



**HOW CAN WE GET
BETTER AT PRODUCING
KNOWLEDGE?**

The windy path of research in the Amaral Lab

Team Assembly Mechanisms Determine Collaboration Network Structure and Team Performance

ROGER GUIMERA, BRIAN UZZI, JARRETT SPIRO, AND LUÍS A. NUNES AMARAL [Authors Info & Affiliations](#)

SCIENCE • 29 Apr 2005 • Vol 308, Issue 5722 • pp. 697-702 • DOI:10.1126/science.1106340

The role of mentorship in protégé performance

R. Dean Malmgren, Julio M. Ottino [✉](#) & Luís A. Nunes Amaral [✉](#)

Nature 465, 622–626 (2010) | [Cite this article](#)

Quantifying the Performance of Individual Players in a Team Activity

Jordi Duch, Joshua S. Waltzman, Luís A. Nunes Amaral [✉](#)

Published: June 16, 2010 • <https://doi.org/10.1371/journal.pone.0010937>

Cross-evaluation of metrics to estimate the significance of creative works

Max Wasserman, Xiao Han T. Zeng, and Luís A. Nunes Amaral [✉](#) [Authors Info & Affiliations](#)

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January 20, 2015 | 112 (5) 1281-1286 | <https://doi.org/10.1073/pnas.1412198112>

On Universality in Human Correspondence Activity

R. DEAN MALMGREN, DANIEL B. STOUTER, ANDRIANA S. L. O. CAMPANHARO, AND LUÍS A. NUNES AMARAL [Authors Info & Affiliations](#)

SCIENCE • 25 Sep 2009 • Vol 325, Issue 5948 • pp. 1696-1700 • DOI:10.1126/science.1174562

How can we produce better science?

Collaboration



Mentoring



<https://www.aihr.com/wp-content/uploads/workplace-collaboration-featured.jpg>

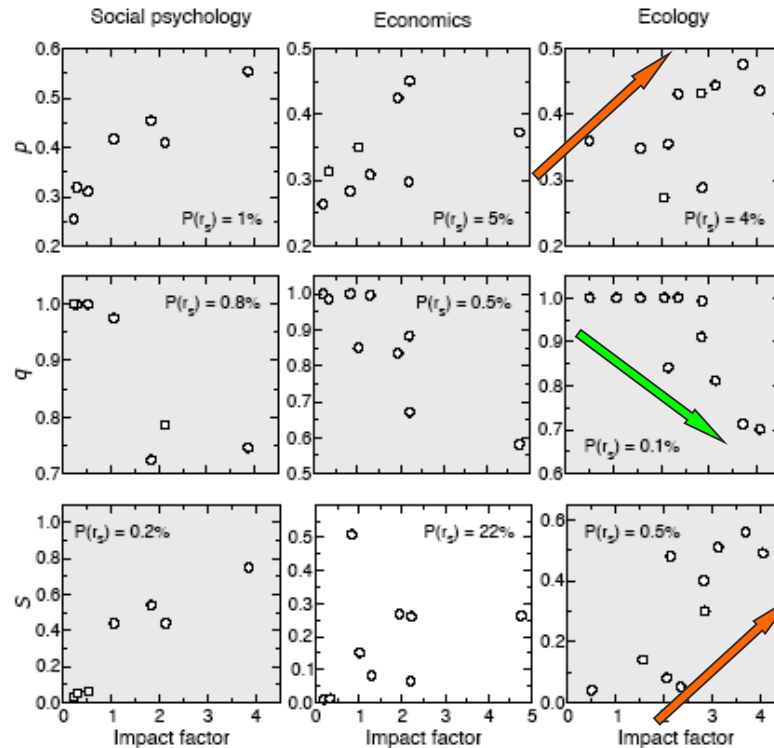
<https://www.the-rheumatologist.org/article/10-characteristics-of-good-mentoring-tips-for-what-mentees-need-from-their-mentors/>

Characteristics of good teams

Increasing experience of team members

Decreasing probability of repeating collaborations

Increasing size of community



Guimera, Uzzi, Spiro & Amaral, *Science* 308, 697 (2005)

Can we trust our measures of impact?

