

Science of Success

Albert-László Barabási

CENTER FOR COMPLEX NETWORKS RESEARCH

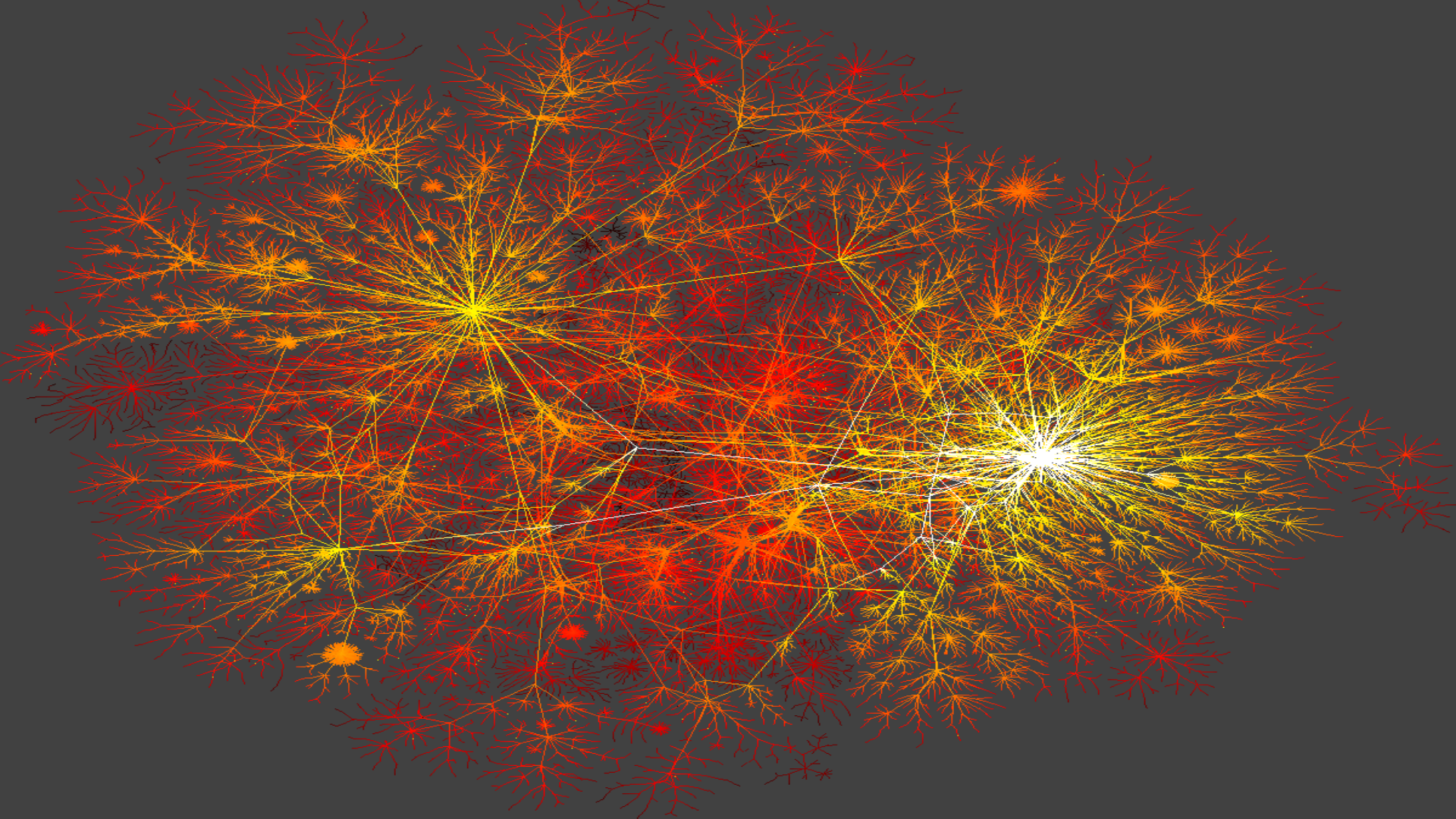
NORTHEASTERN UNIVERSITY

DEPARTMENT OF MEDICINE AND CCSB

HARVARD MEDICAL SCHOOL

CENTRAL EUROPEAN UNIVERSITY, BUDAPEST

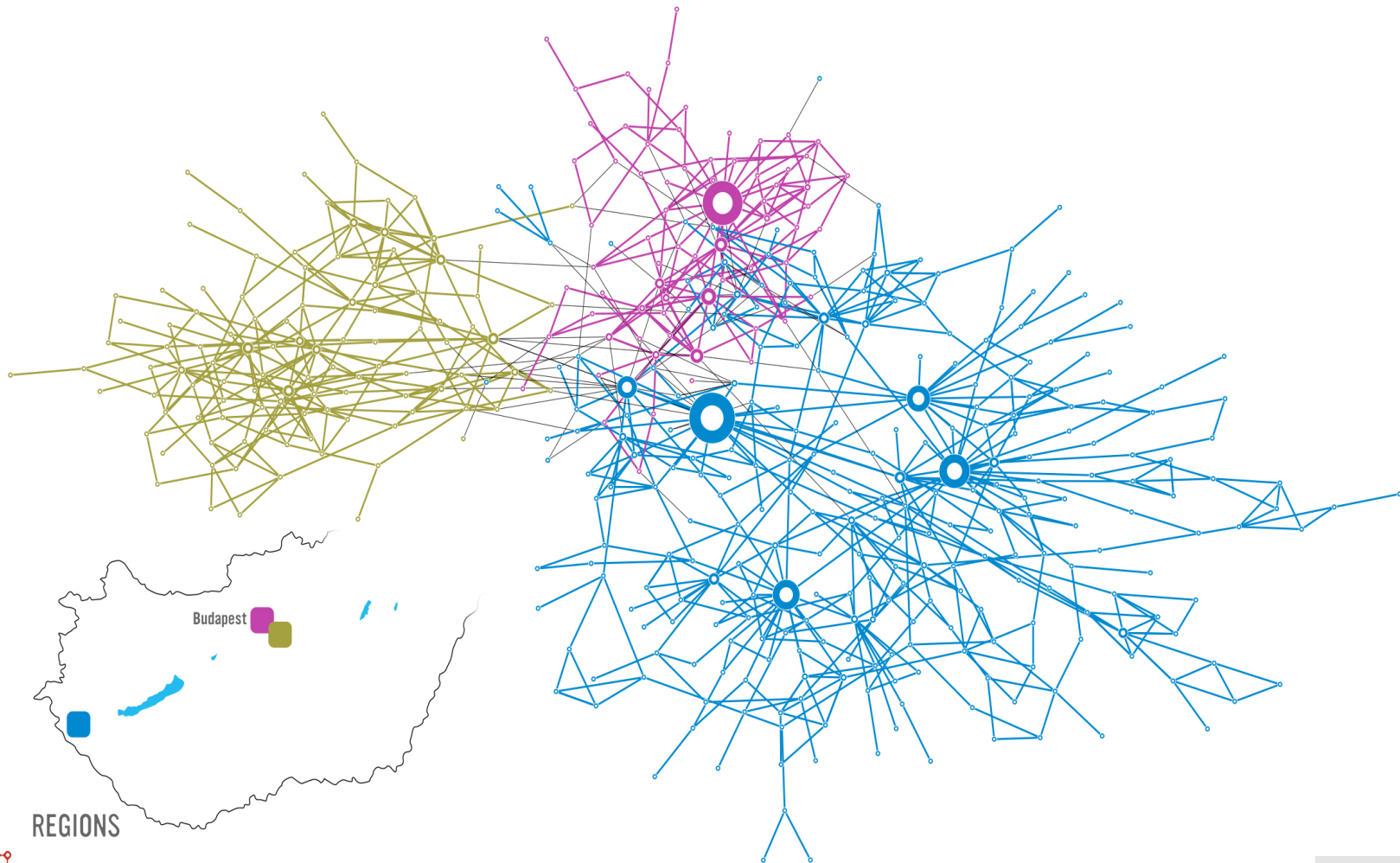
www.BarabasiLab.com





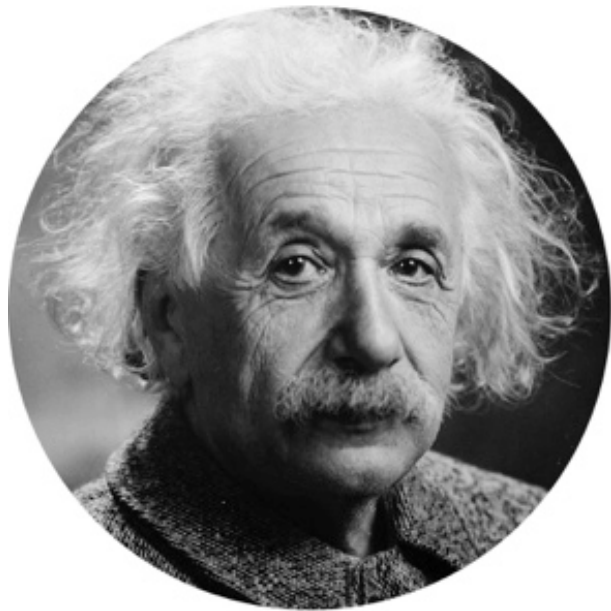






John Bardeen

James Clerk Maxwell





1905

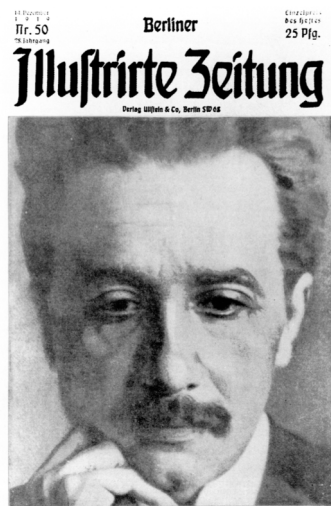
$E = mc^2$

“miracle year”



1915

general theory
of relativity



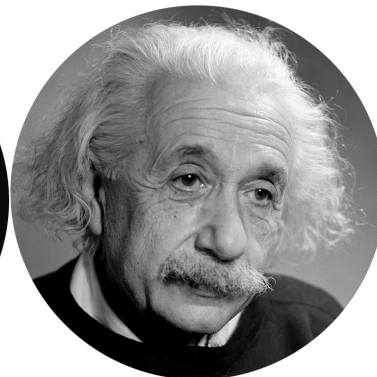
1919

Eclipse proves
general relativity



1922

Nobel Prize



1955

Heart failure

“It is an interesting theory but to those who know our man in the street, it is not plausible.”

“The true answer is democracy. The Declaration of Independence itself is outraged by the assertion that there is anything on earth, or in interstellar space that can be understood by only the chosen few.”

April 1921, The New York Times



April 3, 1921

The Washington Post

NO. 20,991

ENTERED AS SECOND CLASS MATTER
POSTOFFICE, WASHINGTON, D. C.

WASHINGTON, TUESDAY

Hot Shots Fired in Vote War; Citizens Hang Long Effigies

Control Battles Occupants
of Truck Believed
Carrying Ballots.

It's Quiet, Huey
Avers From Afar

10 Deputies Sworn In
to Up Old Court's
Election Ban.

Stephens, La., Dec. 4 (AP).—A battle between a group of citizens, French citizens and occupants of a truck in which it was used new ballots were being held from Baton Rouge to replace or burned earlier in the night the main street of Chauvin, La., in protest against the Sixth anti-Congressional election of the Louisiana State Police. The truck was on the bridge and was used from the 25 armed citizens over the ceiling of the truck without holding a Democratic primary. A new law was passed in the case of about 30 shots, but the firing ended in the grave loss of a truck. The truck was later in the evening men knew it in 15 automobiles and trucks and later shots for the Louisiana State Police from a machine gun. The police men, and citizens drove to the main street of Chauvin Springs, the largest town in parish, and burned them in a fire.

Mr. Felix Morley.

Will become Editor of THE WASHINGTON POST on December 1st, succeeding Mr. J. B. Hennrich, who has tendered his resignation to engage in other work. Mr. Morley has been a member of the staff of the Washington Post for the past three years. Prior to his association with that institution, he had extensive editorial and newspaper experience. He was of the editorial staff of the Washington Public Ledger in 1916-17, with the Washington Bureau of the United Press Association in 1917, and with the Washington Bureau of the Philadelphia North American in 1918. He was a member of the editorial staff of the Baltimore Sun from 1919 to 1920, serving as co-editor in the far East in 1920, and at Geneva, Switzerland, in 1920. He was a lecturer on current political questions at St. John's College, Annapolis, in 1920-21, and served as Director of the General office of the League of Nations Association of the United States in 1922-23. He is the author of several books and numerous articles on political and economic subjects. Prior to our entry into the war, Mr. Morley served with the ambulance corps of the British Army in Flanders, and in 1917-18 was engaged in overseas service for the United States Department of Labor. Mr. Morley was born at Havertown, Pa., in 1884, and received the degree of A. B. from Haverford College in 1910. He was a Rhodes scholar at Oxford University from 1910 to 1911, where he also received the degree of A. B., and was Dickinson research fellow at the London School of Economics and Political Science in 1911-12.

Thousands at Pier to Greet Einstein

Triumphal
Procession in his
Honor Bewilders
Sensitive Jewish
Scientist.

By Elbert Thurston.
Behind a scattering of new developments yesterday, 44 President Roosevelt returned to his White House duties, could be observed the thousands of interesting contacts over economy, and other political issues now splitting the administration family and old political friends. The outward developments were these: The Administration left the R. F. C. prize for newly mined diamonds sold at \$24.61 an ounce, the same as Saturday's market, and with it government bonds, valued up again, the Treasury reported it had bought but \$2,445,000 of Government last week, as against \$4,745,000 the week before, but while officials pointed to the management of the bond market as evidence of the ability of Government bonds to hold their own, they had to concede that the dollar had gone up, contrary to the alarm and hopes of Prof. George F. Warren and the other disciples of current monetary manipulations.

Fletcher Sees President.
Senator Duncan W. Fletcher (Democrat, Florida, chairman of the Senate Committee on Banking and Currency, called on the President and emergency, and the White House might have other interesting of the ability of the subject being, a new point with the so-called Young, Liberal, who said President's

G. O. P. Group Again Flays Roosevelt

Epithets, Abuse Answer
to Criticism, in Charge
of Committee.

Conducting a "dissemination" is charged against the Roosevelt Administration in a second printed pamphlet issued yesterday by the Republican National committee. Returning to the attack began a few weeks ago, after a long period of possible silence, the committee cited efforts to censor press and radio, and charged that the President and his leaders answer criticism "with epithets." The cover of the latest broadsheet, instead of bearing a title, quotes the following "epithets": "No respect, utterances of the President, Gen. Hugh H. Johnson, Donald B. Richards, Governor-elect for MRA, and Speaker Rainey, of the House."

Government Only Criticism.

Factory Plan In Hill Colony Stirs Protest

Project Would Cost Job
of 250, Rep. Ludlow
Tells President.

An appeal to President Roosevelt to shun operation of factories in connection with the Federal "substance" "substance" experiment has been sent to the White House by Representative Louis Ludlow (Democrat, Indiana). Plans to spend \$100,000 to equip a factory in West Virginia for the manufacture of possible equipment as part of the homebased project, sponsored by Mrs. Roosevelt, would give the Keyhole Lock Co., of Indianapolis, to "sell business government."

"All the News
That's Fit to Print"

The New York Times.

Copyright, 1931, by The New York Times Company.

LATE CITY EDITION
Friday and Saturday, 1931
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Printed at No. 10, N. 10th St., N. Y. C.
No. 10, N. 10th St., N. Y. C.

NOV. 10, 1931.
NEW YORK, WEDNESDAY, OCTOBER 14, 1931.
THREE CENTS

PROFESSOR EINSTEIN HERE, EXPLAINS RELATIVITY

Thousands Wait For Hours to Welcome Theorist and His Party to America.

Profiteering as a result of the milk strike brought a warning last night from the big distributing companies that they would shut off the supply of any dealer or storekeeper who attempted to extort exorbitant prices. Health Commissioner Dr. Royal S. Copeland said that some complaints had been registered with his department, and he would act if profiteering became a menace. Reports showed that the prices exacted by profiteering grocers and storekeepers in some sections ranged from 35c to 25c a quart. Some Brooklyn grocers were selling "loose" milk at from 31c to 35c, and one store near Borough Hall was getting 35 cents for a single quart of grade "B" milk, usually sold for 10 cents. Other stores near Borough Hall were asking from 17c to 25c a quart. Not many people were buying from these stores, most householders going to milk depots, where the regular prices prevailed. Some stores in the Williamsburg section were reported to have sold milk at

20 cents a quart and in several instances the prices went to 30 cents. High prices were extorted for Grade A milk, which retails at 15 cents a quart. Dealers able to get this milk said that the distributors had made them pay the retail price, and they had to add sufficient to make a profit. Profiteering milk peddlers made their appearance in the Bronx, Harlem and the Washington Heights section, getting as much as 40 cents a quart. Many householders seemed to be relieved to obtain milk even at this price for the sake of their babies. "We are prepared to use every means to protect the public from profiteers," said Patrick Fox, President of the Eboran Company. "Any dealers found overcharging will be shut off from further supply. No extra charge is being made at our depots or distributing stations." At the Milk Conference Board it was said that the distributors had taken steps to stop any flagrant cases of profiteering.

