









tested against the data (Fig. 5C). The survival curves are now based on all cohorts, so they represent time-averaged survival for lead and supporting authors. The model reproduces the salient features of the empirical curve. Remarkably, the analysis shows that the hazard is relatively constant throughout the career (i.e., that there are no punctuated bottlenecks at which a large fraction of a cohort would leave the field).

**Early Indicators of Scientific Survivability.** Given the increasing uncertainty of achieving a full career in science, one wonders whether there are any characteristics of scientists early in their careers that could indicate their survival status (38). We define “early” as the first 5 y of a researcher’s presence in the field (what we might call his or her “apprenticeship” years). Given our focus on the roles that scientists play in the production of knowledge, we focus on the variables that are directly related to this process: productivity, impact, and collaboration. These variables have been identified in prior work as correlated with career trajectories. We do not focus on some other variables that have been identified as important for career longevity and success, such as gender and the prestige of an institution a scientist is affiliated with, which are more pertinent in the context of studies that focus on career aspects that involve institutional and job roles (hiring, tenure, and promotion). While our models do not explicitly control for gender, two recent studies analyzing career longevity of academic faculty found no differences in faculty attrition by gender (except in the field of mathematics) since 1990 (36, 37).

In this analysis, we look at the total productivity in the first 5 y of a career (in any authorship role) and examine two types of impact: average impact of early work (the number of citations per paper received in the first 5 y) and the peak impact (the maximum number of citations received in a 5-y window to a single, early-career publication). Finally, for collaboration, we focus on the number of direct collaborators in the first 5 y of the career. Direct collaborators are defined as coauthors on a paper led by the author in question, as well as all of the unique lead authors of papers on which the author in question is a coauthor. If neither author is a lead author on some publication, such authors do not constitute direct collaboration.

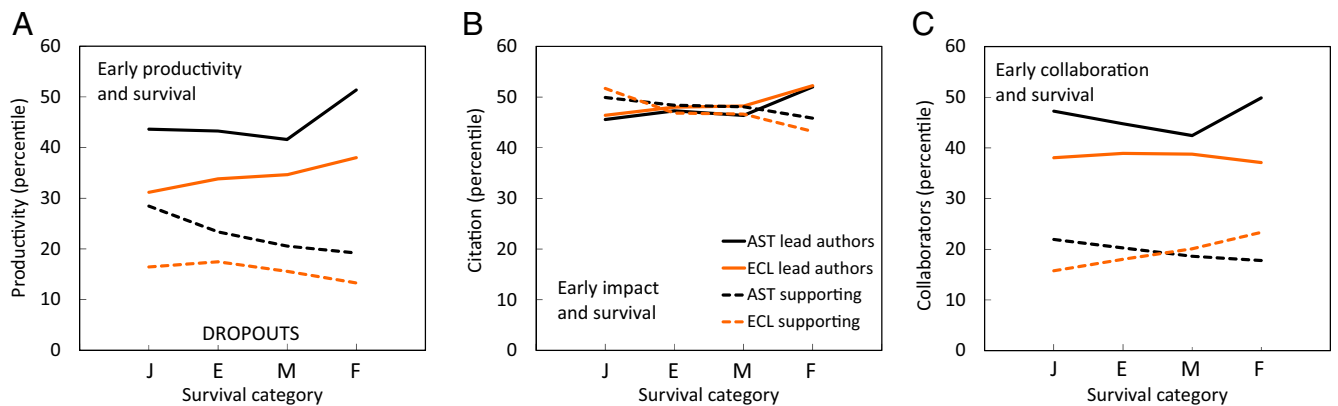
To aggregate the data from cohorts that span a long time period, one needs to take into account that all three variables have significantly increased over time. For example, a researcher from the 1960 cohort who had 10 citations per paper may have been the most impactful in that cohort (~100 percentile), whereas the same number of citations for a cohort from 2000 may place the researcher in middle of the cohort (~50 percentile).

Therefore, we establish normalized measures by determining the percentiles for each variable and for each author in a given cohort.

