Faculty hiring, social class, and epistemic inequality

Allison Morgan
Work w/ Dimitrios Economou, Nick LaBerge, Samuel Way, Daniel Larremore, Mirta Galesic, Aaron Clauset

EDI Spotlight Series @ University of Aberdeen, May 26th
Academic workforce

What makes some research more visible?
Who becomes tenure-track faculty?
Outline:

1. Career trajectories and university prestige
2. Institutional prestige shapes scholarship
3. Socioeconomic status shapes academic careers
4. Discuss implications
Career trajectories form networks

BA, Physics
Reed College

BS, Physics
Haverford College

PhD, Computer Science
University of New Mexico

Assistant Professor
University of Colorado

Fellow
Santa Fe Institute

PhD, Computer Science
University of Colorado

Associate Professor
University of Colorado
Career trajectories form networks

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Santa Fe Institute

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University of Colorado

Associate Professor
University of Colorado
Faculty hiring networks

Each directed edge $u \rightarrow v$
PhD from $u \rightarrow$ faculty at $v$

[US academia: big, mobile, self-contained, competitive]

Dramatic inequality in PhD production
[80/20 rule holds]

Common large-scale structure: influential, well-connected core

Small percentage of edges are self-loops
[8% in CS]

Assumption: reveals collective preferences.
Hiring committees want to hire the best candidates

Computer science faculty hiring network;
http://tuvalu.santafe.edu/~aaronc/facultyhiring/
Features of hierarchy

**systematic**
90% of hiring movement is “down” the hierarchy

**steep**
< 7% of faculty have PhD from lower 75% of universities

**biased**
median change for women ~3 ranks worse than men
Core-periphery position changes with rank

What are the implications?

Mean geodesic distance / diameter

Stanford
UMass
Colorado
SUNY Buffalo
UConn
Oregon St.
York
Montana St.
BYU

University Prestige ($\pi / n$)
Shape of the faculty hiring network

- Large inequalities in placement power
- Faculty flow out of core, into periphery
- Modest fraction stays inside core
- Small fraction flows “upstream”
- Prestige describes influence via individuals placement

**Next:** How does prestige affect science as a system? How does SES shape researcher prestige?
Outline:

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Prestige drives epistemic inequality in the diffusion of scientific ideas

Allison C. Morgan, Dimitrios J. Economou, Samuel F. Way, and Aaron Clauset

Visibility of research

https://pxhere.com/en/photo/950021 (CC 2.0)
Visibility of research

**DEPARTMENTAL EFFECTS ON SCIENTIFIC PRODUCTIVITY**

Paul D. Allison
University of Pennsylvania

J. Scott Long
Indiana University

*Am. Soc. Rev. 55, 469-478 (1990)*

**Professional Standing and the Reception of Scientific Discoveries**

Stephen Cole
State University of New York at Stony Brook, and Bureau of Applied Social Research, Columbia University

*Am. J. Soc. 76(2), 286-306 (1970)*

Prestige drives epistemic inequality in the diffusion of scientific ideas

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Visibility of research

https://pxhere.com/en/photo/950021 (CC 2.0)
Three explanations

(1) genuine differences in merit

(2) non-meritocratic social processes

(3) non-meritocratic structural factors
Three explanations

(1) genuine differences in merit
(2) non-meritocratic social processes
(3) non-meritocratic structural factors
Faculty hiring as a mechanism

R1: Are research ideas carried by faculty hiring?
Faculty hiring as a mechanism

**R1:** Are research ideas carried by faculty hiring?

Earliest published Feynman Diagram

Faculty hiring as a mechanism

**R1:** Are research ideas carried by faculty hiring? (Yes.)

*W. Lamb, J. Wheeler, A. Pais, R. Feynman, H. Feshbach, J. Schwinger*
Faculty hiring as a mechanism

**R1:** Are research ideas carried by faculty hiring?

**R2:** Does the structure of the faculty hiring network affect the spread of ideas?
Does the structure of the faculty hiring network affect the spread of ideas?