Must Double Milk Supply by Tomorrow, Copeland Warns

STRIKERS RIOTING ALL OVER THE CITY

BRICKS RAIN ON TRUCK

Drivers and Dealers A Beaten, Policemen A tacked, Wagons Stolen

ONE DYING, TWO BADLY HU

People With Pails Are Turn Back From Stations, Small Storekeepers Cowed.

40 ARRESTS, FOUR TO J

Courts Score Disregard Public, Threaten Severe Ser



Chaim Weizman

Meachim Usishkin

Performance

Success/Recognition



Performance is about you, success is about us.

Novak Djokovic



Google search: 27500000 hits

In 2014:

#1 & 2 in rankings

11,360 score points

61 wins & 8 losses

2,811,439 Wikipedia visits

Winnings \$14 Million

Endorsements \$21 Million

Performance



Google search: 27500000 hits

In 2014:

#1 & 2 in rankings

11,360 score points

61 wins & 8 losses

2,811,439 Wikipedia visits

Winnings \$14 Million

Endorsements \$21 Million

Success

The First Law:

Performance is about you,
success is about us.

Performance and Popularity

Performance

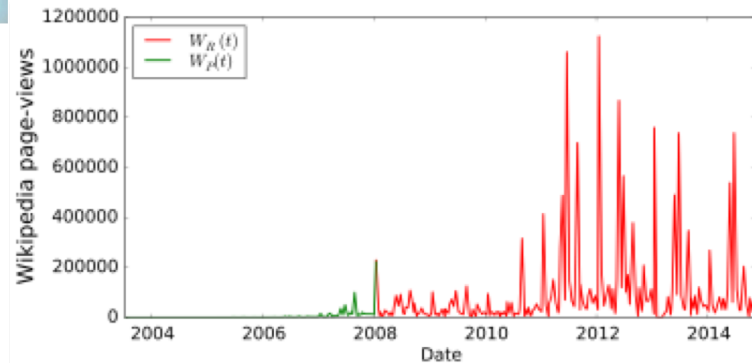
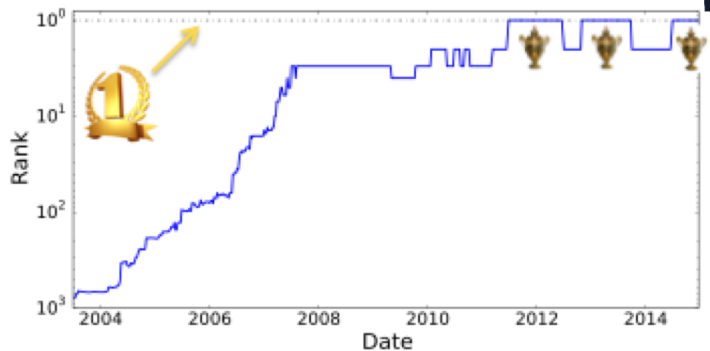
#1 & 2 in rankings
11,360 score points
61 wins & 8 losses
Winnings \$13 Million

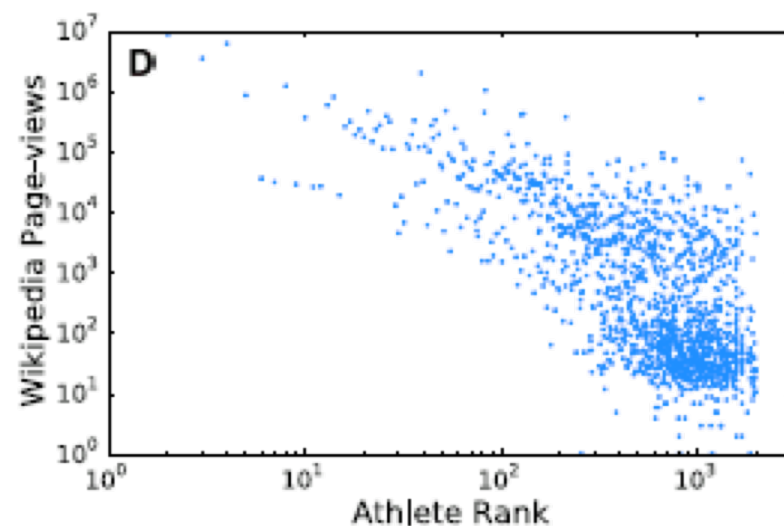
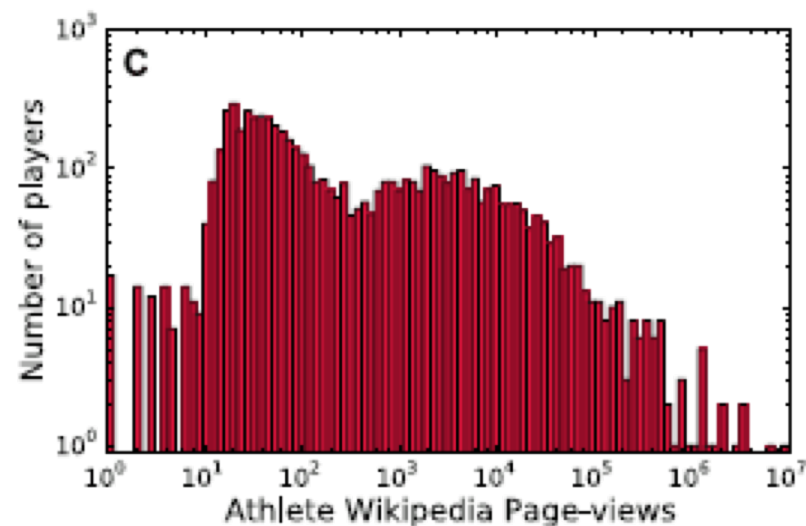
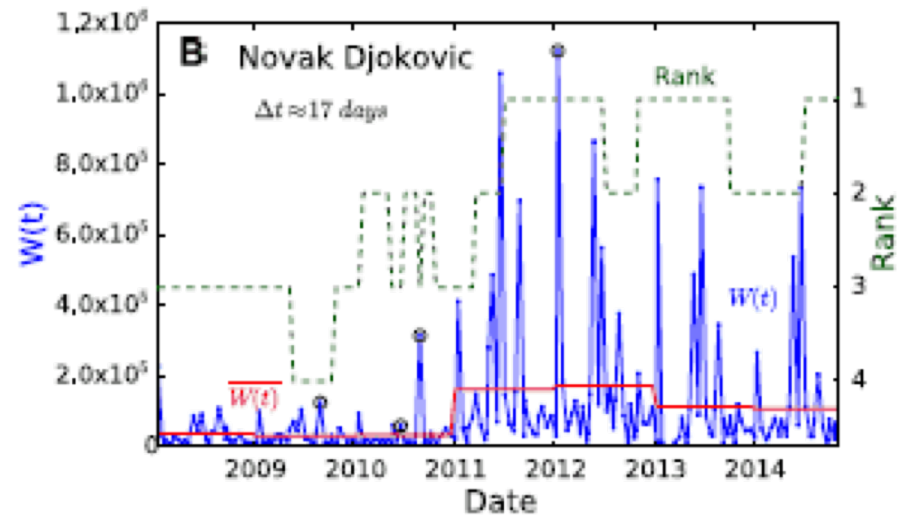
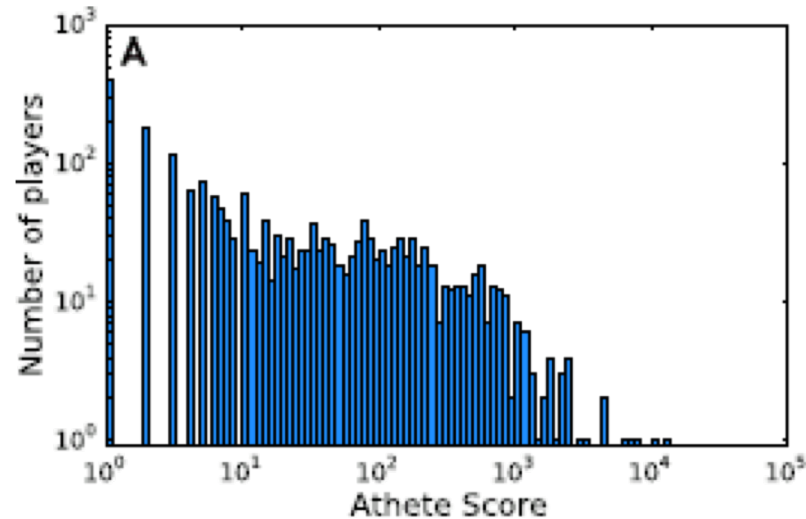
Novak Djokovic



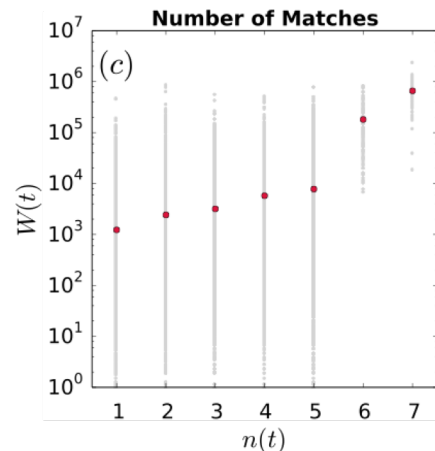
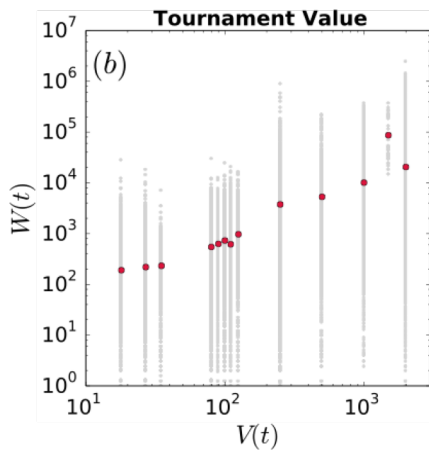
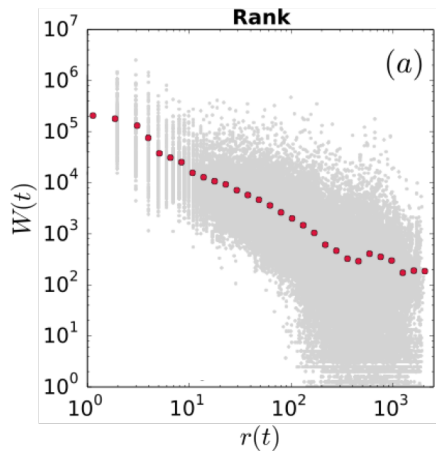
Fame

Google search: 27,500,000 hits
2,811,439 Wikipedia visits
Endorsements \$21 Million





Performance and Popularity



$V(t)$: Tournament value

$n(t)$: Number of matches

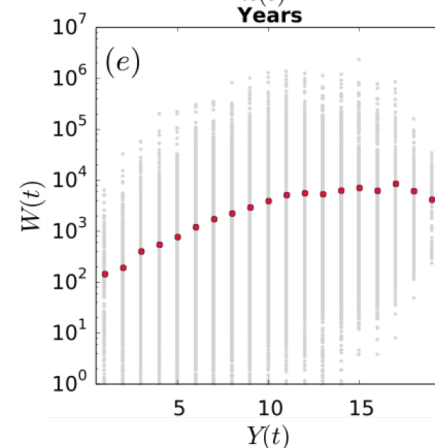
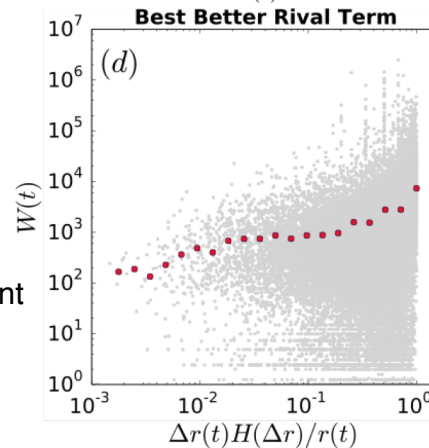
$Y(t)$: Number of active years

$$\Delta r(t) = r(t) - r'(t)$$

$r(t)$: Rank of player

$r'(t)$: Rank of best rival in tournament

$$H(\Delta r) = \begin{cases} 0 & \text{if } \Delta r < 0 \\ 1 & \text{if } \Delta r \geq 0 \end{cases}$$

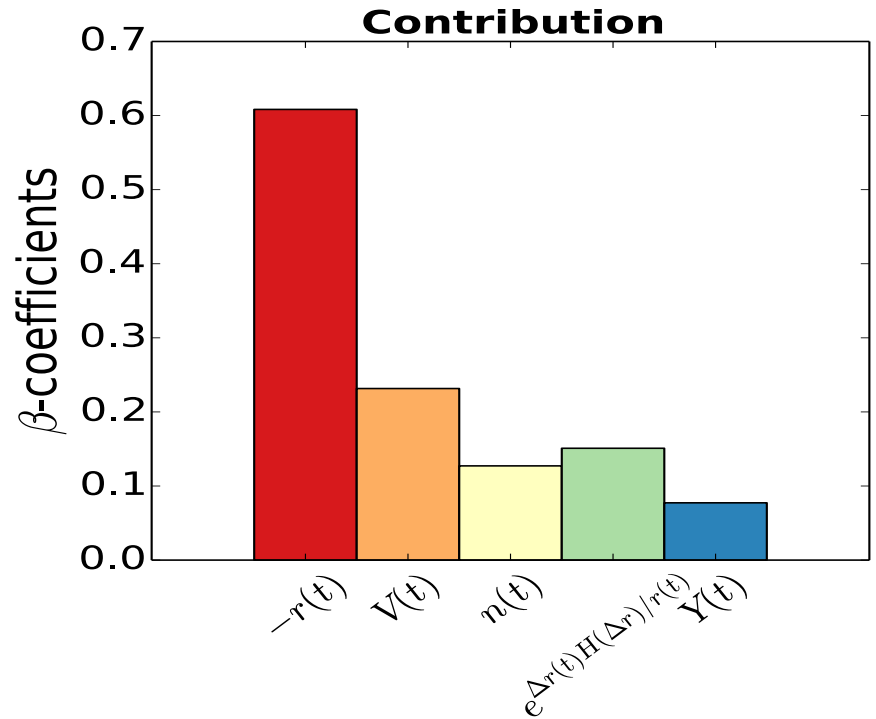


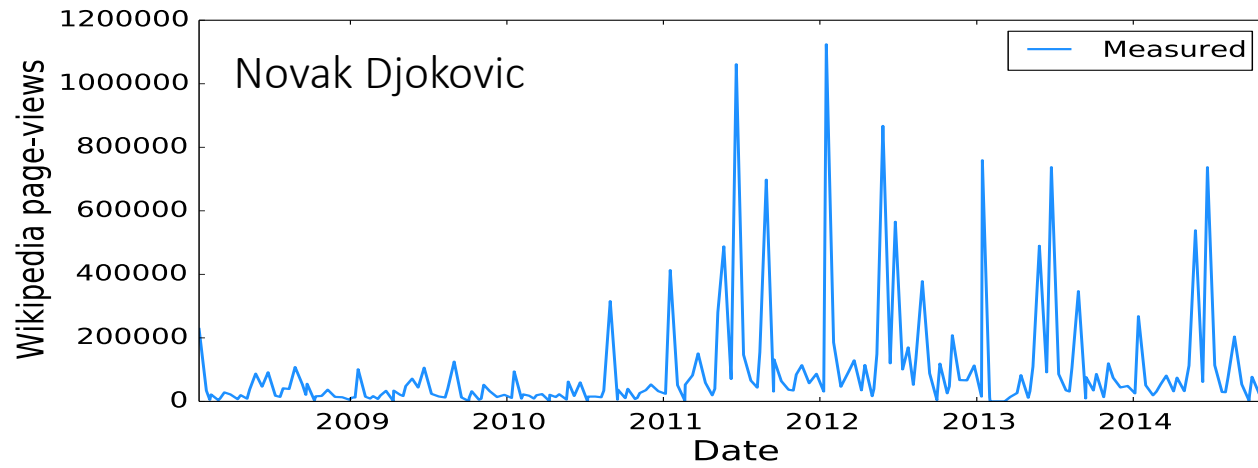
Performance and Recognition:

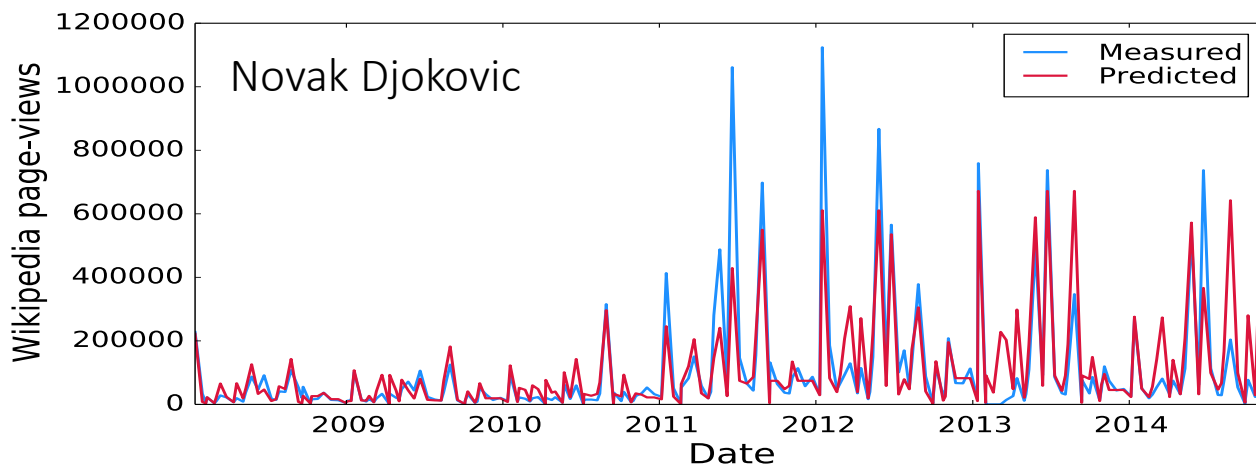
$$W_M(t) = A \frac{Y(t)}{r(t)} V(t) n(t) e^{\Delta r(t) H(\Delta r)/r(t)} + C \frac{Y(t)}{r(t)}$$