Fig. 6 shows mean productivity, citation, and collaboration levels for authors of different survival categories: junior dropouts (J; leaving 6–10 y after the first publication); early-career dropouts (E; 11–15 y); midcareer dropouts (M; 16–20 y); and, finally, the scientists who achieved full careers (F; >20 y). The values for robotics, which contains fewer cohorts and a smaller sample size, is noisier, and we omit it for clarity. The trends are shown separately for lead and supporting authors. The trends are fairly consistent between astronomy and ecology (with the exception of collaboration). Furthermore, we find that the trends involving average number of citations per paper and maximum number of citations are very similar, and we show only the ones involving average number of citations. Fig. 6 reveals that lead and supporting authors follow different trends. Overall, lead authors, regardless of survival category, have significantly higher production and collaboration levels than supporting authors, whereas their impact levels are similar. Supporting authors, while working on fewer papers and with fewer direct collaborators, nevertheless contribute to projects of similar impact. For lead authors, there is a slight positive trend between the early level of all three metrics and eventual survival (except for ecology and collaboration, where there is no significant trend). In particular, based on the means comparisons, lead researchers who go on to full careers (F) tend to have, on average, higher levels of productivity, citation, and (for astronomy) collaboration.

The four-state career model, which provides an estimate of the career termination hazard rate by career state, not only supports the empirical survival functions well but shows that the hazard rate is relatively constant throughout a career, thus also supporting the model developed by Petersen et al. (34).

The above plots focused on individual variables. To quantify the effect of the variables on survival taking into account internal correlations, we use the Cox proportional hazard survival model. For this analysis, we use career lengths in annual increments (rather than grouping into only four categories) and the Efron method to correct for ties. Although many of the cases include careers of greater than 20 y, we recode career length as maximizing at 20 y (hence, all careers greater than 20 y, corresponding to full-career survival status, are treated as right-truncated). In addition, because we are testing the effects of the first 5 y of performance on subsequent exit, all our cases in this analysis have career lengths of at least 6 y. We are then testing, among the set of researchers who accumulate 5 y of background experience, how career lengths differ by publications, citations, and number of collaborators during their first 5 y (net of the effects of the



**Fig. 6.** Early predictors of survivability in astronomy (AST) and ecology (ECL). Normalized productivity (A), impact (B), and collaboration (C) metrics based on the number of publications from the first 5 y of an author’s career are shown for lead (full lines) and supporting (dashed lines) authors in two disciplines for authors of different survival status: junior dropouts (J; leaving after 6–10 y after the first publication), early-career dropouts (E; 11–15 y), midcareer dropouts (M; 16–20 y), and, finally, the scientists who achieved full careers (F; >20 y).

**Table 1. Cox proportional hazard regressions, for lead authors, by cohort**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Lead authors	All	All	1960s	1970s	1980s	1990s	2000s
No. of publications	0.891*** (0.004)	0.891*** (0.004)	0.945* (0.021)	0.950*** (0.013)	0.925*** (0.012)	0.886*** (0.008)	0.857*** (0.009)
Average citations per paper	0.999 (0.001)		0.987** (0.004)	0.990*** (0.003)	0.994* (0.002)	0.998 (0.001)	1.000 (0.001)
Maximum citations on a paper		1.000 (0.000)					
No. of collaborators	1.001 (0.003)	1.001 (0.003)	1.042 (0.032)	0.975 (0.016)	0.963** (0.012)	0.996 (0.005)	0.997 (0.005)
Cases	34,037	34,037	1,862	4,764	6,195	9,511	11,705
Exits	9,034	9,034	617	1,227	1,843	3,531	1,816
LR $\chi^2$	1,111.49	1,110.52	22.14	82.20	160.91	557.17	508.79
$P > \chi^2$	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Publication productivity, citations, and collaborators pertain to the first 5 y of an author's career. Standard errors shown in parentheses. LR, likelihood ratio. \*\*\* $P < 0.001$ ; \*\* $P < 0.01$ ; \* $P < 0.05$ .

other variables). We use the untransformed publications and citations data, as we will be focusing on comparisons within cohorts.

Given the very different survival curves for the lead and supporting authors (Fig. 5), we estimate the effects separately for each group. Tables 1 and 2 give the models. Column 1 in Tables 1 and 2 shows the effects of background characteristics (publications, citations, and number of collaborators) on hazards of exit (with values greater than 1 increasing the rate of exit and values less than 1 decreasing the rate of exit). Table 1 shows the results for lead authors, and Table 2 shows the results for supporting authors. Column 2 repeats this analysis using the maximum number of citations among the researchers for the first 5 y of publications. We see that when we control for the net effects of the other indicators across the 50 y (1960–2010) for lead authors, publications significantly reduce the hazard of exit, while there is little effect of citations (either measure) or number of collaborators. For supporting researchers, publications also have a negative effect on exit, although the effect is weaker than for lead authors. Citations (either measure) also have an effect, although the effect is positive (increasing exit). The number of collaborators has no effect.

