstars

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

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Voting, Success,  
and Superstars  
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Winning: it's not  
for everyone

Superstars  
Musical

References

Prof. Peter Sheridan Dodds | @peterdodds

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



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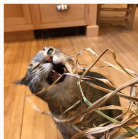
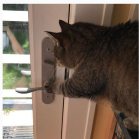
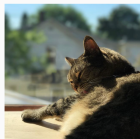
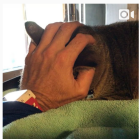
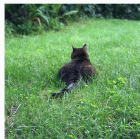
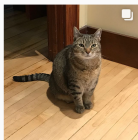
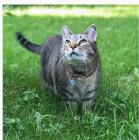
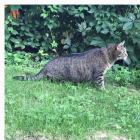
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 On Instagram at [pratchett\\_the\\_cat](https://www.instagram.com/pratchett_the_cat) 

# Outline

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Winning: it's not  
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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. <sup>[5]</sup>

Examples:



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Examples:

 Full-time Comedians ( $\approx 200$ )





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# Where do superstars come from?



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## Examples:

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



# Superstars


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Rosen's theory:


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



# Superstars

## Rosen's theory:

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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,  
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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.*"



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Assumes extreme case of equal 'inherent quality'





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

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- 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]

“Individual differences versus social dynamics in the formation of animal dominance hierarchies” ↗

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 The aggressive female *Metriaclima zebra*:



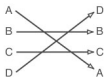
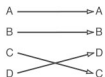
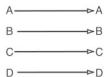
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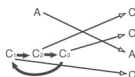
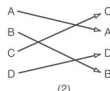
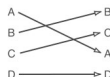
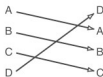
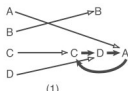
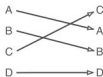
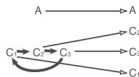
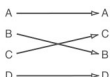
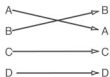
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## Fish forget—changing of dominance hierarchies:

1st Hierarchy  $\Rightarrow$  2nd Hierarchy



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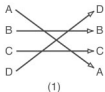
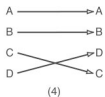
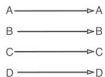
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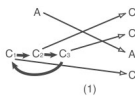
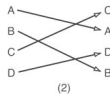
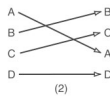
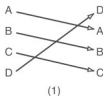
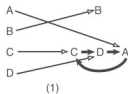
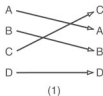
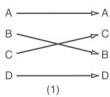
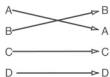
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1st Hierarchy  $\Rightarrow$  2nd Hierarchy



1st Hierarchy  $\Rightarrow$  2nd Hierarchy



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



# Dominance hierarchies

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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 C<sub>1</sub> → C<sub>2</sub> → C<sub>3</sub></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>C<sub>1</sub> → C<sub>2</sub> → C<sub>3</sub></p> <p>(3)</p>	<p>B<sub>1</sub> → B<sub>2</sub> → B<sub>3</sub></p> <p>D</p> <p>(1)</p>	n=16		
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 → C</p> <p>D → E</p> <p>(1)</p>	<p>B<sub>1</sub> → B<sub>2</sub> → B<sub>3</sub></p> <p>D</p> <p>E</p> <p>(2)</p>	<p>A</p> <p>C<sub>1</sub> → C<sub>2</sub> → C<sub>3</sub></p> <p>E</p> <p>(1)</p>	<p>A</p> <p>B</p> <p>D<sub>1</sub> → D<sub>2</sub> → D<sub>3</sub></p> <p>(1)</p>	n=12



Group versus isolated interactions produce different hierarchies



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# Music Lab Experiment

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48 songs  
30,000 participants

**BAND NAME**

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

**SONG TITLE**

**NUMBER OF  
DOWNLOADS**

multiple 'worlds'  
Inter-world variability





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How probable is the world?



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Inter-world variability



How probable is the world?



Can we estimate variability?



