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Dr Liz Allen

Beyond Authorship: Introducing the Contributor Role Taxonomy (CRediT)

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Beyond authorship: Introducing the Contributor Role Taxonomy (CRediT)

Liz Allen

Director of Strategic Initiatives, F1000

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RIOT Science Club | July 2020

About me (declarations)

- F1000 Director of Strategic Initiatives (2015 – present)
- Head of Evaluation at Wellcome (2000s - 2015)
- Co-led development of project CRediT (2010 - present)

- ORCID, Board of Directors (2010 – 2015)
- Software Sustainability Institute, Advisory Board (2016 – present)
- Crossref, Board of Directors (2017 – present)

- Visiting Senior Research Fellow, Policy Institute @ KCL
- Love all things research meta-data & ‘research on research’

What I am going to cover

1. Origins of the Contributor Roles Taxonomy (CRediT)

2. Adoption and implementation

3. Putting a lens on authorship ('research on research')

4. Debate & discussion

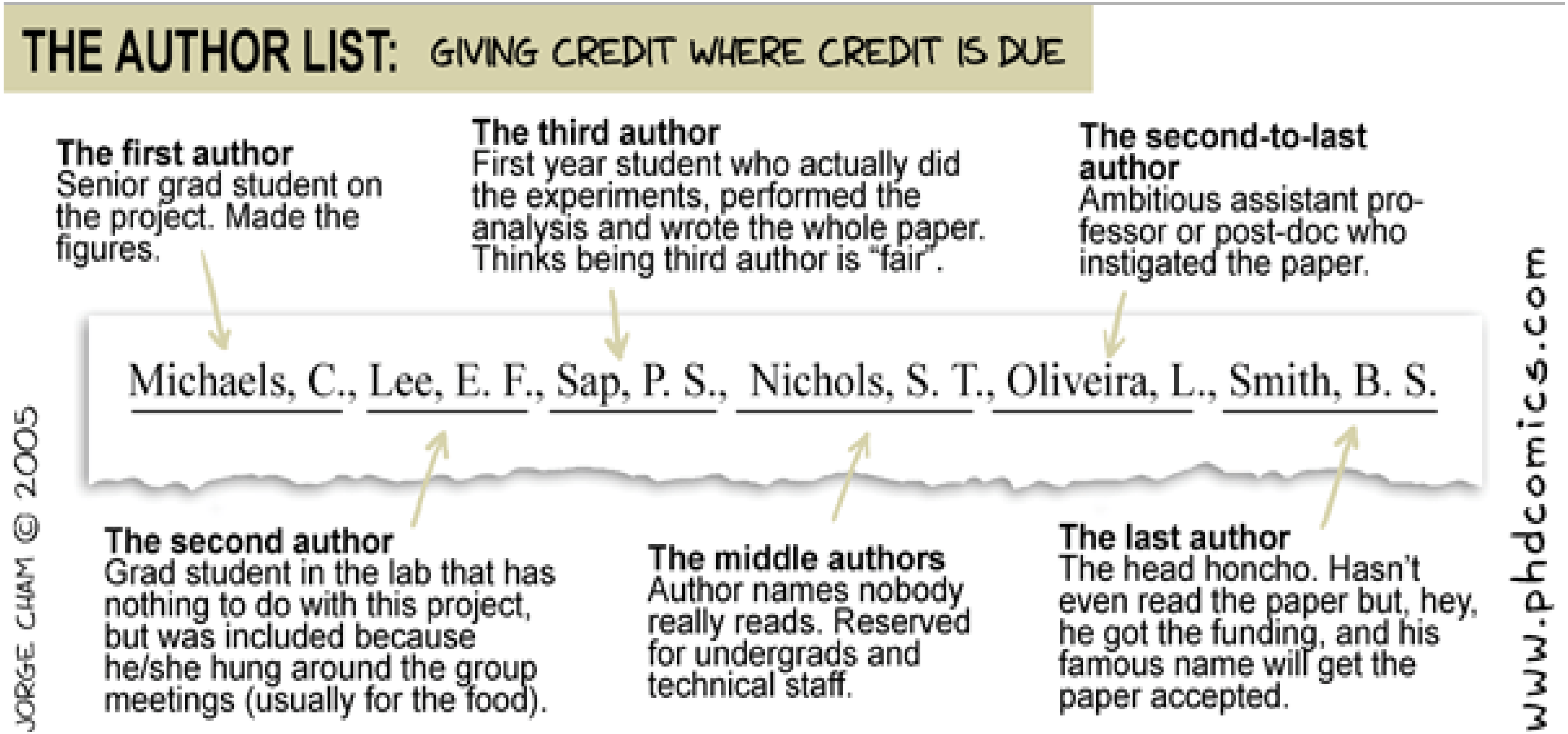
What I am going to cover

1. **Origins of the Contributor Roles Taxonomy (CRediT)**

Problems with authorship in scholarly publishing

1. **Authorship doesn't reflect range and nature of contribution**

Does authorship reflect contribution?



Problems with authorship in scholarly publishing

1. Authorship doesn't reflect range and nature of contribution
2. **… nor support accountability**

Article

August 20, 1997

The JAMA Network

When Authorship Fails

A Proposal to Make Contributors Accountable

Drummond Rennie, MD; Veronica Yank; Linda Emanuel, MD, PhD

» Author Affiliations

JAMA. 1997;278(7):579-585. doi:10.1001/jama.1997.03550070071041

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Editorials

Authorship: time for a paradigm shift?

BMJ 1997 ; 314 doi: https://doi.org/10.1136/bmj.314.7086.992 (Published 05 April 1997)
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Problems with authorship in scholarly publishing

1. Authorship doesn't reflect range and nature of contribution
2. … nor support accountability.
3. **There has been a demise of the lone author (in most disciplines)**

Demise of the lone author

NATURE|Vol 450|20/27 December 2007

The demise of the lone author

As the average number of contributors to individual papers continues to rise, science's credit system is under pressure to evolve.

Mott Greene