A test of the proportional hazard assumption that the effects of the predictors are constant over time rejects the null hypothesis for publications (and is close to significant for citations). Furthermore, the data above suggest that the career conditions are changing over time and that publications, citations, and collaborations rates have also been changing over time. Hence, we estimate the effects across cohorts separately (Tables 1 and 2, columns 3–7). For lead authors, we see that publications have

consistently been a significant predictor of career longevity. We also see that citations reduced the hazard of exit in the early cohorts; however, more recently, the model is dominated by publications, with citations having little independent effect. In contrast, for supporting authors, publications have very weak effects until the most recent cohort. Table 3 shows that these effects are largely consistent across fields, although we find that the effect of publications is significant for supporting researchers in astronomy.

In Tables 1 and 2, we report the hazard ratios from a multivariate Cox proportional hazard model. We are estimating the relative hazard to exiting, truncating at 20 y (so we are estimating the relative hazard of leaving academic publishing before 20 y). The table is reporting the change in the hazard ratio for exiting from a one-unit change in each variable, controlling for the effects of all of the other variables. These hazard ratios can be interpreted by estimating how far they are from 1.0. For example, for lead authors across all years, publications have a coefficient of 0.891 (Tables 1 and 2, column 1). This means that one publication reduces the hazard of exit by about 11% ( $1.000 - 0.891 = 0.109$ ). In terms of the probability of achieving a full career, it grows gradually from 50% for authors with one early publication to 85% for authors with 20 publications. In contrast, one citation reduces the hazard very little (0.1%). Therefore, for lead investigators, each publication has substantially more impact on survival than does each citation (about 100-fold greater). In contrast, for supporting authors, one publication reduces the hazard of exit by about 3% ( $1.000 - 0.966$ ), while citations again have very little effect. However, looking across the cohorts, we see this effect for supporting authors is largely limited to the most recent cohort (Tables 1 and 2, column 7). We can also see

**Table 2. Cox proportional hazard regressions, for supporting authors, by cohort**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Supporting authors	All	All	1960s	1970s	1980s	1990s	2000s
No. of publications	0.966*** (0.008)	0.966*** (0.008)	0.972 (0.099)	1.056 (0.066)	1.042 (0.046)	1.017 (0.015)	0.938*** (0.012)
Average citations per paper	1.001** (0.000)		1.003 (0.007)	0.990* (0.005)	1.005* (0.002)	1.001* (0.000)	1.000 (0.000)
Maximum citation on a paper		1.000* (0.000)					
No. of collaborators	1.006 (0.015)	1.003 (0.016)	1.223 (0.244)	1.038 (0.093)	0.964 (0.061)	0.942* (0.023)	0.994 (0.024)
Cases	10,677	10,677	195	761	1,540	3,136	5,045
Exits	4,290	4,290	91	308	767	1,865	1,259
LR $\chi^2$	59.16	55.76	1.83	7.70	5.77	10.95	103.24
$P > \chi^2$	0.00	0.00	0.61	0.05	0.12	0.01	0.00

Publication productivity, citations, and collaborators pertain to the first 5 y of an author's career. Standard errors shown in parentheses. LR, likelihood ratio. \*\*\* $P < 0.001$ ; \*\* $P < 0.01$ ; \* $P < 0.05$ .

**Table 3. Cox proportional hazard regressions, for lead and supporting authors, by field**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lead and supporting authors	All (lead authors)	AST (lead authors)	ECL (lead authors)	ROB (lead authors)	All (supporting authors)	AST (supporting authors)	ECL (supporting authors)	ROB (supporting authors)
No. of publications	0.891*** (0.004)	0.921*** (0.005)	0.867*** (0.012)	0.924*** (0.024)	0.966*** (0.008)	0.969*** (0.082)	1.012 (0.052)	1.105 (0.099)
Average citations per publication	0.999 (0.001)	1.001 (0.001)	0.999 (0.001)	0.996 (0.003)	1.001** (0.000)	1.001** (0.000)	1.009*** (0.001)	0.992 (0.005)
No. of collaborators	1.001 (0.003)	1.001 (0.003)	1.018 (0.009)	0.979 (0.018)	1.006 (0.015)	1.019 (0.016)	0.937 (0.066)	0.822 (0.102)
Cases	34,037	22,178	9,499	2,360	10,677	6,791	2,988	898
Exits	9,034	4,613	3,488	933	4,290	2,476	1,409	405
LR $\chi^2$	1,111.49	417.21	129.20	27.42	59.16	39.73	26.73	6.33
$P > \chi^2$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09

Publication productivity, citations, and collaborators pertain to the first 5 y of an author’s career. Standard errors shown in parentheses. AST, astronomy; ECL, ecology; LR, likelihood ratio; ROB, robotics. \*\*\* $P < 0.001$ ; \*\* $P < 0.01$ ; \* $P < 0.05$ .

that for the full span of cohorts (Tables 1 and 2, column 1), the effect of publications for lead authors is much greater than that for supporting authors (11% vs. 3%), and that when we compare across cohorts (Tables 1 and 2, columns 3–7), the effect of publications for reducing exit is stronger (the hazard ratio is lower) for lead authors than for supporting authors.