Table 1. Approaches for estimating the significance of films

Class	Method	Property	Strengths	Weaknesses
Expert opinions	Preservation board (e.g., NFR)	Significance	Consistent selection process Careful deliberation	Binary value Long time delay
	Critic reviews (e.g., Roger Ebert)	Quality	Subjective Many independent samples	Poor data availability Limited value range
	Awards (e.g., Oscars)	Quality	Distinctive Information for older items	Affected by promotion Restricted to small subset of films
Wisdom of the crowd	Average rating (e.g., IMDb user rating)	Quality/impact	Quantitative	Rater biases Unknown averaging procedure
	Total vote count (e.g., IMDb user votes)	Impact	Simple Quantitative	Proxy for popularity
Automated/objective measures	Economic measures (e.g., box office gross)	Impact	Quantitative	Proxy for popularity Data availability
	Electronic measures (e.g., Wikipedia edits)	Impact	Quantitative	Proxy for popularity Complex interpretation
	Citation measures (e.g., PageRank)	Influence	Quantitative	Complex interpretation

1282 | www.pnas.org/cgi/doi/10.1073/pnas.1412198112

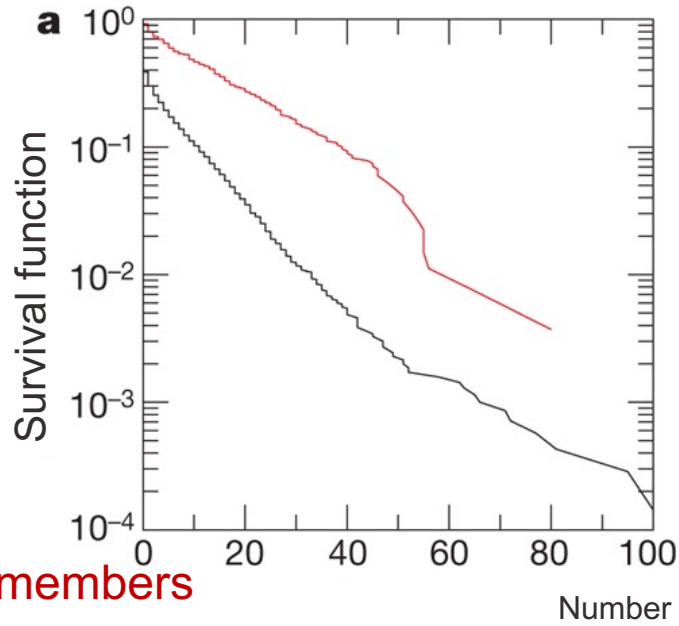
Wasserman et al.



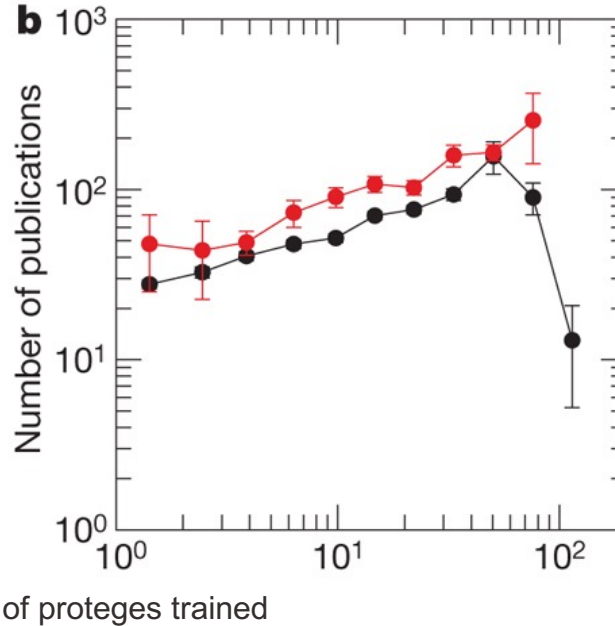
Wasserman, Zeng & Amaral, *PNAS* **112**, 1281 (2015)

Measuring mentor impact

7,259 mathematicians
with trainee counts



4,447 mathematicians
with publication counts



469 NAS members
in Math

Malmgren, Ottino & Amaral, *Nature* **463**, 622 (2010)