V(t): Tournament value
n(t): Number of matches
Y(t): Number of active years
 $\Delta r(t) = r(t) - r'(t)$
r(t): Rank of player
r'(t): Rank of best rival in tournament

$$H(\Delta r) = \begin{cases} 0 & \text{if } \Delta r < 0 \\ 1 & \text{if } \Delta r \geq 0 \end{cases}$$

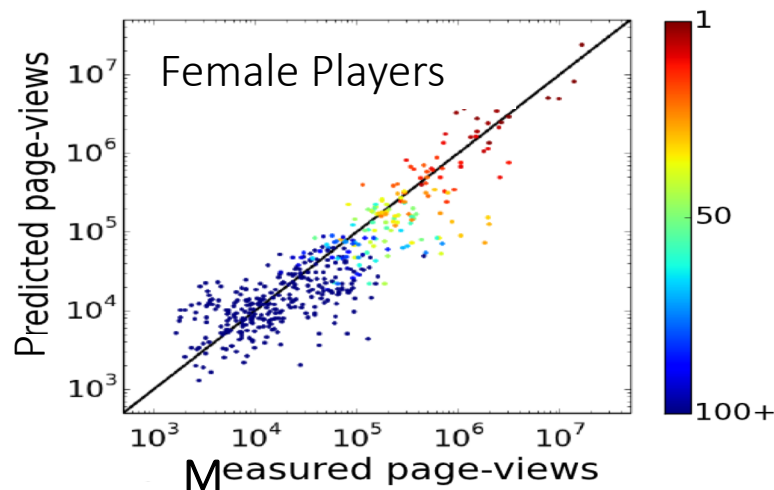
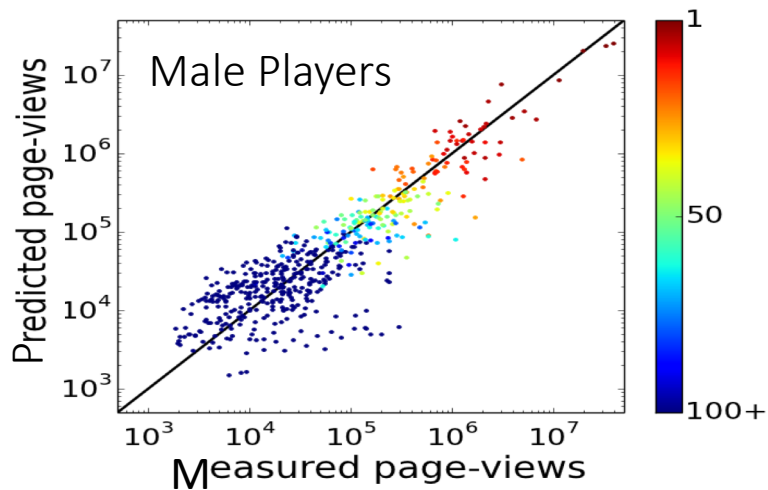
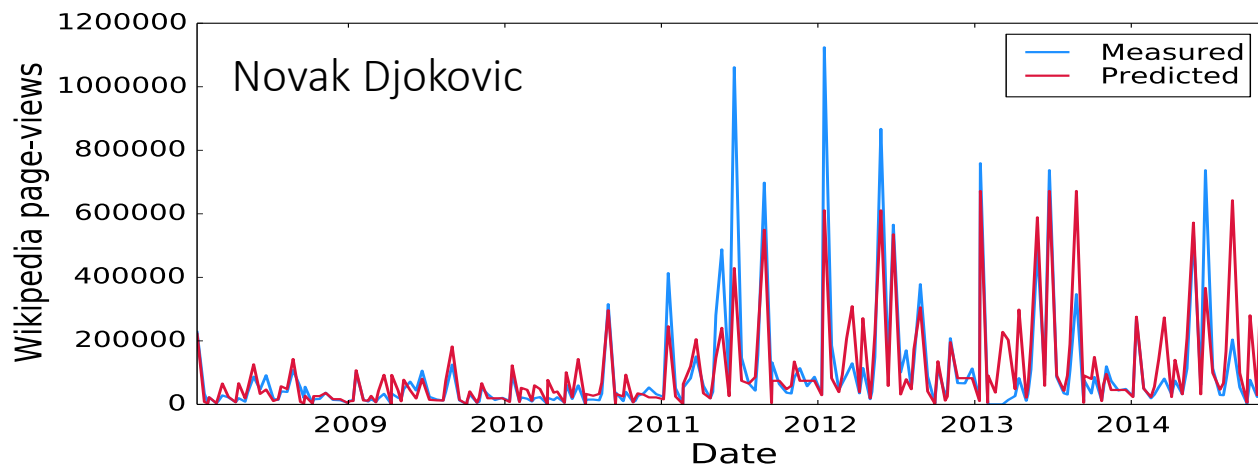






$$W_M(t) = A \frac{Y(t)}{r(t)} V(t) n(t) e^{\Delta r(t) H(\Delta r)/r(t)} + C \frac{Y(t)}{r(t)}$$

Performance Drives Success

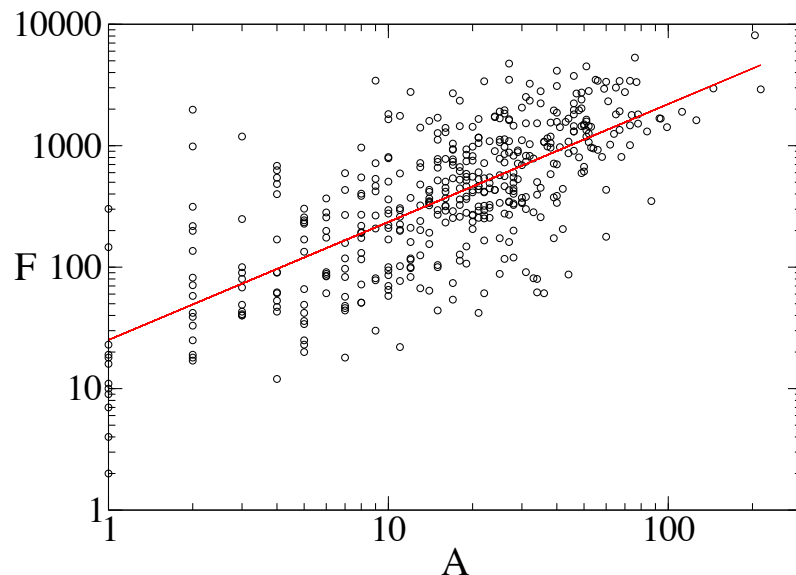


The Second Law:

Performance drives success.

How Famous is a Scientist? — Famous to Those Who Know Us.

James P. Bagrow, Hernan D. Rozenfeld, Erik M. Bollt, and Daniel ben-Avraham₁



$$P(A) \sim e^{-\nu A}; \quad \nu = c\eta.$$

$$P(F) \sim e^{-\eta F}; \quad \eta = 0.00102 \pm 0.00006.$$

$$F(A) \sim cA^\xi; \quad \xi = 0.97 \pm 0.04 \approx 1.$$

FIG. 2: Fame of individual scientists (*Google* hits) versus achievement (number of papers posted in the /cond-mat e-archive). The data ($\circ$) is better fitted by an almost linear relation, $F \sim cA$ (straight line), than by the exponential dependence found in [1].

The Red Baron

"I have not gone to war to collect cheese and eggs, but for another purpose,"



Only 24 hours of training

Six kills within the first month

"Bloody April": 21 planes in April 1917

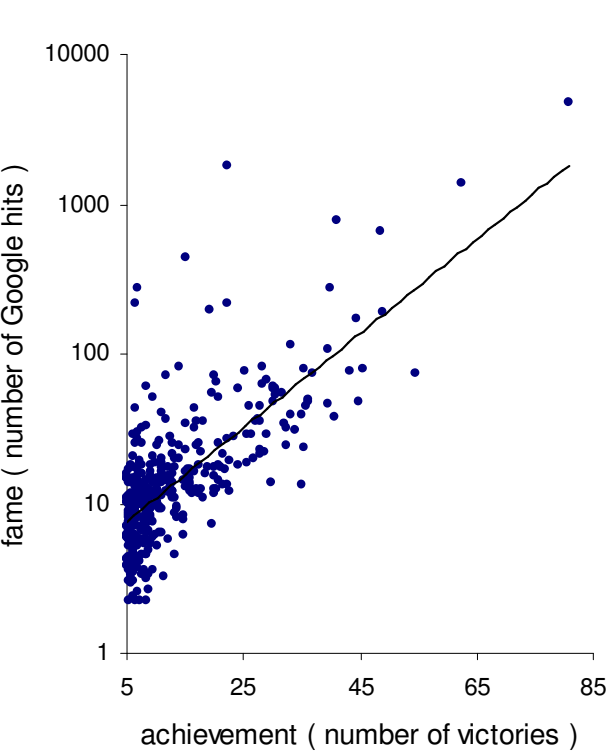
80 planes in total

Manfred von Richthofen

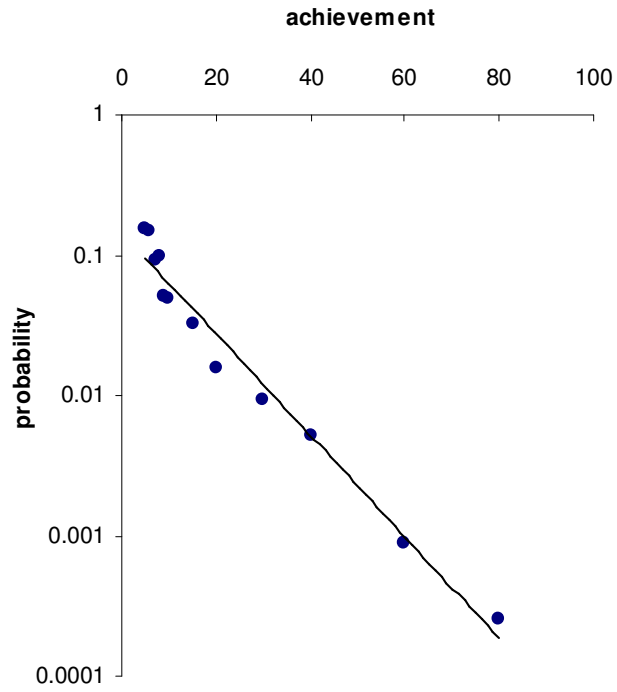
WWI ace pilot

- subject of more than thirty books
- his own 1917 autobiography
- Hollywood, graphic novels,
- comic books, documentaries
- even – Red baron pizza

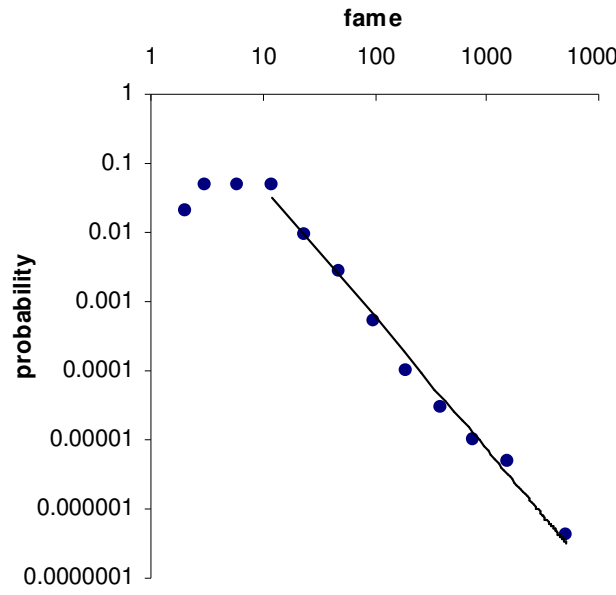




A scatter plot of fame versus achievement for 392 German WWI aces. The correlation coefficient of 0.72 suggests that $0.72^2 \cong 52\%$ of the variation in fame is explained by the variation in achievement. The straight line is the fit using Eq.2 with $\beta \cong 0.074$.



The distribution of achievement (number of victories) obtained using a sample of 392 German WWI aces. The straight line is the fit using Eq.1 with $\alpha \cong 0.083$.



The distribution of fame (number of Google hits) computed using a sample of 392 German WWI aces. The straight line is the fit $p(F) \propto F^{-\gamma}$ with $\gamma \cong 1.9$.

Performance and Recognition: Famesque

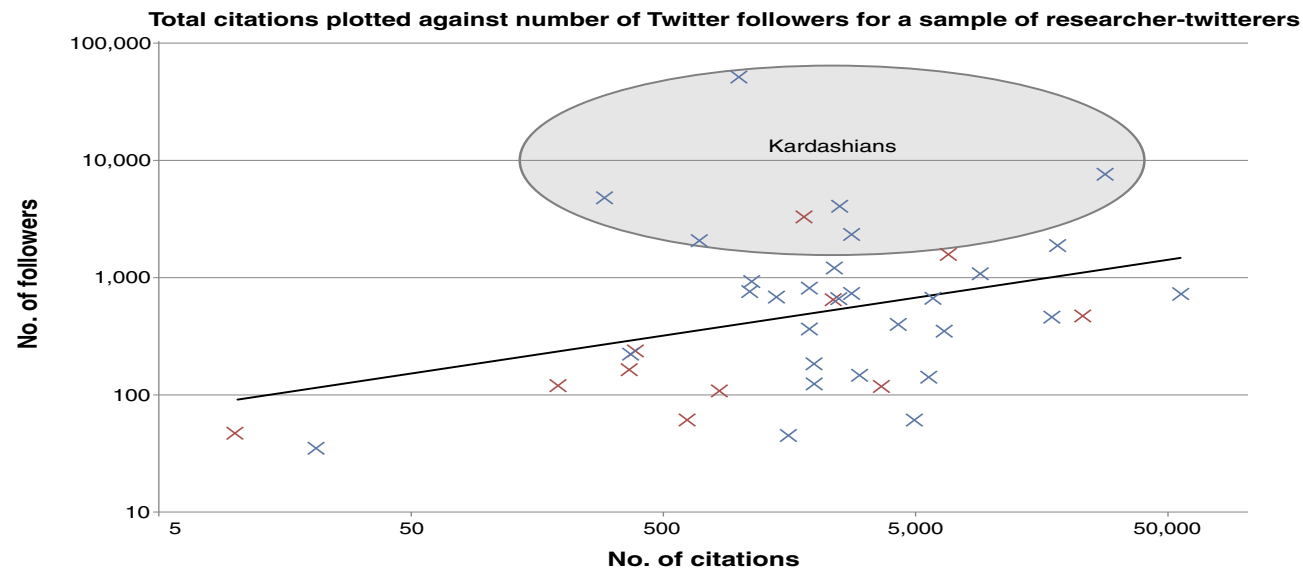
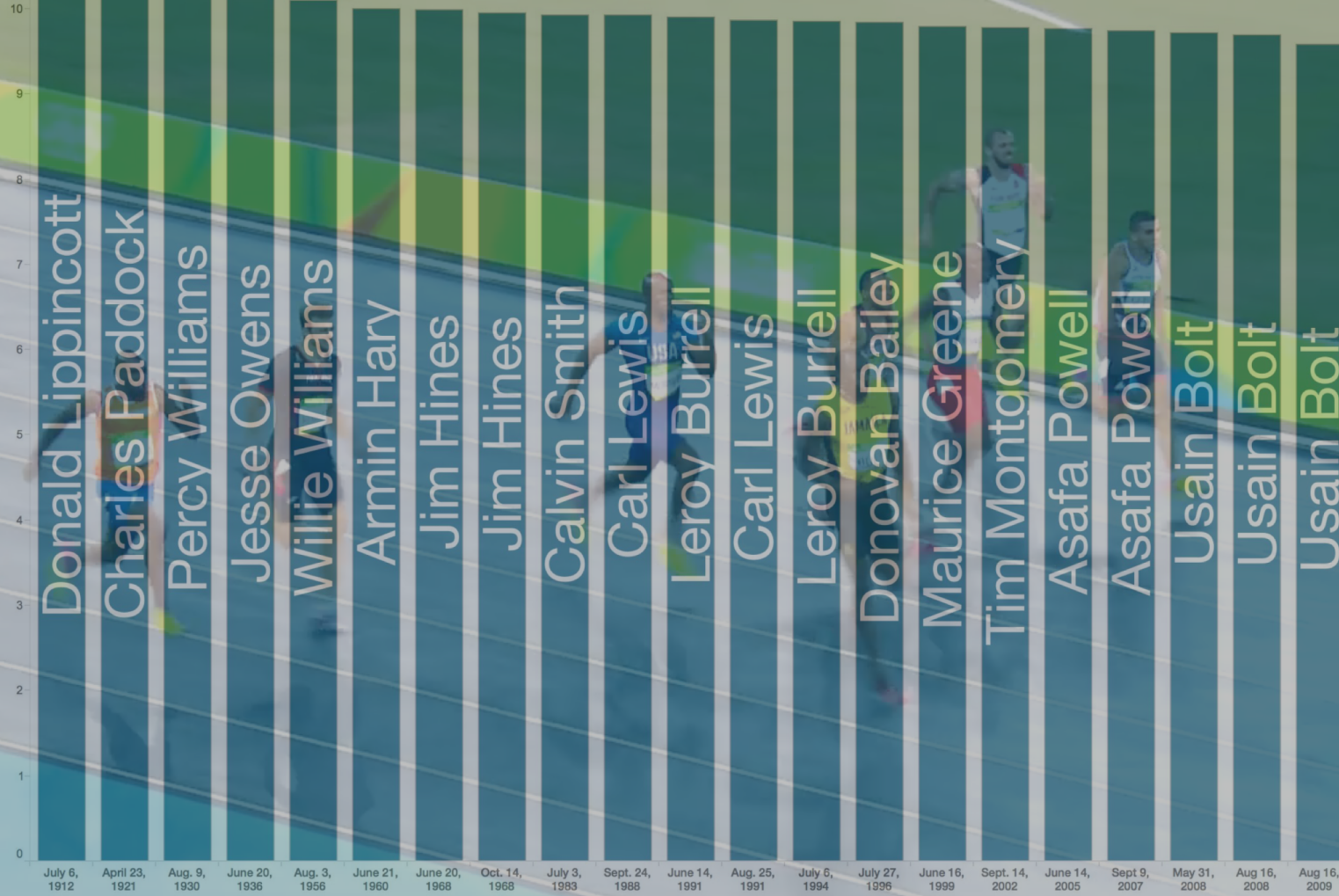


Figure 1 Twitter followers versus number of scientific citations for a sort-of-random sample of researcher tweeters. Red crosses represent female tweeters and blue crosses represent male tweeters. The black trendline describes the best fit to the data. Those individuals with a highly overinflated number of followers (when compared with the number predicted by the trendline) are highlighted by the area labeled Kardashians.