**Discussion**

Recent work on the organization of science has focused on the internal structures of research teams and has argued that one likely outcome of this shift in the nature of scientific work has been the growth of supporting scientists, whose careers depend on being members of such teams (6, 13). Less obviously, there has also been a concomitant increase in high-stakes evaluation and competition for funding, increasing the emphasis on productivity (44–47). One solution to this new emphasis on productivity is increasing the division of labor (48, 49). The growth of scientific team sizes is being accompanied by a transition in the organization of scientific work from craft to bureaucratic industrial principles, with increased division of labor and standardization of tasks (13, 50, 51). The result is a growth of scientists whose function is to support the projects that others are leading. Our results confirm this scenario, showing that an increasing fraction of entering authors never transition from a supporting author to lead author role. We also show that such a trend is not an inevitable outcome of the increasing sizes of teams, per se, but arises due to the different roles that some authors now have in large teams compared with the roles that members of smaller teams have (team members vs. collaborators). In some fields, such as ecology and robotics, lead and supporting authors have similar half-lives, while in others, such as astronomy, the half-lives of supporting authors is significantly shorter.

Of course, there are well-known productivity advantages from organizing teams with a division of labor, and with having some team members specializing in supporting roles (48). Hence, it is perhaps not surprising that science is shifting to larger teams, with more specialization, and that, increasingly, some scientists are specializing in supporting roles. Note that we are not assuming status or skill distinctions in our classification of lead and supporting authors (50). We are arguing that such supporting scientists are critical to the production of contemporary science (6). However, it is also the case that institutions, such as universities and funding agencies, build around these traditional status distinctions, for example, between postdoctoral scientists and tenure track professors (6). However, our survival analyses suggest that the criteria predicting longevity for supporting

scientists are quite distinct from those for lead researchers and it may not be appropriate to impose similar criteria on both groups when making decisions about who to hire or whose contract to renew. We argue there is a need to reform career structures in universities to account for the changing nature of the population composition and reproduction cycles in team science, with social insect colonies rather than parent-child reproduction as a more appropriate model.

While we cannot address this with our current data, we point to a tension between the research production and teaching functions that academic laboratories provide (5, 12, 44, 50, 52). These two trends are bringing fundamental changes to scientific careers, with decreasing opportunities for lead researcher positions and increasing production of, and demand for, a scientific workforce to fill positions as permanent supporting scientists. Together, these trends suggest downward pressure on career longevity (as more people exit the academic science labor force) and the growth of dependent supporting scientist positions to support the relatively shrinking share of lead researchers. However, one concern is that such supporting scientist positions do not fit well with the employment system in most universities, which are structured around a graduate apprenticeship, a short period of postdoctoral training, and then movement into a tenure track (and eventually tenured) professor position (5). Instead, these support workers may be relegated to a series of short-term postdoctoral contracts or other forms of contingent academic work. While the traditional model implies an up-or-out academic pipeline (with significant shares of the research workforce dropping out of research-active academic positions at each stage), the growth of permanent supporting scientists may suggest an alternative career path that, while perhaps with shorter survival than the traditional lead researcher path, may be a growing share of the academic labor force. Furthermore, such careers may be premised on a different set of criteria than is typically predictive of the career survival of lead researchers.

Our findings show that the shift in the mode of knowledge production from solo authors and small core teams (2) has coincided with a differentiation in the scientific workforce in terms of their roles. The increased need for both the specialization and possession of specialized technical knowledge to manipulate increasingly complex instrumentation and data has created an essential group of supporting contributors to knowledge. Unfortunately, the existing job roles and educational structures may not be responding to these changes. Our results suggest that, while essential, these supporting researchers are suffering from

greater career instability and worse long-term career prospects in some fields.