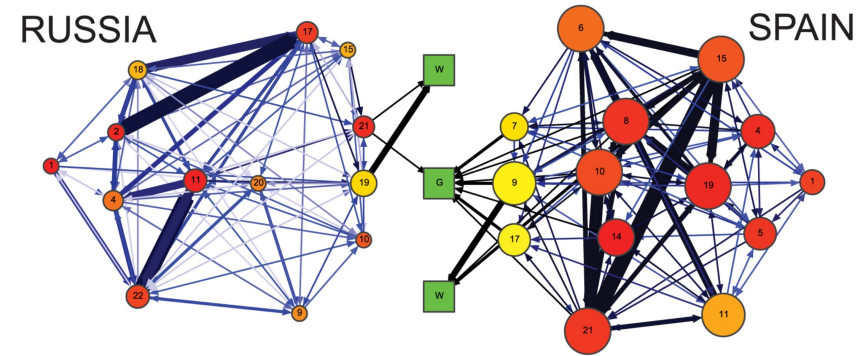
Career stage and mentor impact

Number of proteges trained

Career Stage	Small	Medium	Large
1 st third	+37%	---	+29%
2 nd third	+37%	---	---
3 rd third	+37%	---	-31%

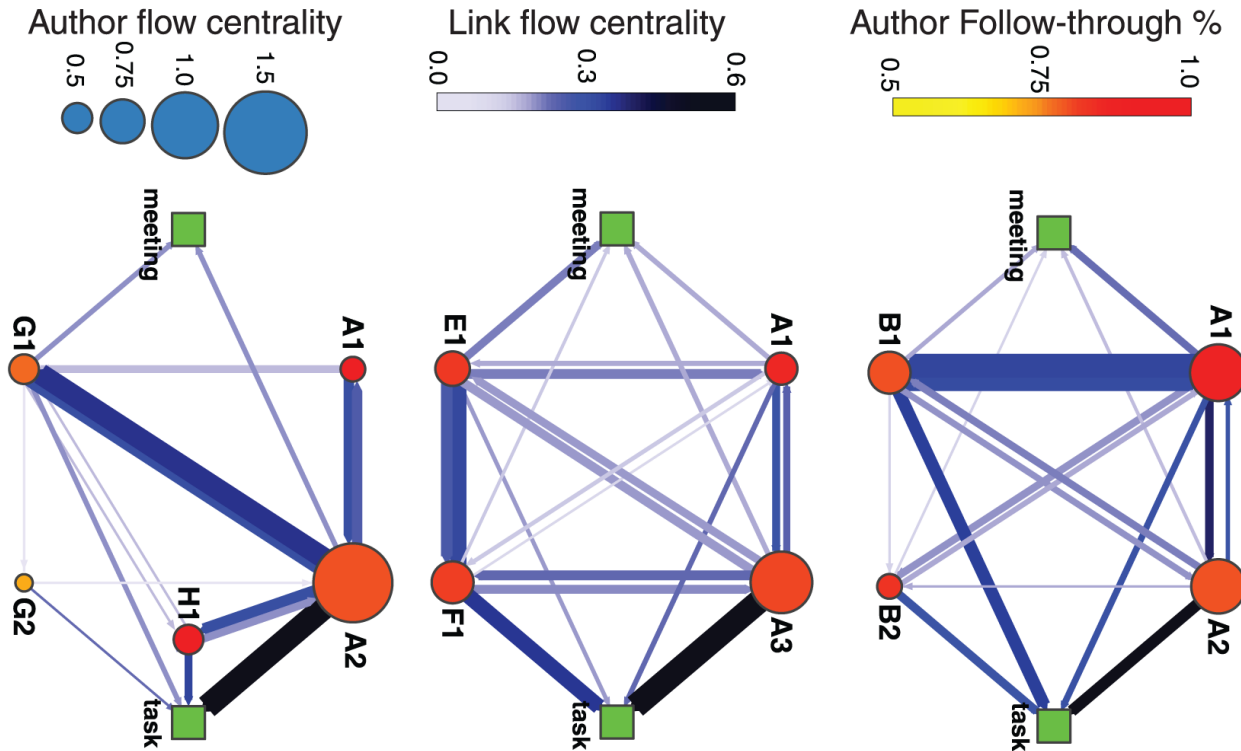
Malmgren, Ottino & Amaral, *Nature* **463**, 622 (2010)

Observable interactions



Duch, Waizman & Amaral, PLOS One 5, e10937 (2010)

Scientific interaction



Duch, Waitzman & Amaral, PLOS One 5, e10937 (2010)

Are there patterns to human communication?