Seed an epidemic at a university with unique prestige $\pi$, varying the transmissibility $p$ (quality of an idea)

Quality of idea relates to how many nodes will adopt an idea (on average)

Measure the fraction of universities which adopted the idea
Does the structure of the faculty hiring network affect the spread of ideas?

Core-periphery position changes with prestige
Fraction of Network Infected

University Prestige ($\pi$) Increasing Prestige
Average of 10K simulations originating from \( u \) with particular quality \( p \)
Assuming quality of ideas and their origins are independent.
Increasing Prestige, University Prestige ($\pi$)

Fraction of Network Infected

Infection Rate $\rho$ ("Idea Quality")

- 0.1
- 0.3
- 0.5
- 0.7
- 0.9

Increasing Prestige
Poor quality ideas spread more easily from high-prestige universities.
Fraction of Network Infected

Increasing Prestige

University Prestige ($\pi$)

Increasing Prestige

Great ideas can spread regardless of starting place
We may lose medium quality research ideas because the system structurally disallows their spread.
Aside: What about other fields?

Gini coefficient for history is 0.72, business is 0.62, and computer science is 0.69.
Outline:

1. Career trajectories and university prestige
2. Institutional prestige shapes scholarship
3. Socioeconomic status shapes academic careers
4. Discuss implications
Who becomes tenure-track faculty?
Who becomes tenure-track faculty?

Mobility Report Cards: The Role of Colleges in Intergenerational Mobility

How elite colleges fail half of the poor students they admit

“Access isn’t the same as acceptance,” says Harvard professor Anthony Abraham Jack.
Measuring SES among faculty

**Data:** Survey responses from tenure-track faculty in Anthropology, Biology, Business, CS, History, Physics / Astronomy, Psychology, and Sociology across U.S.

Information about professors’ parents’ education levels (N = 7218; 90.2%), and zip code of where they grew up (N = 4807; 60.0%).
Methods

**Income:** Linked respondent provided ZIP with average AGI from IRS (1998-2018) in the year closest to when they grew up. Adjusted for inflation.

**Education:** Respondent provided: What was your parents’ highest levels of education? Benchmarks come from the Census Bureau and NSF SED.
# Parental education

<table>
<thead>
<tr>
<th>Survey of Earned Doctorates (NSF)</th>
<th>Elementary</th>
<th>Some HS</th>
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Percentages of faculty by their parents’ highest held degree, compared to the closest available data on educational attainment of the U.S. adult population when faculty were born and the education levels of the parents of doctoral recipients when faculty started their tenure-track job.
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<tr>
<td>Anthropology Professors</td>
<td>0.8</td>
<td>2.3</td>
<td>14.9</td>
<td>7.3</td>
<td>19.4</td>
<td>32.1</td>
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<tr>
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<td>3.2</td>
<td>3.3</td>
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Percentages of faculty by their parents’ highest held degree, compared to the closest available data on educational attainment of the U.S. adult population when faculty were born and the education levels of the parents of doctoral recipients when faculty started their tenure-track job.
### Parental education and career support

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<th>Parents’ Highest Level of Education</th>
<th>1: None</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5: A lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ HS</td>
<td>11.5%</td>
<td>13.5%</td>
<td>20.2%</td>
<td>19.7%</td>
<td>35.1%</td>
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<tr>
<td>&lt; College</td>
<td>11.0%</td>
<td>17.2%</td>
<td>24.0%</td>
<td>42.1%</td>
<td></td>
</tr>
<tr>
<td>College</td>
<td>19.1%</td>
<td>22.6%</td>
<td>43.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Masters</td>
<td>14.6%</td>
<td>25.0%</td>
<td>50.4%</td>
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<td></td>
</tr>
<tr>
<td>Doctorate</td>
<td>17.0%</td>
<td></td>
<td>68.3%</td>
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</table>

Amount of support parents provided for academic careers on a scale of 1 (None at all) to 5 (A lot), stratified by faculty members’ parents’ highest education levels.
Estimated income

Average income distribution estimated using faculty members’ childhood ZIP codes (green), compared with the income distribution across the 1998 U.S. population (black).
Aside: Isn’t this to be expected?