The Second Law:

Performance drives success.

Time



Rio2016



Rio2016



Rio2016



PHELPS, LE CLOS & CSEH WIN SILVER IN FIRST EVER OLYMPIC 3-WAY TIE



The Third Law:

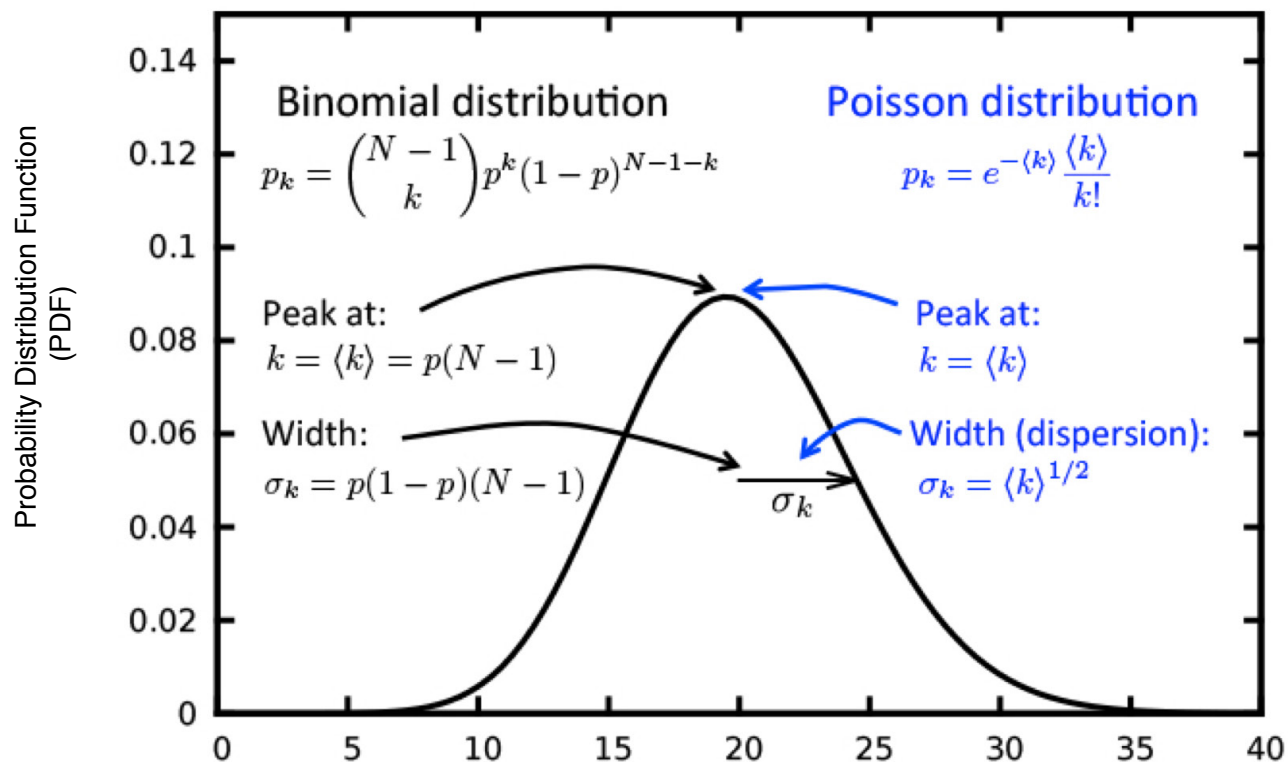
Performance is Bounded

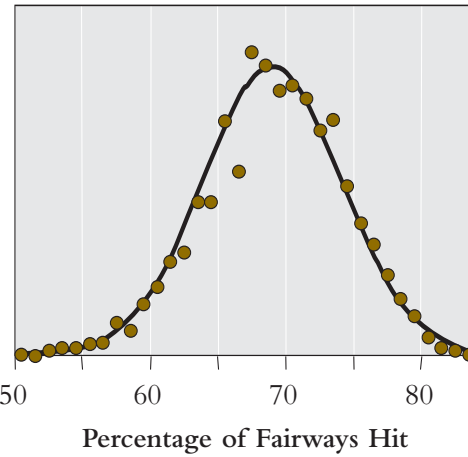
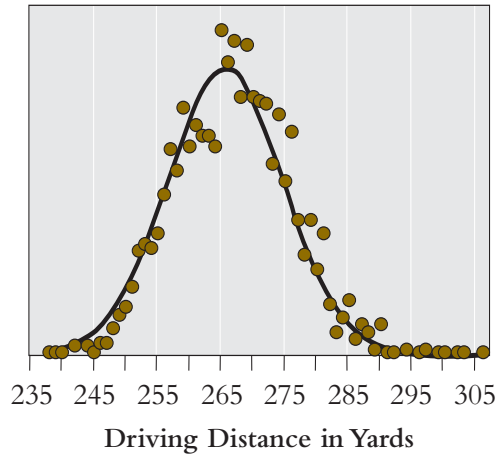
Exact Result

-binomial distribution-

Large N limit

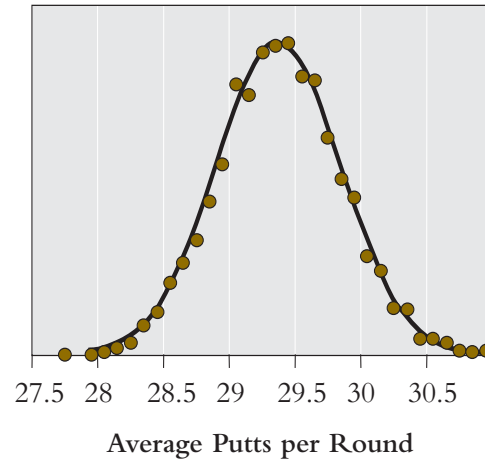
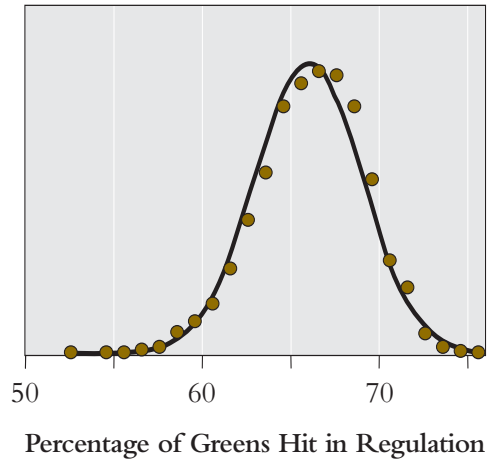
-Poisson distribution-

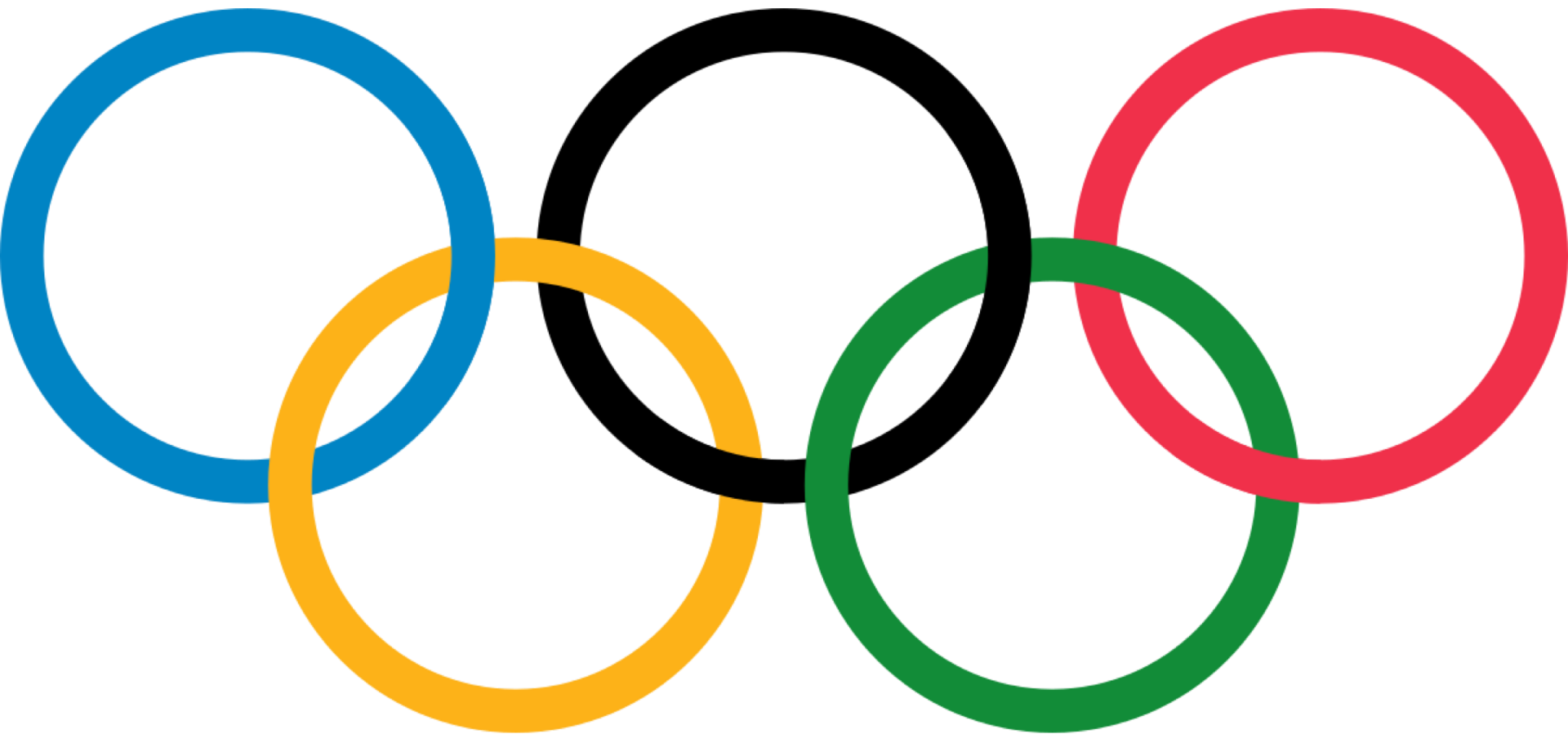




Woods:

- between 2004 and 2006, averaging 303.24 yards
- 70.30 percent of greens in regulation between 2004 and 2009.





Why consider performances only at the Olympics?

1. Data cover more than a century of sport performances since the first edition of the Olympics dates back to 1896.
2. Olympic data provide a regular view of the history of sport performances because the Games have been always organized every four years
3. Olympic medalists' performances truly reflect the best achievements that could be obtained in a given historic moment

Relative change in performance

$$\xi_y : = (\Delta p_{y-4} - \Delta p_y) / \Delta p_{y-4}$$

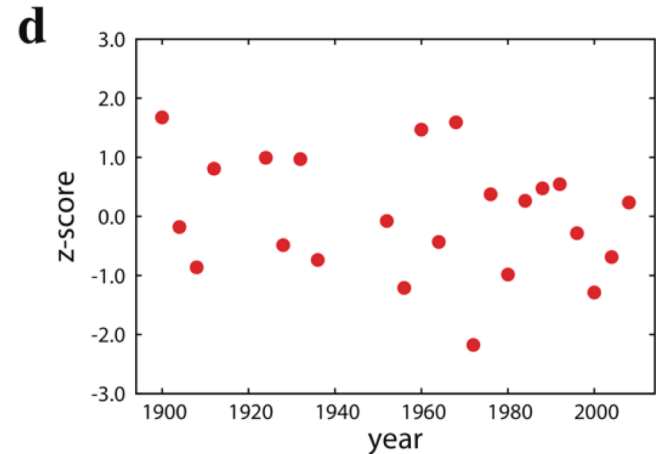
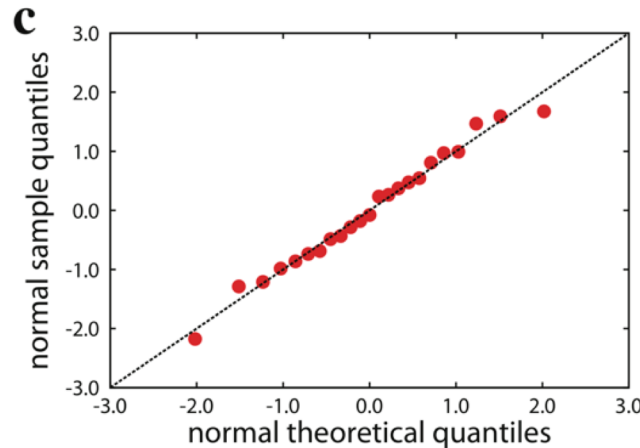
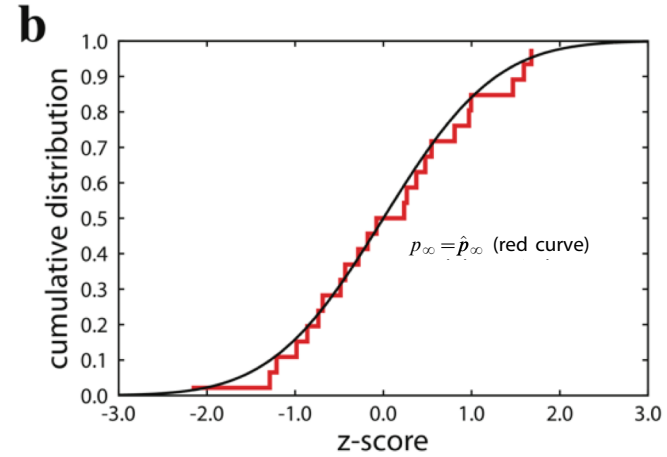
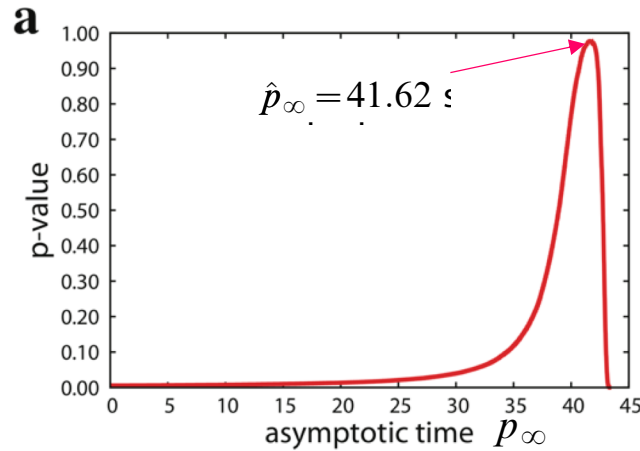
$$\Delta p_y = p_y - p_\infty$$