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- Fortunato S, et al. (2018) Science of science. *Science* 359:eaa0185.
- Milojević S (2014) Principles of scientific research team formation and evolution. *Proc Natl Acad Sci USA* 111:3984–3989.
- Wuchty S, Jones BF, Uzzi B (2007) The increasing dominance of teams in production of knowledge. *Science* 316:1036–1039.
- Bordons M, Gomez I (2000) Collaboration networks in science. *The Web of Knowledge: A Festschrift in Honor of Eugene Garfield*, eds Cronin B, Atkins HB (Information Today, Medford, NJ), pp 197–213.
- Stephan PE (2012) *How Economics Shapes Science* (Harvard Univ Press, Cambridge, MA).
- Barley SR, Bechky B (1994) In the backrooms of science: Notes on the work of science technicians. *Work Occup* 21:85–126.
- Cyranoski D, Gilbert N, Ledford H, Nayyar A, Yahia M (2011) Education: The PhD factory. *Nature* 472:276–279.
- Schillebeeckx M, Maricque B, Lewis C (2013) The missing piece to changing the university culture. *Nat Biotechnol* 31:938–941.
- Stephan P (2012) Research efficiency: Perverse incentives. *Nature* 484:29–31.
- Alberts B, Kirschner MW, Tilghman S, Varmus H (2014) Rescuing US biomedical research from its systemic flaws. *Proc Natl Acad Sci USA* 111:5773–5777.
- Kaiser D (2012) Booms, busts, and the world of ideas: Enrollment pressures and the challenge of specialization. *Osiris* 27:276–302.
- Teitelbaum MS (2014) *Falling Behind? Boom, Bust, and the Global Race for Scientific Talent* (Princeton Univ Press, Princeton).
- Walsh JP, Lee Y-N (2015) The bureaucratization of science. *Res Policy* 44:1584–1600.
- Geuna A, Shibayama S (2015) Moving out of academic research: Why do scientists stop doing research? *Global Mobility of Research Scientists: The Economics of Who Goes Where and Why*, ed Geuna A (Academic, Amsterdam), pp 271–300.
- Preston AE (2004) *Leaving Science: Occupational Exit from Scientific Careers* (Russell Sage Foundation, New York).
- Gaule P, Piacentini M (2018) An advisor like me? Advisor gender and post-graduate careers in science. *Res Policy* 47:805–813.
- Allison PD (2014) *Event History and Survival Analysis* (Sage, Los Angeles).
- Allison PD, Stewart JA (1974) Productivity differences among scientists: Evidence for accumulative advantage. *Am Sociol Rev* 39:596–606.
- Long JS, Allison PD, McGinnis R (1993) Rank advancement in academic careers: Sex differences and the effects of productivity. *Am Sociol Rev* 58:703–722.
- Sugimoto CR, Sugimoto TJ, Tsou A, Milojević S, Larivière V (2016) Age stratification and cohort effects in scholarly communication: A study of social sciences. *Scientometrics* 109:997–1016.
- Clemens ES, Powell WW, McIlwaine K, Okamoto D (1995) Careers in point: Books, journals, and scholarly reputation. *Am J Sociol* 101:433–494.
- Xie Y, Shauman KA (2003) *Women in Science: Career Processes and Outcomes* (Harvard Univ Press, Cambridge, MA).
- Allison PD, Long JS (1990) Departmental effects on scientific productivity. *Am Sociol Rev* 55:469–478.
- Long JS, Allison PD, McGinnis R (1979) Entrance into the academic career. *Am Sociol Rev* 44:816–830.
- Long JS, McGinnis R (1985) The effects of the mentor on the academic career. *Scientometrics* 7:255–280.
- Leahy E, Keith B, Crockett J (2010) Specialization and promotion in an academic discipline. *Res Soc Stratif Mobility* 28:135–155.
- Cole S, Cole JR (1967) Scientific output and recognition: A study in the operation of the reward system in science. *Am Sociol Rev* 32:377–390.
- Fox MF, Faver CA (1985) Men, women, and publication productivity: Patterns among social work academics. *Sociol Q* 26:537–549.
- Xie Y, Shauman KA (1998) Sex differences in research productivity: New evidence about an old puzzle. *Am Sociol Rev* 63:847–870.
- Way SF, Morgan AC, Clauset A, Larremore DB (2017) The misleading narrative of the canonical faculty productivity trajectory. *Proc Natl Acad Sci USA* 114:E9216–E9223.
- Fox MF (1983) Publication productivity among scientists: A critical review. *Soc Stud Sci* 13:285–305.
- Cole JR, Cole S (1973) *Social Stratification in Science* (Univ of Chicago Press, Chicago).
- Petersen AM, Riccaboni M, Stanley HE, Pammolli F (2012) Persistence and uncertainty in the academic career. *Proc Natl Acad Sci USA* 109:5213–5218.