Medical school admission test: advantages for students whose parents are medical doctors?

Anne Simmenroth-Nayda & Yvonne Görlich
BMC Medical Education 15, Article number: 81 (2015) | Cite this article
7771 Accesses | 7 Citations | 11 Altmetric | Metrics

“I IN MY FATHER’S FOOTSTEPS: CAREER PATTERNS OF LAWYERS”**

by

STEPHEN L. WASBY ** & SUSAN S. DALY***

57 Celebrities with Famous Parents

These stars practically stole the spotlight from their parents.

by CASINE LAVACHE and REBEKAH NORMAN • Jan 27, 2021

The 25 Most Important Families in Hollywood History

From the Coppolas to the Barrymores to, yes, the Kardashians.

Kennedy family

The Kennedy family is an American political family that has long been prominent in American politics, public service, entertainment, and business. The first Kennedy elected to public office was Patrick Joseph "P. J." Kennedy in 1884, 35 years after the family's arrival from Ireland. [Wikipedia]

Parent family: O'Kennedy
Place of origin: Dunganstown
Current region: New England
Founder: Patrick Kennedy (1823-1855)

Probably.
Aside: Isn’t this to be expected?

It might be tempting to take the position that the extreme microclass inequalities uncovered here are not all that objectionable. Should we really care, for example, that the child of the truck driver has a special propensity to become a truck driver while the child of a gardener has a special propensity to become a gardener? Must we truly commit ourselves to equal access to truck driving and gardening? If pressed, we would argue that allascriptive constraints on choice, even those pertaining to purely horizontal inequalities, are inconsistent with a commitment to an open society. By this logic, all types of origin-by-destination association are problematic because they imply that human choice has been circumscribed, a circumscription that is wholly determined by the accident of birth. We care, in other words, that the truck driver is fated to become a truck driver at birth because that amounts to a stripping away of choice, and most of us would embrace an open society in which choices are expanded, not stripped away. Although our illustrative nonchoice (i.e., being a truck driver versus being a gardener) may not have implications for total rewards (of the sort that are consensually valued), it is nonetheless a fateful nonchoice that determines the texture and content of a human life. It is this commitment to an open society, sometimes left quite implicit, that underlies the discipline’s long-standing interest in monitoring marital homogamy, occupational sex segregation, and many other forms of ascription that are hybrids of vertical and horizontal processes.
Relationship between prestige and SES

![Graph showing the relationship between Current Institutional Prestige and Percentage of Faculty with PhD Parents. The x-axis represents Current Institutional Prestige ranging from 0 to 100, and the y-axis represents Percentage of Faculty with PhD Parents ranging from 0 to 40. The graph indicates a possible correlation between prestige and SES.](image)
Relationship between prestige and SES

![Graph showing the relationship between current institutional prestige and percentage of faculty with PhD parents. The graph indicates a consistent percentage of faculty with PhD parents across different levels of prestige.](image-url)
The relationship between the current institutional ranking of faculty and whether they have a parent with a PhD. Lines show the relationship for faculty born in different time periods.
Relationship between prestige and SES

Percentage of faculty with at least one parent holding a PhD, stratified by prestige of the faculty’s current institution. Green upward arrows describe faculty at top 20% of institutions by USNWR or NRC ranking, and downward arrows describe the bottom 20% of ranked institutions. The black line describes the average proportion of faculty with PhD parents.
Linear regression of current institutional prestige as a function of neighborhood, estimated income, and parents’ highest education.