towards a limiting performance value

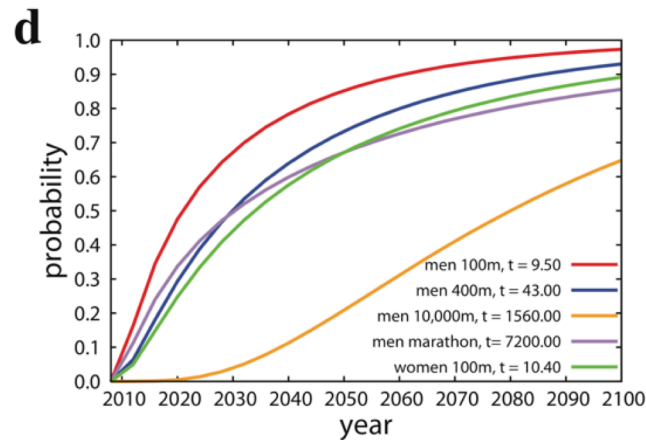
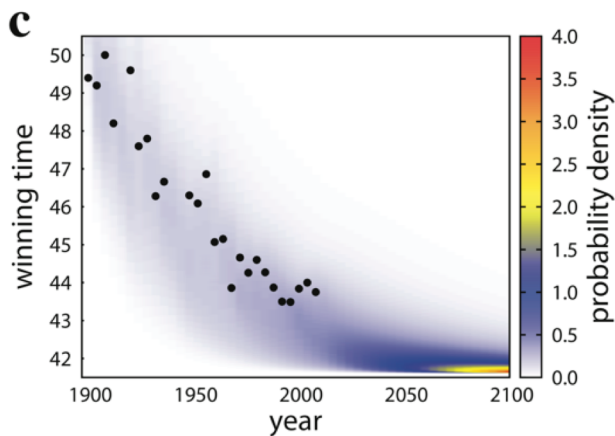
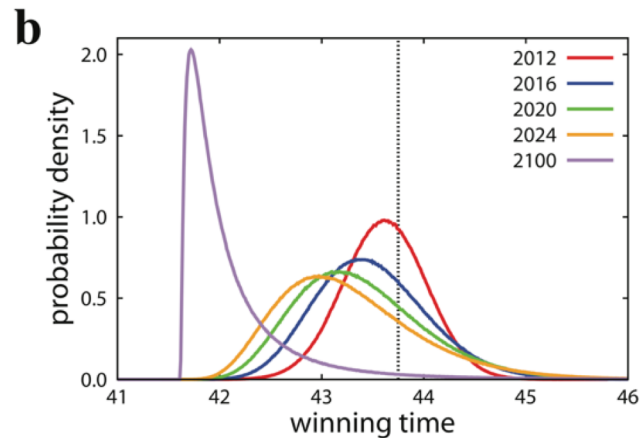
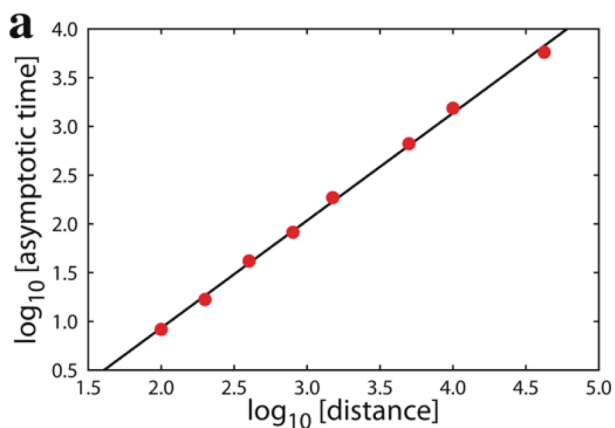
for performance we mean: time, length, height, distance,

Comparison between the performances of gold-, silver-, bronze-medalists, etc..
but only for specialities where the conditions are the same: for example, 100
meters, height jump, long jump, ...

Relative changes in performance are normally distributed



We can make predictions



$$p_{2012} = (p_{2008} - \hat{p}_{\infty})(1 - \xi) + \hat{p}_{\infty},$$

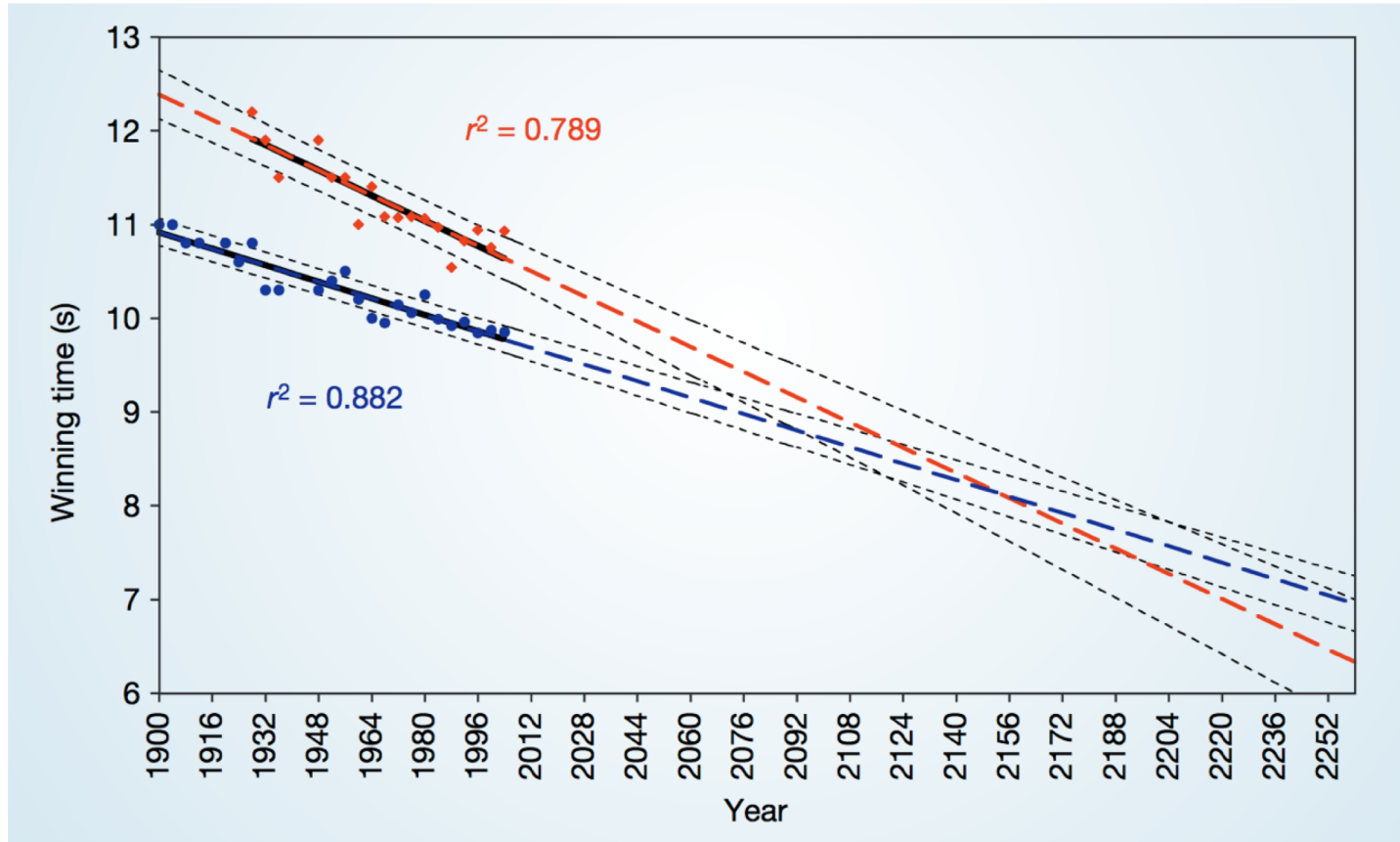
and predictions were actually very good

sport	gender	specialty	$\hat{p}_{\infty}$	$\hat{\mu}$	$\hat{\sigma}$	p-value	E	P	$\hat{p}_{2012}$	
Track & Field	Men	100 m	8.28	0.04	0.10	0.64	26	0.35	9.63 ± 0.13	9.63
		110 m hurdles	11.76	0.05	0.12	0.48	26	0.50	12.87 ± 0.14	12.92
		400 m	41.62	0.06	0.19	0.98	26	0.14	43.62 ± 0.41	43.94
		10,000 m	1,539	0.05	0.19	0.45	22	0.01	$1,617 \pm 15$	1650
		marathon	5,771	0.03	0.15	0.58	26	0.34	$7,537 \pm 273$	7681
		pole vault	6.87	0.05	0.08	0.91	26	0.03	6.00 ± 0.07	5.97
		hammer throw	103.81	0.04	0.09	0.47	25	0.03	82.89 ± 1.96	80.59
Swimming	Women	100 m	9.72	0.05	0.19	0.97	19	0.12	10.73 ± 0.20	10.75
		400 m	45.14	0.02	0.15	0.77	12	0.00	49.53 ± 0.67	49.55
		long jump	8.12	0.04	0.18	0.34	16	0.01	7.08 ± 0.19	7.12
	Men	100 m fs	44.84	0.09	0.10	0.92	23	0.36	47.00 ± 0.24	47.52
		100 m bs	48.98	0.09	0.11	0.93	22	0.24	52.22 ± 0.39	52.12
		100 m brs	57.38	0.16	0.16	0.93	11	0.36	58.67 ± 0.24	58.46
		1,500 m fs	577	0.05	0.05	0.50	23	0.71	866 ± 15	871 WR
	Women	100 m fs	51.87	0.12	0.19	0.54	22	0.00	52.97 ± 0.24	53.00
		100 m bs	54.73	0.08	0.14	0.59	20	0.20	58.62 ± 0.59	58.33
		100 m brs	62.08	0.13	0.10	0.86	11	0.15	64.77 ± 0.31	65.47
		800 m fs	388	0.05	0.07	0.84	11	0.76	489 ± 7	494 WR=493

$$\langle p_y \rangle = p_{y_0} e^{-\hat{\mu}(y-y_0)} + \hat{p}_{\infty}$$

table published on July 12th, 2012. London Olympics started on July 27th, 2012

By 2054, women will run faster than men?



Linear regression $p(t) = a + bt$

HOW DO WE DECIDE
WHEN
WE CAN'T DECIDE?

Famous for its fairness - Meticulous

- Performers are invited from all over the world
- Once arrived in Brussels, whittled down from 85 to 12 finalists
- The same concerto, composed specifically for the competition
- A random draw determines their performance order
- Everyone has exactly one week to practice



QE

QUEEN ELISABETH COMPETITION

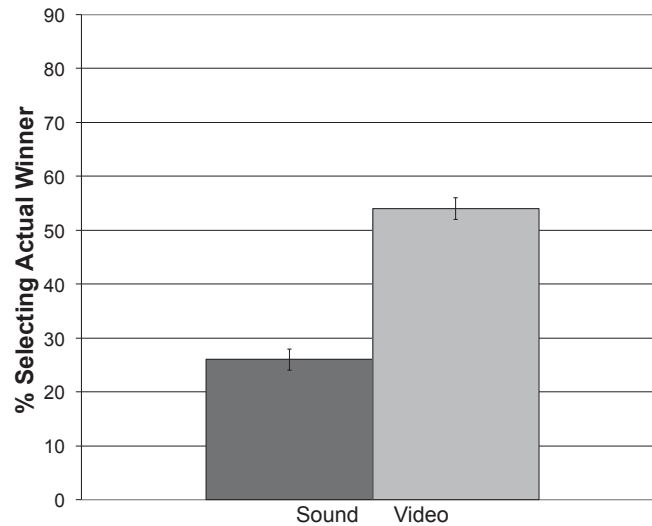
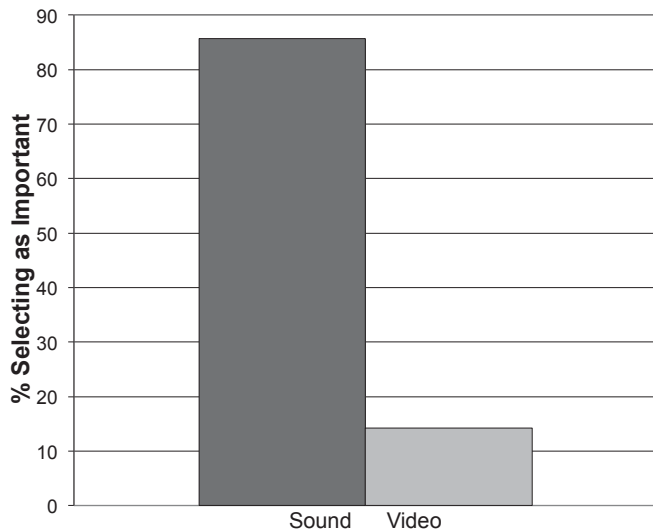
Between 1952 and 1991, for over 40 years,
11 winners in total in piano. Which day did they perform in?

Day 1	0
Day 2	2
Day 3	2
Day 4	2
Day 5	4
Day6	1

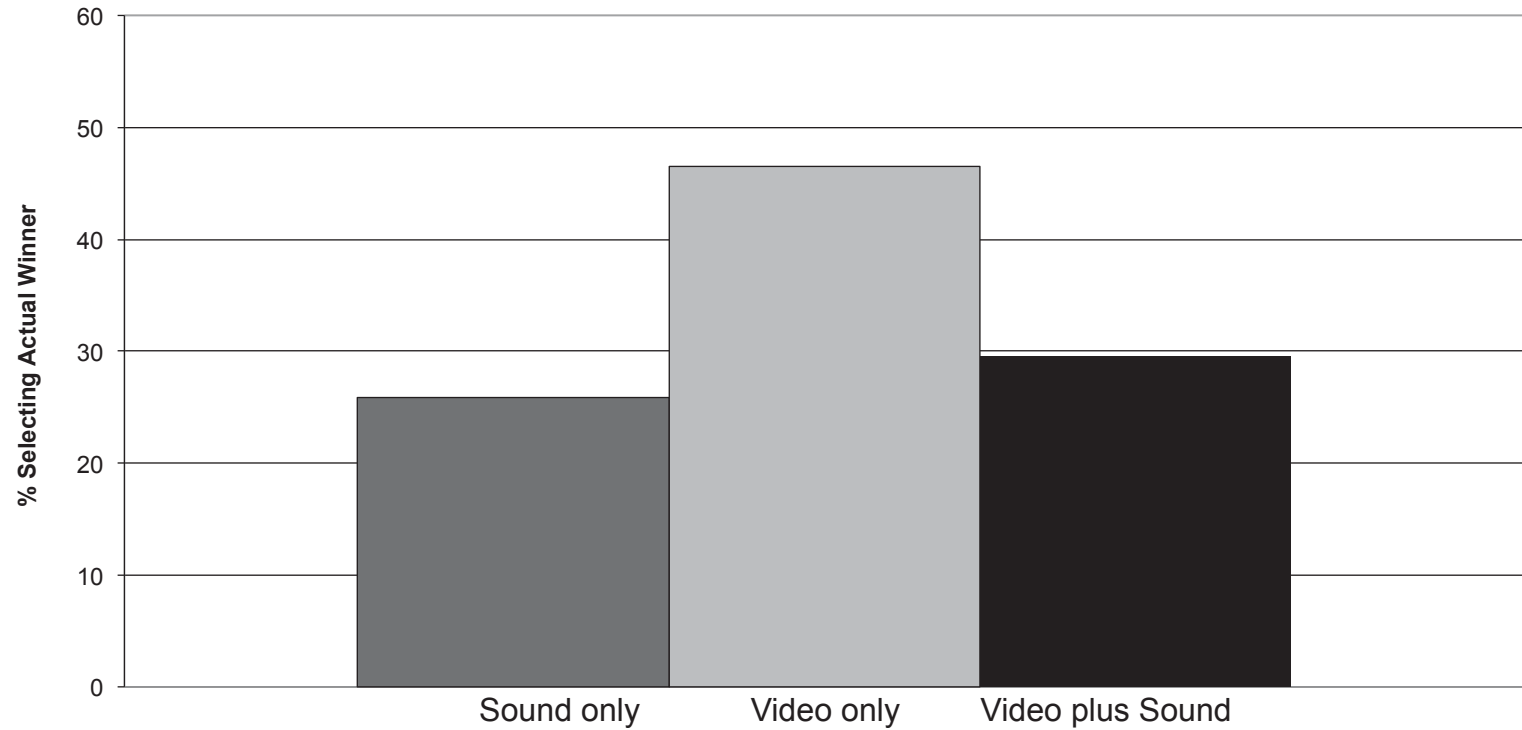
- those who performed during the first *systematically ranked almost three positions below those who performed on the fifth day*
- .those who performed second tended to be ranked one position higher than the opening act.
- **men were systematically ranked about two positions higher than women.**
- Taken together, a female performer who opens the finals will be ranked about 6 positions lower than a male performer with identical talent who performed second on day five or six.