# Music Lab Experiment

PoCS, Vol. 1  
Voting, Success,  
and Superstars  
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Winning: it's not  
for everyone

Superstars  
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References



**BAND NAME**

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

**SONG TITLE**

**NUMBER OF DOWNLOADS**

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 MORECOCAL: "It 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: "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 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 don't"	31	BY NOVEMBER: "I could take you"	20
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "pieces and cracks"	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 doneyay j"	10
BEERBONG: "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,  
Science, **311**, 854-856, 2006. [6]



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## Experiment 1

Rank	Song Title	# of Votes
1	WINTERGUILD "Through a Veil"	24
2	CEY MOPEDAN "I love you so bad"	24
3	DEEP BEACHES TO DIE "The Sea"	22
4	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	21
5	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	20
6	WELL OCTOBER "WELL OCTOBER"	20
7	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	20
8	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	19
9	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	19
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11	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	19
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29	THE SHUFFY SUGGESTIVE "SUGGESTIVE"	19
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## Experiments 2-4

Rank	Song Title	# of Votes
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# Music Lab Experiment

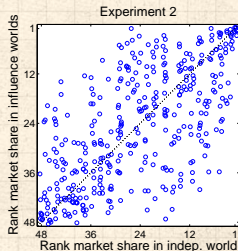
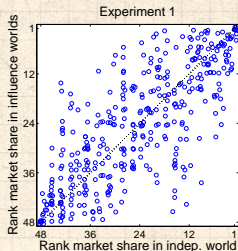
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Variability in final rank.



# Music Lab Experiment

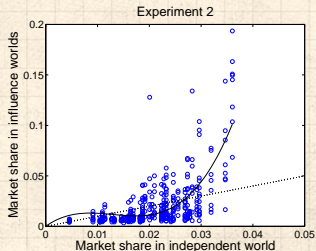
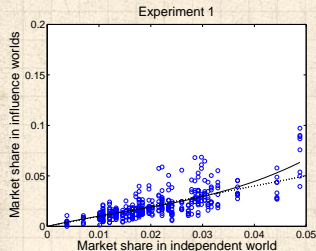
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Variability in final number of downloads.



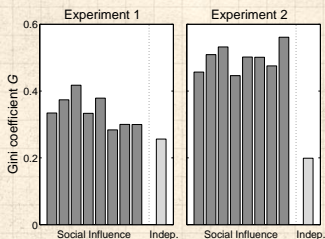
# Music Lab Experiment

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Inequality as measured by Gini coefficient:

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





# Music Lab Experiment

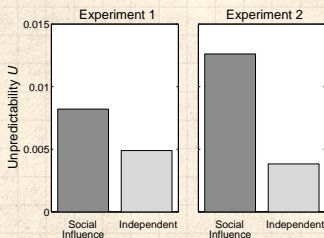
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## Unpredictability


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



# Music Lab Experiment

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Sensible result:

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

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Peculiar result:



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Very peculiar observation:



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

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## Peculiar result:

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## Very peculiar observation:

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



# Music Lab Experiment

## Sensible result:

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- The most unequal distributions would suggest the greatest variation in underlying 'quality.'
- But success may be due to social construction through **following.**

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# Music Lab Experiment

## Sensible result:

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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])

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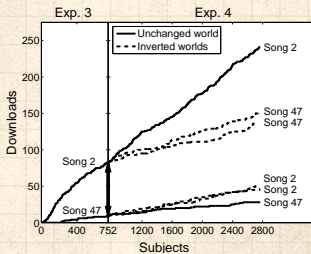
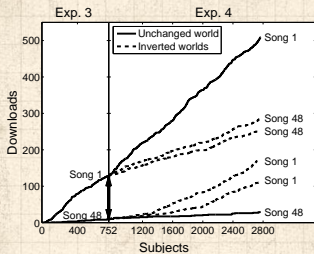
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Inversion of download count



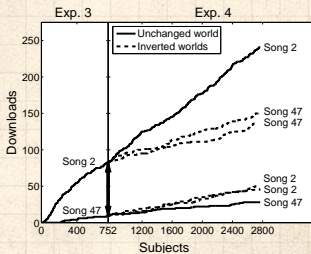
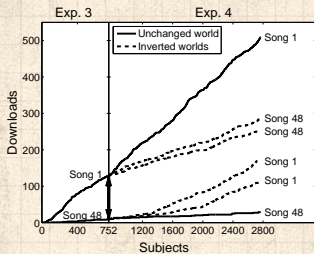
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 The pretend rich get richer ...



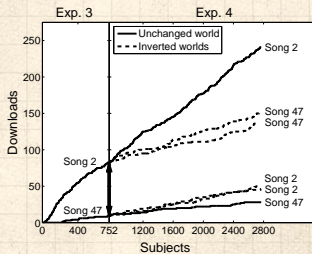
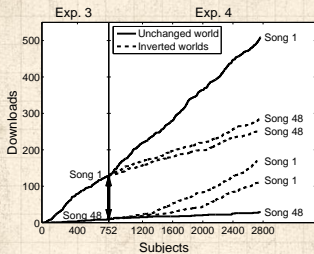
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References



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






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