- Petersen AM, Jung W-S, Yang J-S, Stanley HE (2011) Quantitative and empirical demonstration of the Matthew effect in a study of career longevity. *Proc Natl Acad Sci USA* 108:18–23.
- Price DJS, Gürsey S (1976) Studies in scientometrics. Part I. Transience and continuance in scientific authorship. *Int Forum Inf Doc* 1:17–24.
- Kaminski D, Geisler C (2012) Survival analysis of faculty retention in science and engineering by gender. *Science* 335:864–866.
- Box-Steffensmeier JM, et al. (2015) Survival analysis of faculty retention and promotion in the social sciences by gender. *PLoS One* 10:e0143093.
- Sinatra R, Wang D, Deville P, Song C, Barabási A-L (2016) Quantifying the evolution of individual scientific impact. *Science* 354:aaf5239.
- Henneken EA, et al. (2007) E-print journals and journal articles in astronomy: A productive co-existence. *Learn Publ* 20:16–22.
- Nobis M, Wohlgemuth T (2004) Trend words in ecological core journals over the last 25 years (1978–2002). *Oikos* 106:411–421.
- Carmel Y, et al. (2013) Trends in ecological research during the last three decades—A systematic review. *PLoS One* 8:e59813.
- Milojević S (2013) Accuracy of simple, initials-based methods for author name disambiguation. *J Informetrics* 7:767–773.
- Yoachim P (2016) *Publishing Lifetimes of American Astronomy PhDs: A Post-2008 Collapse*. Available at [staff.washington.edu/yoachim/Share/Daily\\_build/writeup.pdf](http://staff.washington.edu/yoachim/Share/Daily_build/writeup.pdf). Accessed December 15, 2018.
- Hackett EJ (1990) Science as a vocation in the 1990s: The changing organizational culture of academic science. *J Higher Educ* 61:241–279.
- Hicks D (2012) Performance-based university research funding systems. *Res Policy* 41: 251–261.
- Lewis JM (2015) Research policy as “carrots and sticks”: Governance strategies in Australia, the United Kingdom and New Zealand. *Varieties of Governance*, Studies in the Political Economy of Public Policy, eds Capano G, Howlett M, Ramesh M (Palgrave Macmillan, London), pp 131–150.
- Whitley R, Gläser J, eds (2007) *The Changing Governance of the Sciences: The Advent of Research Evaluation Systems* (Springer, Dordrecht, The Netherlands).
- Becker GS, Murphy KP (1992) The division of labor, coordination costs, and knowledge. *Q J Econ* 107:1137–1160.
- Smith A (1776) *Wealth of Nations* (W. Strahan and T. Cadell, London).
- Hagstrom WO (1964) Traditional and modern forms of scientific teamwork. *Adm Sci Q* 9:241–263.
- Hargens LL (1975) *Patterns of Scientific Research: A Comparative Analysis of Research in Three Scientific Fields* (Am Sociol Assoc, Washington, DC).
- Pavlidis I, Petersen AM, Semendeferi I (2014) Together we stand. *Nat Phys* 10:700–702.



# Correction

## COLLOQUIUM

Correction for “Changing demographics of scientific careers: The rise of the temporary workforce,” by Staša Milojević, Filippo Radicchi, and John P. Walsh, which was first published December 11, 2018; 10.1073/pnas.1800478115 (*Proc Natl Acad Sci USA* 115:12616–12623).

The authors note that a reference was omitted from the article. The complete reference appears below. The reference should be cited in a new sentence, to be added on page 12618, right column, at the end of the first paragraph, following “in that discipline”: “Comparing our astronomy results to similar findings from astronomy by Yoachim (43), we can see that even making different methodological choices about the population at risk, the journal lists, and the disambiguation methods, the results are robust. This gives us additional confidence in the findings.”

The authors note that the following statement should be added to the Acknowledgments: “We thank Peter Yoachim for sharing his results on the declining career lengths in astronomy.”

The online version has been corrected.

43. Yoachim P (2016) *Publishing Lifetimes of American Astronomy PhDs: A Post-2008 Collapse*. Available at [staff.washington.edu/yoachim/Share/Daily\\_build/writeup.pdf](http://staff.washington.edu/yoachim/Share/Daily_build/writeup.pdf). Accessed December 15, 2018.

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