Novices



Experts



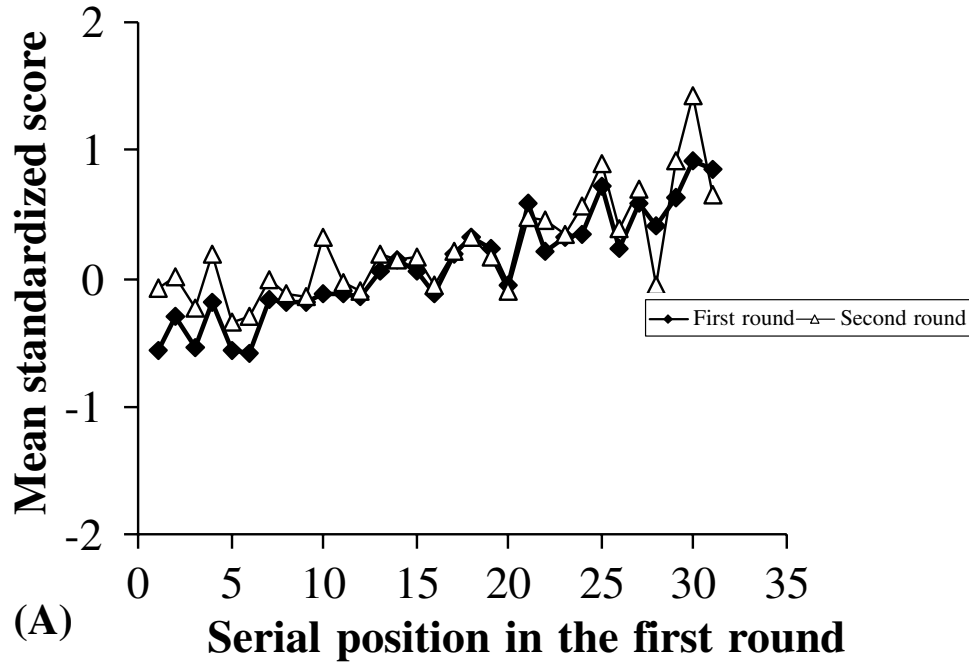
HZ



Chia-Jung Tsay, Sight over sound in the judgment of music performance PNAS (2013)



World Figure Skating competitions



reduce bias :
would be to reverse
engineer the second round
slots by flipping them on
their head. If first round
high-scorers



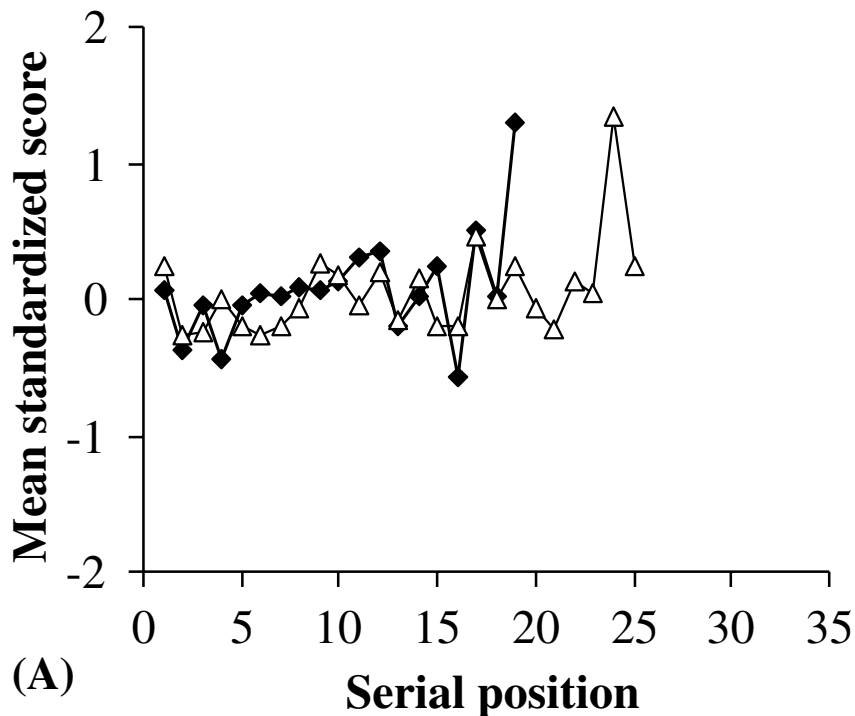


EURO♥vision
SONG CONTEST





EUROVISION



- The analyses reported here use the data of the 47 editions of the Eurovision Song Contests held over the years 1957–2003.
- Fans and professionals have suggested a higher probability of winning for songs performed near the beginning or the end, countries that share culture with more national juries, the host, and songs performed in



HOW DO YOU BECOME A SPANISH JUDGE?

What it takes to become a judge in Spain?

[See the Excel sheet!](#)

EXAM 1. GENERAL CULTURE

% de aprobados por día de la semana	
Lunes	40%
Martes	38%
Miércoles	37%
Jueves	42%
Viernes	53%

EXAM 2 LANGUAGES

% Pass per week day	
Monday	52%
Tuesday	59%
Wednesday	65%
Thursday	60%
Friday	70%

EXAM 3. HISTORY, LAW, CULTURE, ECONOMOMICS

% Pass per week day	
Monday	50%
Tuesday	76%
Wednesday	79%
Thursday	77%
Friday	75%

Source: Brian Uzzi

The Third Law:

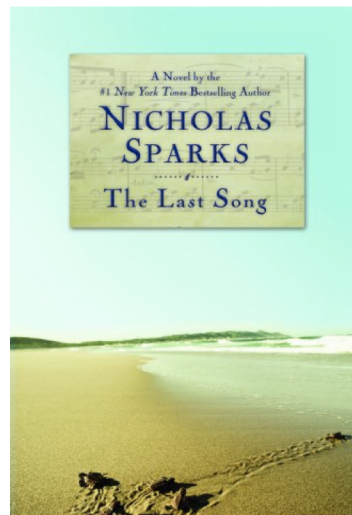
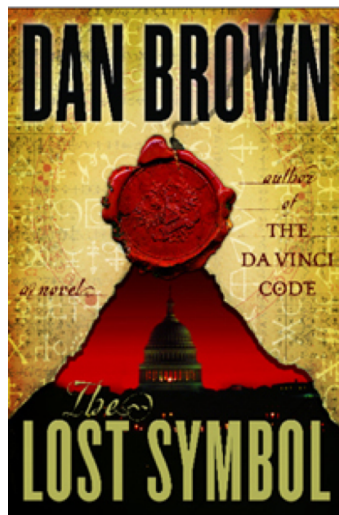
Performance is Bounded

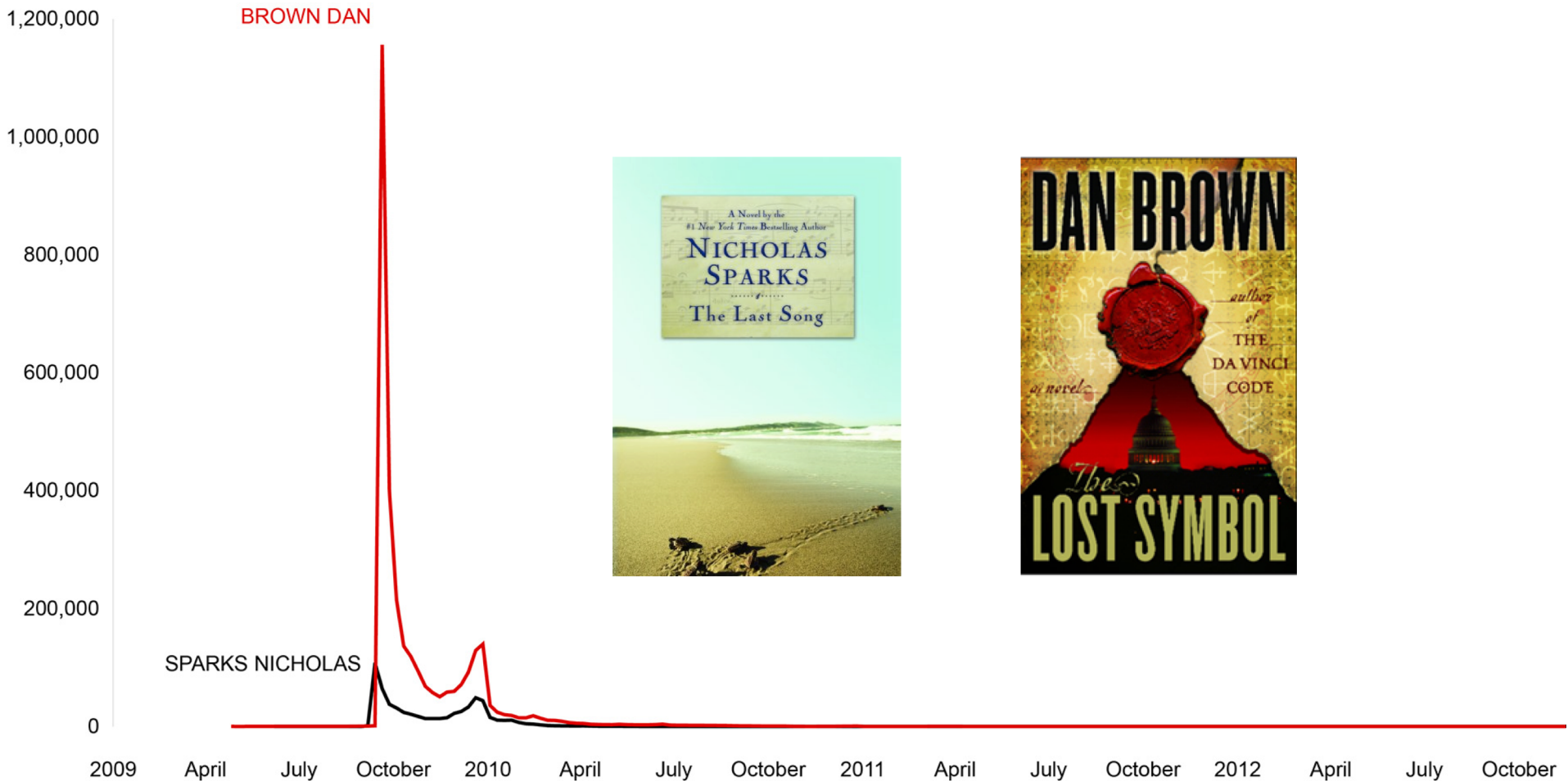
October 04, 2009

Sep 27, 2009

Oct 11, 2009

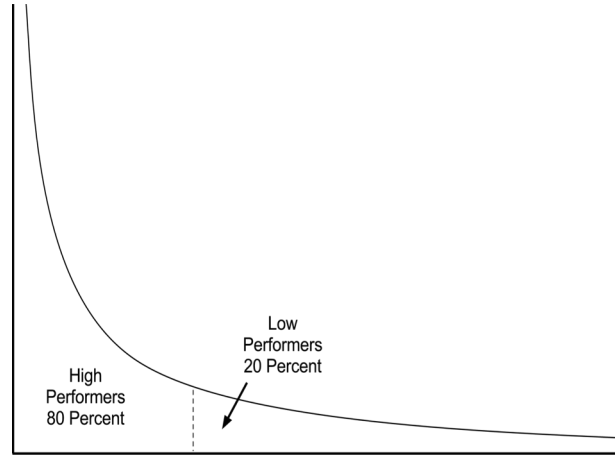
THIS WEEK	LAST WEEK	HARDCOVER FICTION	WEEKS ON LIST
1		THE LOST SYMBOL , by Dan Brown. (Doubleday, \$29.95.) Robert Langdon among the Masons. Sunday Book Review Books of The Times Review	1
		Buy	
2	1	THE LAST SONG , by Nicholas Sparks. (Grand Central, \$24.99.) A 17-year-old girl spends the summer with her divorced father in North Carolina and finds many kinds of love.	2
		Buy	







80/20 RULE



Vilfredo Federico Damaso Pareto (1848 – 1923), Italian economist, political scientist and philosopher, who had important contributions to our understanding of income distribution and to the analysis of individuals choices. A number of fundamental principles are named after him, like Pareto efficiency, Pareto distribution (another name for a power-law distribution), the Pareto principle (or 80/20 law).

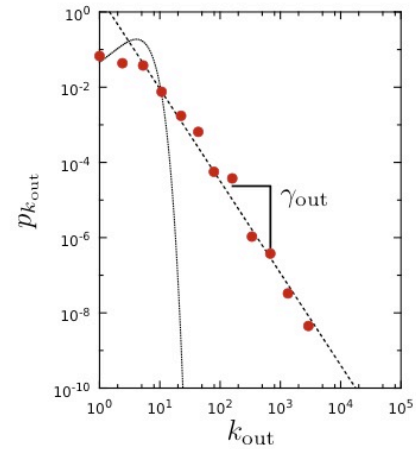
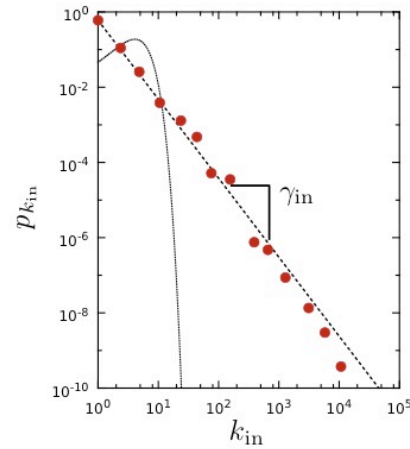
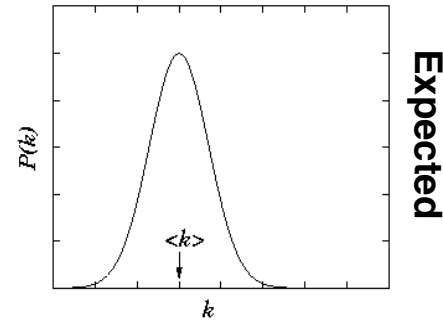
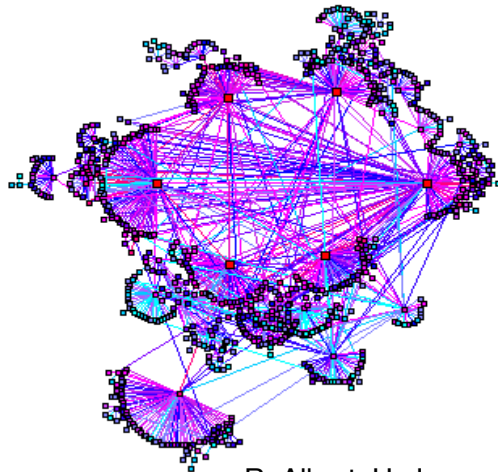
WORLD WIDE WEB

Nodes: **WWW documents**

Links: **URL links**

Over 3 billion documents

ROBOT: collects all URL's
found in a document and
follows them recursively

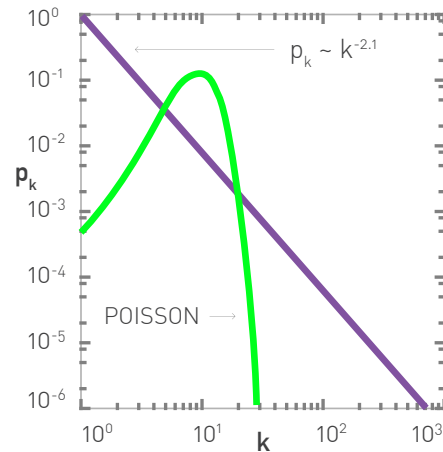
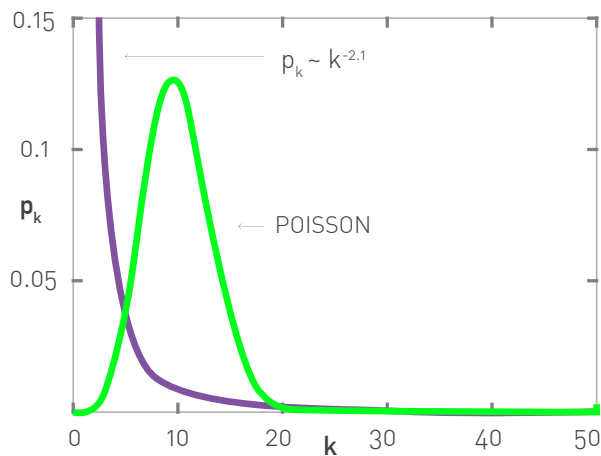


R. Albert, H. Jeong, A-L Barabasi, *Nature*, 401 130 (1999).

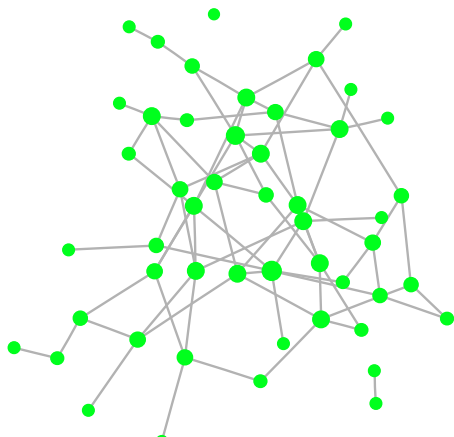
The Fourth Law:

Success or recognition is
unbounded.