15
Down Bromley SE
Tuesday 16/7
64
My dear Wallace
After I had despatched
my last note, the simple
explanation which you
give had occurred to me,
& seems satisfactory.
I do not think you under-
stand what I mean by the
non-blending of ^{certain} varieties.
It does not refer to fertility
an instance will explain;
I crossed the Painted lady
& Purple sweet-peas, which

are very differently coloured
vars, & got, even out of the
same pod, both varieties
perfect but none inter-
-mediate. Something of this
kind, ^{I think} must occur ^{at first} with
your butterflies & the 3
forms of Lythrum; tho' these
cases are in appearance
so wonderful, I do not
know that they are really
more so than every female
in the world producing
distinct male & female
offspring.

65
I am heartily glad that
you mean to go on
preparing your journal.

Believe me yours
very sincerely

Ch Darwin


<https://www.bl.uk/learning/timeline/english/all/darwinletter-tl.jpg>




Historical data

UNIVERSITY OF CAMBRIDGE


Darwin Correspondence Project

Home About Darwin The letters Commentary People Learning Resources About us

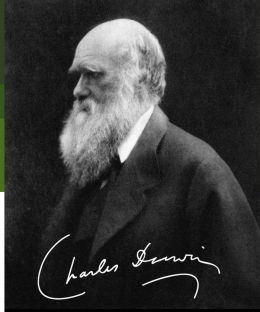
Search over 12000 letters and articles... **Search** advanced search >

Meet the correspondents   

Darwin's letters: a timeline



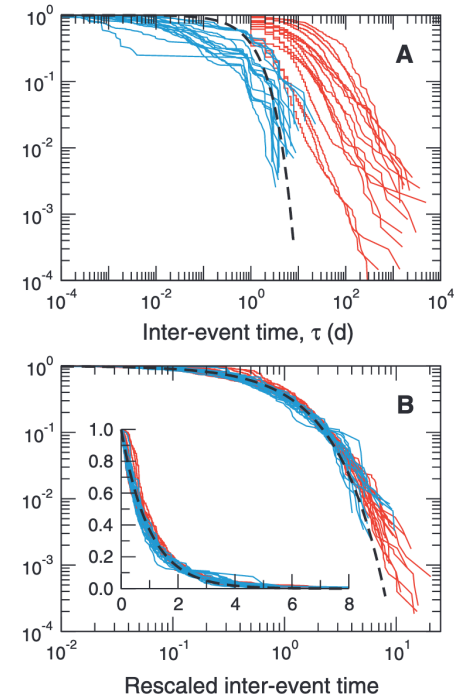
Explore the letters to and from Charles Darwin over time



Read and search the full texts of more than 12,000 of Charles Darwin's letters, and find information on 3,000 more. Discover complete transcripts of all known letters Darwin wrote and received up to the year 1880.

There are indeed patterns

Individual	Time period	Duration (years)	Number of letters	Number of segments	95% CI	Number of rejections
Francis Bacon	1574–1626	53	443	19	[0,3]	3
James H. Leigh Hunt	1790–1859	70	408	25	[0,3]	1
Charles Darwin	1822–1882	61	6785	52	[0,5]	4
Anna Brownell Jameson	1833–1860	28	119	8	[0,2]	1
Friedrich Engels	1833–1895	63	369	24	[0,3]	1
Robert E. Lee	1835–1870	36	282	10	[0,2]	0
Karl Marx	1837–1882	46	469	25	[0,3]	1
Henry Irving	1852–1905	54	1205	35	[0,4]	0
Sigmund Freud	1872–1939	68	3130	49	[0,5]	2
Marcel Proust	1879–1922	44	668	25	[0,3]	2
H. G. Wells	1895–1946	52	422	16	[0,2]	0
Albert Einstein	1896–1955	60	10,319	54	[0,6]	2
Carl Sandburg	1898–1966	69	1894	37	[0,4]	2
Arnold Schoenberg	1902–1951	50	6899	47	[0,5]	3
Ernest Hemingway	1909–1961	53	1934	42	[0,5]	5
Stan Laurel	1924–1964	41	685	17	[0,3]	1



Malmgren, Stouffer, Campanharo & Amaral, *Science* **325**, 37 (2009)

The vision guiding us now