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<th>Model II</th>
<th>Model III</th>
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<tbody>
<tr>
<td>Urban neighborhood</td>
<td>0.129</td>
<td>0.552</td>
<td>0.914</td>
</tr>
<tr>
<td></td>
<td>(0.050)</td>
<td>(0.052)</td>
<td>(0.054)</td>
</tr>
<tr>
<td>Average income (std)</td>
<td>-1.447 *</td>
<td>-1.352 *</td>
<td></td>
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<tr>
<td></td>
<td>(0.037)</td>
<td>(0.038)</td>
<td></td>
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<tr>
<td>Parents’ highest degree</td>
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</tr>
<tr>
<td>Elementary</td>
<td>-2.946</td>
<td></td>
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<tr>
<td></td>
<td>(0.172)</td>
<td></td>
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<tr>
<td>Some high school</td>
<td>-1.816</td>
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<tr>
<td></td>
<td>(0.191)</td>
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<tr>
<td>High school</td>
<td>-4.873 *</td>
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<td></td>
<td>(0.065)</td>
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<tr>
<td>College</td>
<td>-4.416 *</td>
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<td>(0.063)</td>
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<tr>
<td>Masters</td>
<td>-5.177 *</td>
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<td>(0.059)</td>
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<tr>
<td>PhD</td>
<td>-6.889 *</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.061)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusting for discipline, race / ethnicity, gender, PhD prestige</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Adjusted $R^2$</td>
<td>0.105</td>
<td>0.107</td>
<td>0.109</td>
</tr>
</tbody>
</table>
Relationship between prestige and SES

Linear regression of current institutional prestige as a function of neighborhood, estimated income, and parents’ highest education.

<table>
<thead>
<tr>
<th></th>
<th>Model I</th>
<th>Model II</th>
<th>Model III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban neighborhood</td>
<td>0.129</td>
<td>0.552</td>
<td>0.914</td>
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<tr>
<td></td>
<td>(0.050)</td>
<td>(0.052)</td>
<td>(0.054)</td>
</tr>
<tr>
<td>Average income (standardized)</td>
<td>-1.447 *</td>
<td>-1.352 *</td>
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</tr>
<tr>
<td></td>
<td>(0.037)</td>
<td>(0.038)</td>
<td></td>
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<tr>
<td>Parents’ highest degree:</td>
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<tr>
<td>Elementary</td>
<td>-2.946</td>
<td></td>
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<tr>
<td></td>
<td>(0.172)</td>
<td></td>
<td></td>
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<tr>
<td>Some high school</td>
<td>-1.816</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(0.191)</td>
<td></td>
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<tr>
<td>High school</td>
<td>-4.873 *</td>
<td></td>
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<tr>
<td></td>
<td>(0.065)</td>
<td></td>
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</tr>
<tr>
<td>College</td>
<td>-4.416 *</td>
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<tr>
<td></td>
<td>(0.063)</td>
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<tr>
<td>Masters</td>
<td>-5.177 *</td>
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<td></td>
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Outline:

1. Career trajectories and university prestige
2. Institutional prestige shapes scholarship
3. Socioeconomic status shapes academic careers
4. Discuss implications
Academic workforce

Who becomes faculty?

What influences their visibility?
Ideas spread in academia via faculty hiring. The structure of this network can privilege elite institutions.

**Caveats:** Model assumes quality is independent of institution and hiring decisions.
Implications

Faculty are 2X more likely to have a PhD parent than PhD recipients.

Current placement correlates with having PhD parents.

**Caveats:** This study doesn’t speak to barriers once individuals become faculty.

What should we do?

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**The Facade of Fit in Faculty Search Processes**

Damani K. White-Lewis

Department of Counseling, Higher Education, and Special Education, University of Maryland, College Park, Maryland, USA

*Journal of Higher Education* 9:61 (2020)

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**Roles for Computing in Social Change**

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Conf. on Fairness, Accountability, Transparency (2020)
Thanks!

Collaborators: Dimitrios Economou, Samuel Way, Aaron Clauset, Daniel Larremore, McKenzie Mae Weller, Mirta Galesic, Nick LaBerge

Systematic inequality and hierarchy in faculty hiring networks
Aaron Clauset,1,3,5* Samuel Arbesman,4 Daniel B. Larremore1,6

Prestige drives epistemic inequality in the diffusion of scientific ideas
Allison C. Morgan1,*, Dimitrios J. Economou1, Samuel F. Way1 and Aaron Clauset1,3,5
EPJ Data Science 7:40 (2018)

Socioeconomic Roots of Academic Faculty
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https://osf.io/preprints/socarxiv/6wjxc

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