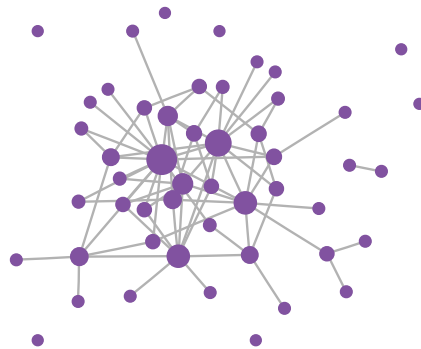
The difference between a power law and an exponential distribution



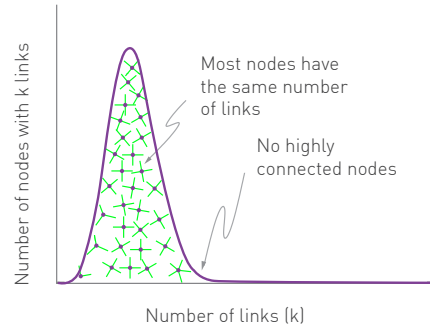
(c)



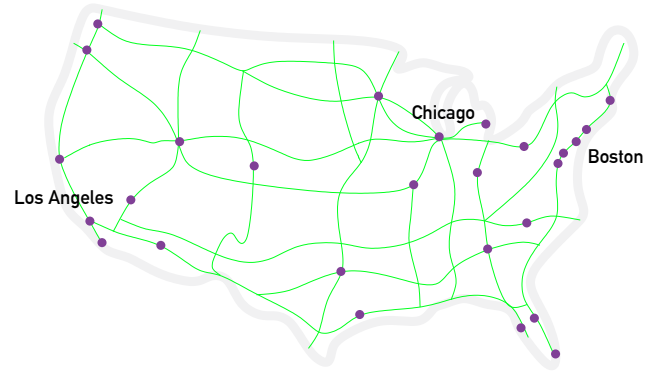
(d)



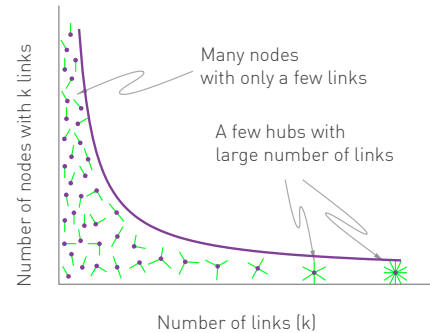
(a) POISSON



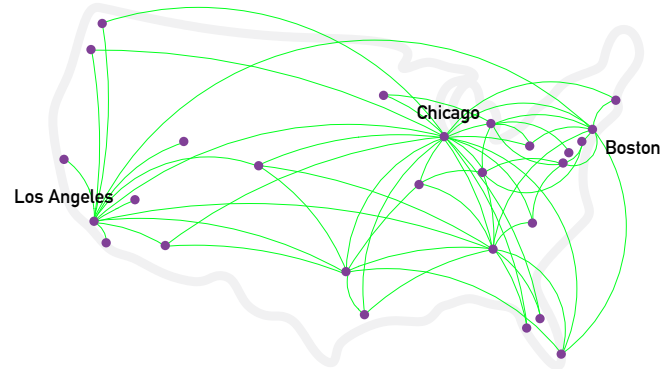
(b)



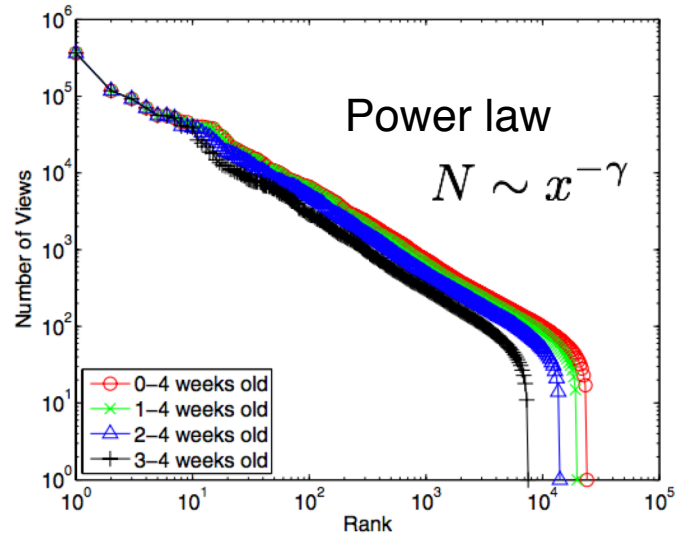
(c) POWER LAW



(d)

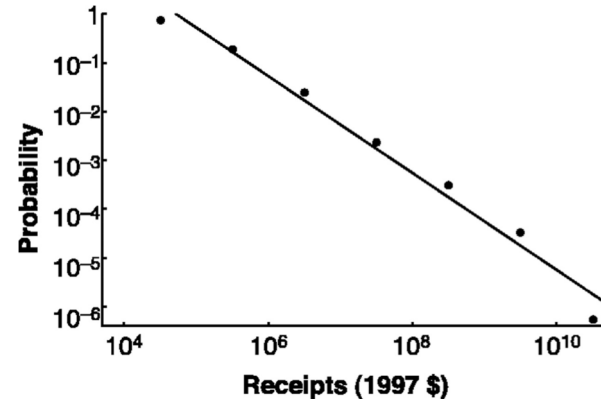
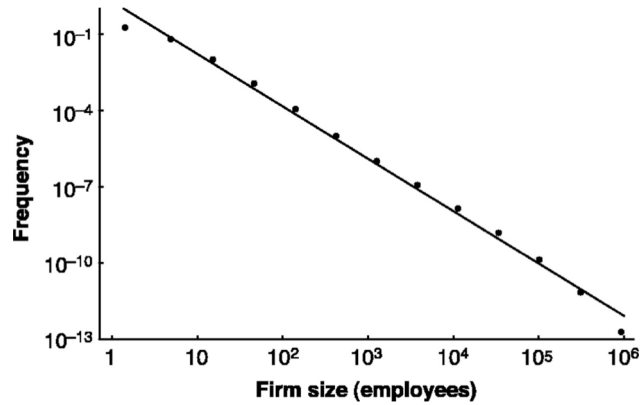


WHAT DO YOUTUBE VIDEOS REALLY LOOK LIKE THEN?

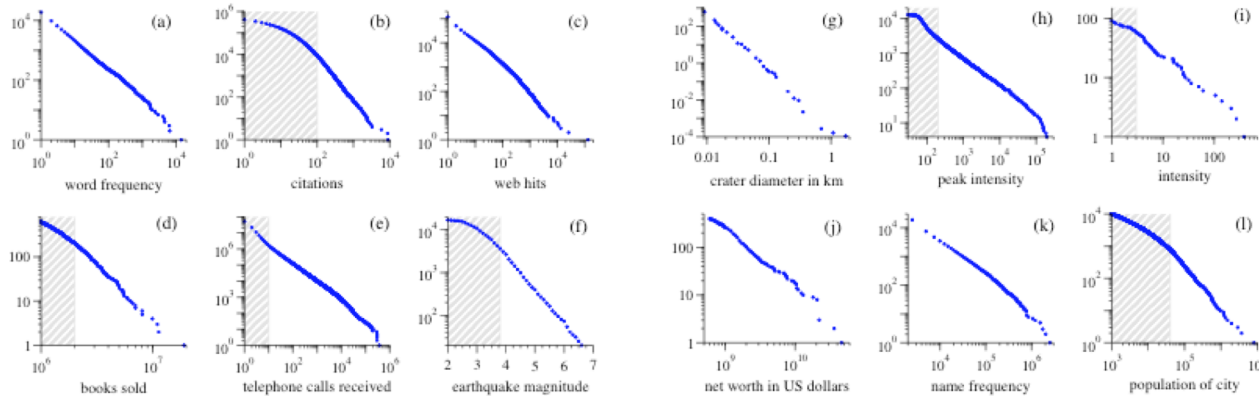


COMPANIES

US Firm Sizes



...AND ACROSS A WIDE RANGE OF TOPICS



- a. Words in *Moby Dick*
- b. Scientific citations
- c. Website hits
- d. Bestselling books
- e. Telephone calls received
- f. Earthquake magnitudes

- g. Moon crater diameters
- h. Solar flare intensity
- i. War intensity
- j. Individual wealth
- k. Family name frequency
- l. City population

The Fourth Law:

Success or recognition is
unbounded.

Informal Rewards on Wikipedia

The screenshot shows a web browser window displaying the Wikipedia user page for 'Quinxorin'. The browser's address bar shows the URL 'https://en.wikipedia.org/wiki/User:Quinxorin'. The page layout includes a sidebar on the left with navigation links like 'Main page', 'Contents', and 'Interaction'. The main content area features the user's name 'Quinxorin' and a section titled 'My Creations' with a single bullet point. Below this is the 'My Barnstars' section, which contains three distinct awards: 'The Tireless Contributor Barnstar' for editing 7 articles, 'The Creator of the Barnstar' for creating the first barnstar, and 'The Kansas Barnstar' for making the 'Kansas Barnstar' project. On the right side, there is a 'Userboxes' section with several icons and text boxes representing different user achievements, such as being a member of the English Wikipedia, having rollback rights, and being a member of the Guild of Copy Editors. The Windows taskbar at the bottom shows the system clock as 4:08 AM on 5/23/2013.

Wikipedia user page for **Quinxorin**. The page displays various informal rewards and barnstars awarded to the user.

My Creations

- A lot of users tend to list their creations. I'm not that kind of guy. While I do have some creations that are my own, most of my work here is improving upon the work of others.

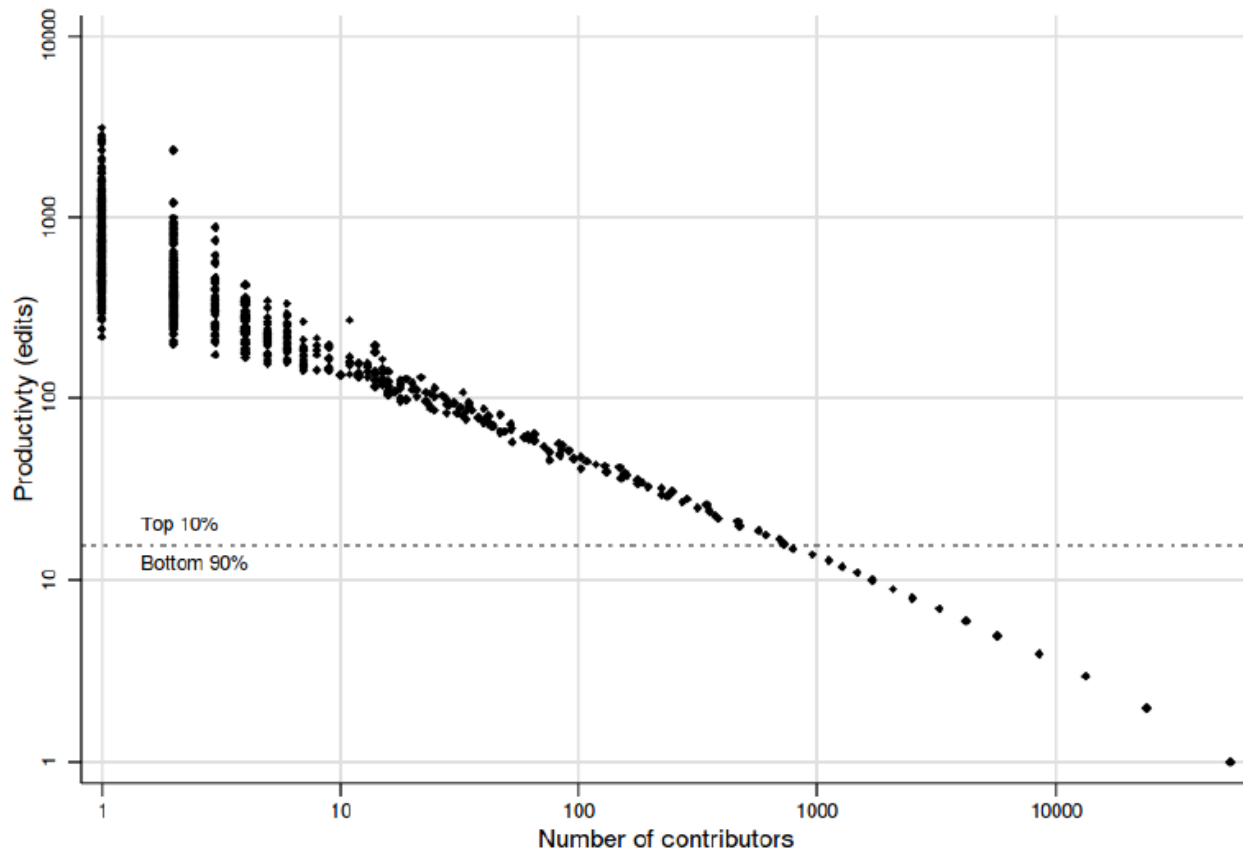
My Barnstars

- The Tireless Contributor Barnstar**
For your copyediting efforts during the May 2010 Guild of Copy Editors Backlog Elimination Drive, editing 7 articles with a combined total of 12,438 words, I hereby award you this Tireless Contributor Barnstar. Congratulations and thank you for all your hard work! --Dianna TALK 03:12, 10 June 2010 (UTC)
- The Creator of the Barnstar**
Hi! --Extra 999 (Contact me + contribs) 07:25, 27 June 2010 (UTC)
- The Kansas Barnstar**
For making the "Kansas Barnstar" for our project, I award you the first ever Kansas Barnstar! Thanks for your efforts!--Paul McDonald (talk) 18:59, 19 July 2010 (UTC)

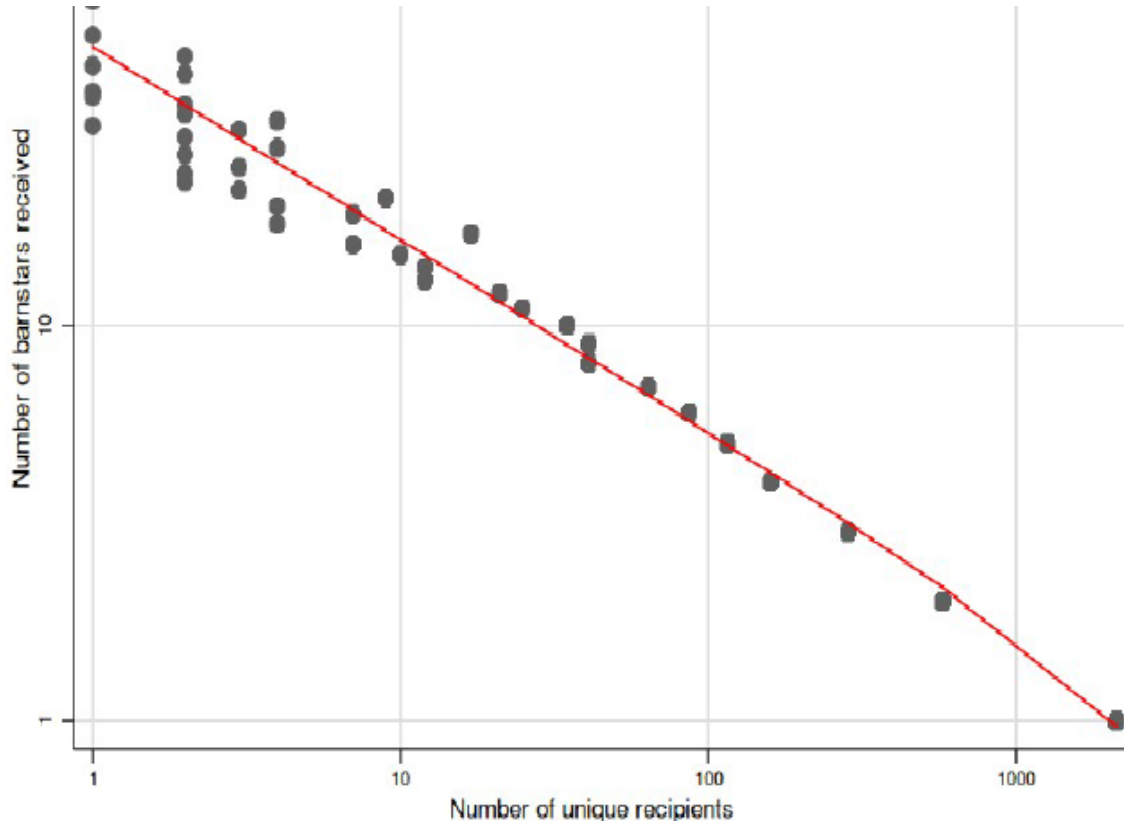
Userboxes

- This user is a **member** on the English Wikipedia. (verify)
- This user has **rollback** rights on the English Wikipedia. (verify)
- This user is a member of the **Guild of Copy Editors**.
- This user is from the **Motor City**, or a suburb near it, and doesn't understand how there can be people in the United States that don't own a car.
- This user is a **modder**.
- This user believes the **cake is NOT a lie**, but in fact tastes very good.
- This user is highly experienced with constructing, programming, and operating vehicular robots.
- This user realizes that there are 10 types of people in this world: those who understand binary and those who don't.
- This user says "AAA".

Distribution of productivity on Wikipedia



Distribution of informal rewards on Wikipedia



- H1 (*Inequality*): Distribution of productivity and awards exhibits extreme variance.

Strategy: Field Experiment

- From 1% most productive Wikipedia editors (by # edits in 30 days prior)
- Eliminate editors with administrative privileges
- Eliminate past recipients of barnstars
- Randomly sample 200 editors
- Randomly assign 100 barnstars
- Measure # edits
- Measure additional barnstars received



Experimental Design

1% most productive Wikipedia editors



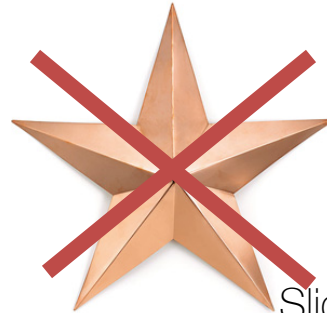
Random assignment



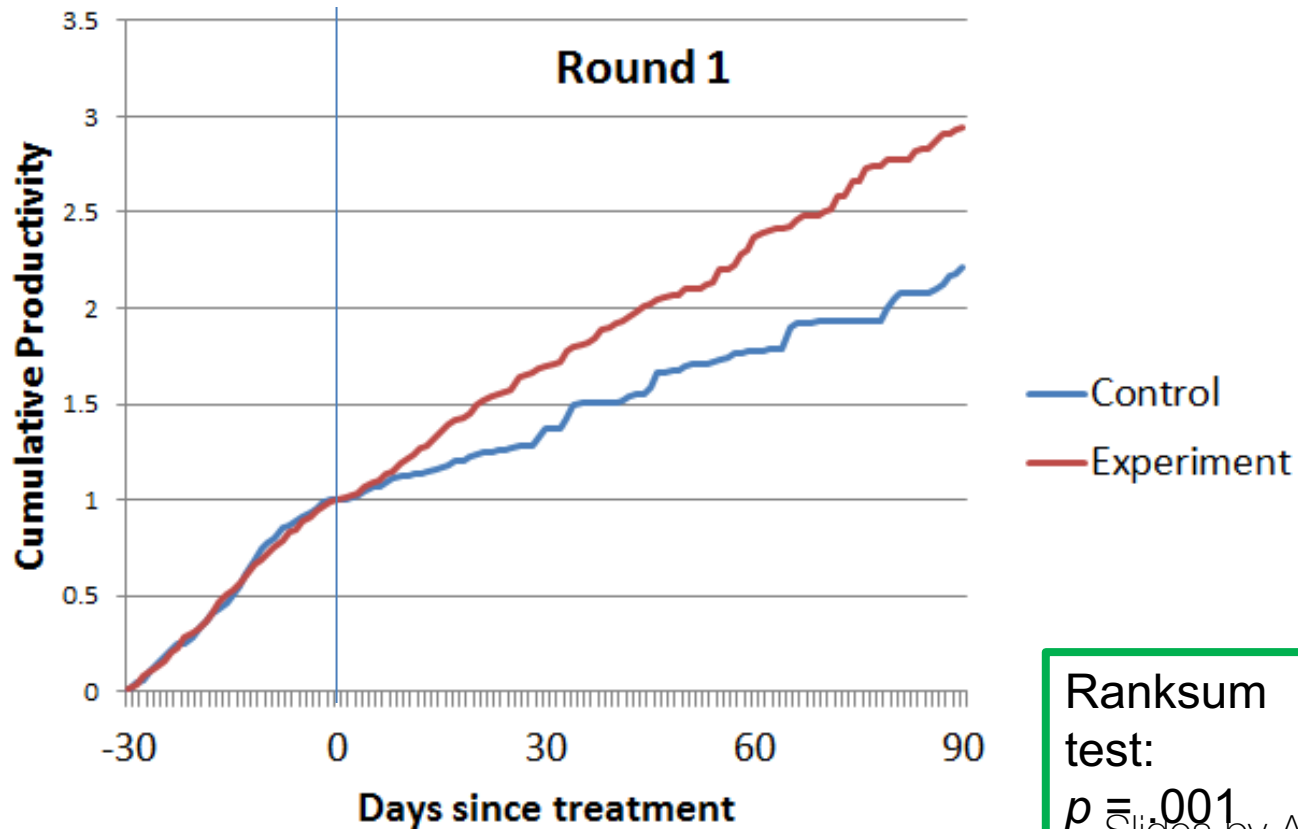
Experimental condition



Control condition

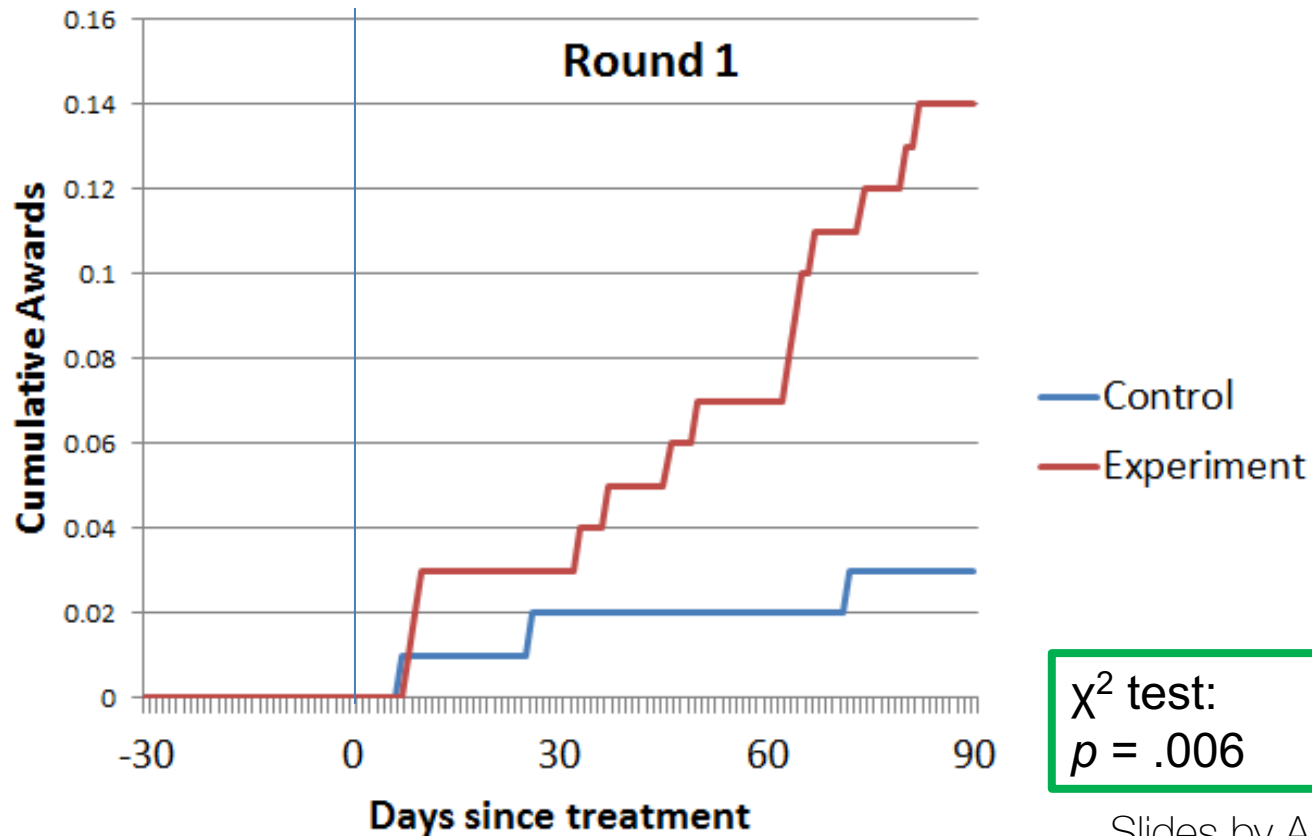


Test of H1: Productivity



- H1 (**Inequality**): Distribution of productivity and awards exhibits extreme variance.
- H2 (**Motivation**): Receiving an award increases productivity.

Test of H2: Awards

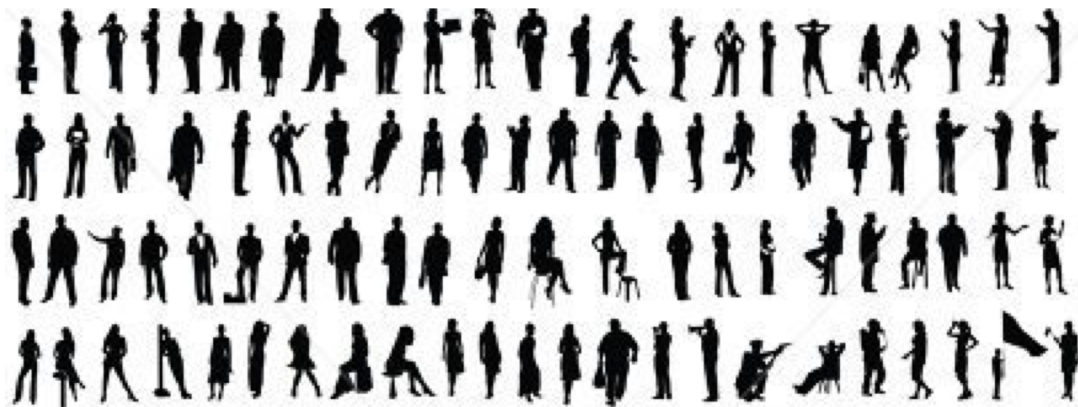
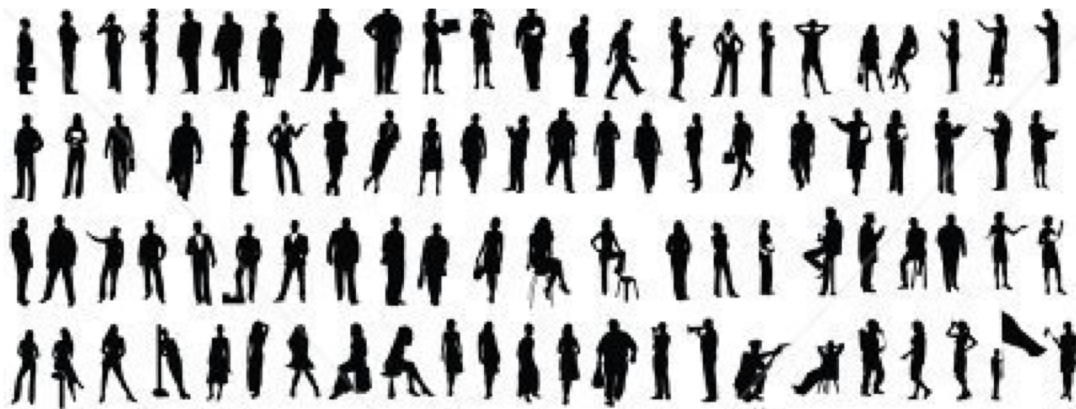


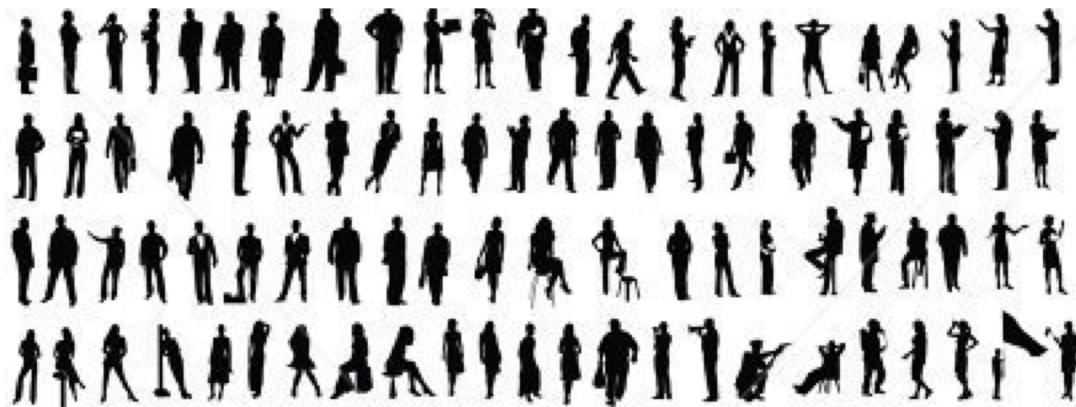
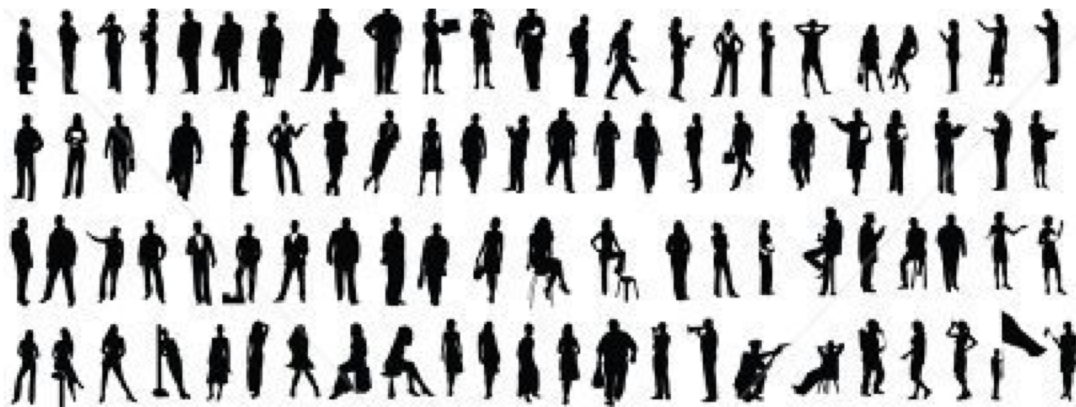
Wikipedia.org

	Control	Experiment	Test
Treatment	0 awards	1 award	
3 rd -party awards after 30 days	0.17	0.28	Rank-sum: $p = 0.008$
3 rd -party awards after 90 days	0.55	0.68	Rank-sum: $p = 0.048$
N	313	208	



- H1 (**Inequality**): Distribution of productivity and awards exhibits extreme variance.
- H2 (**Motivation**): Receiving an award increases productivity.
- H3 (**Reinforcement**): Receiving an award increases the likelihood of future awards.





The Fifth Law:

Success breeds success.

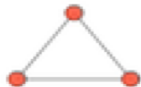
Origin of SF networks: Growth and preferential attachment

(1) Networks continuously expand by the addition of new nodes

WWW : addition of new documents

(2) New nodes prefer to link to highly connected nodes.

WWW : linking to well known sites



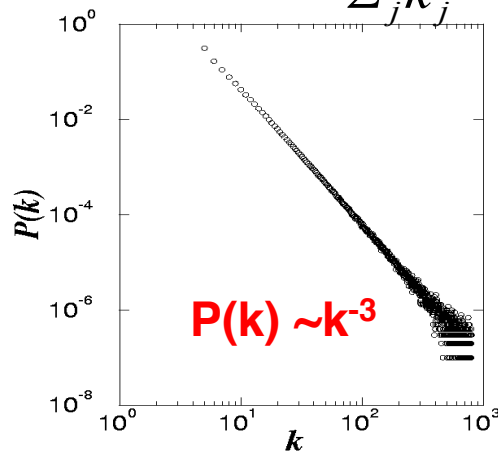
GROWTH:

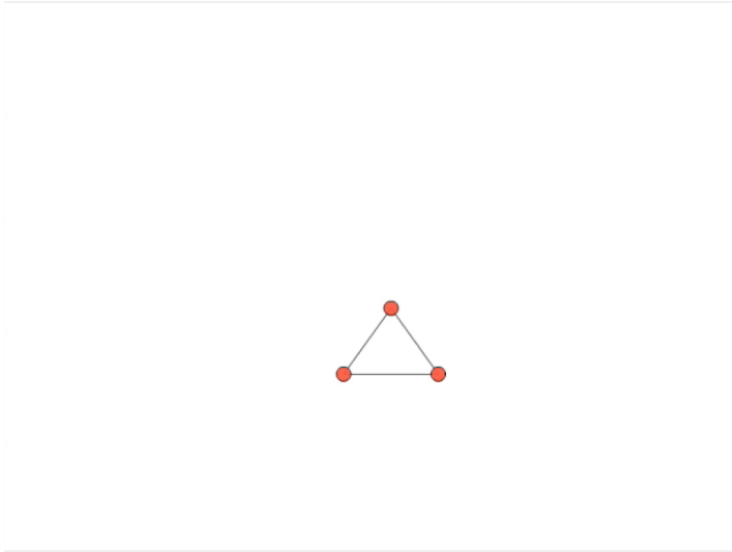
add a new node with m links

PREFERENTIAL ATTACHMENT:

the probability that a node connects to a node with k links is proportional to k .

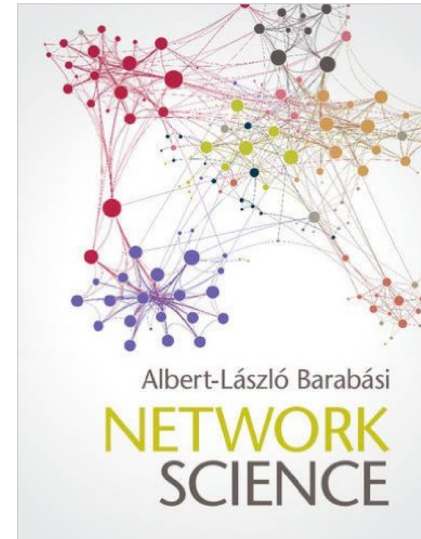
$$\Pi(k_i) = \frac{k_i}{\sum_j k_j}$$





For unto every one that hath shall
be given, and he shall have
abundance...

— [Matthew 25:29](#), [King James Version](#).



Details Kickstarter Experiment

- Sampled only projects with no prior funding and funding goal amount $\leq \$5000$
- Projects matched on goal amount across conditions
- $N = 200$ (100 in each condition)
- Treatment: Donation of 1% of goal amount





Kickstarter.com

	Control	Experiment	Test
Round 1			
Treatment	\$0	\$6.77	
3 rd -party donations	1.11	2.49	Sign-rank: $p = 0.000$
3 rd -party dollars	\$50.35	\$75.50	Sign-rank: $p = 0.000$
N	100	100	

Random donations marked the selected projects for success.

How many kicks does it take to kickstart something?

Repeat Donations

• Average benefit of treatment:	<u>Round 1</u>	<u>Round 2</u>
• Average cost of treatment:	\$ 6.77	\$ 24.52
• # of Donations	1	4
Dollars raised in experiment	\$ 75.50	\$ 293.65
Dollars raised in control	\$ 50.35	\$ 102.65
Difference	\$ 25.15	\$ 191.00

Round 2. The treatment in round 2 involved the donation of either 1% by one donor or a total of 4% by four donors of a funding goal up to \$5,000. No donations were made to projects in the control condition.

Marginal Returns:

First donor raises the likelihood of additional donors to 4.3.
Three subsequent donors: 1.7 more donors apiece.

Return of the first investment (\$24.52): \$191.00
Return on three subsequent investments: \$89.57.

The Fifth Law:

Success breeds success.