Any issue of *Nature* today has nearly the same number of Articles and Letters as one from 1950, but about four times as many authors. The lone author has all but disappeared. In most fields outside mathematics, fewer and fewer people know enough to work and write alone. If they could, and could spare the time and effort to do so, their funding agencies and home institutions would not permit it.

Scientific papers have always contained two quantities — the increment of new science and the credit for its discovery. From the late 1600s until about 1920, the rule was one author per paper: an individual produced an increment of science and obtained a corresponding increment of credit. This symmetry was breached in the 1920s, diminished in the 1950s, and largely abandoned by the 1980s. Collaboration in multidisciplinary research is now universal as well as essential, and we determine from the list of authors who shares in the credit. Curiously, however, in most journals we are not told which of these did what part of the work, nor may we be certain (have we ceased to care?) who drafted the paper.

The ruling convention of multiple authorship is that all authors shared in the work more or less equally and, if the first author or two takes the role of 'first among equals', all listed authors take full credit for the contents of the paper. This is easy enough to swallow where three or four authors are concerned, harder when there are eight to ten authors, and almost impossible with twenty or fifty — let alone hundreds, as in some sequencing papers.

It would, of course, be possible to specify in detail, as in movie credits, who did what on a scientific paper: there is simply no widespread pressure to do so. *Nature*'s editor Philip Campbell introduced a policy in 1999 of including a statement of author contributions in each paper (see *Nature* **399,** 393; 1999). Although this is voluntary, authors in *Nature* are increasingly taking up the option.

Fortunately, where there are large numbers there are laws, and where there are laws there are results to be had. Lotka's law, obtained empirically by the mathematician Alfred Lotka in 1926 and many times confirmed, is a rough 'inverse-square law of scientific productivity'. For every 100 authors who each produce a scientific paper in a given period, there will be 25 authors who produce two, 11 who produce three, and one author who produces ten or more.

The appreciation of Lotka's law has allowed the continuation, in a world of clearly shared credit and hazily specified

D. PARKINS

responsibility, of citation counting as the principal means of establishing scientific prominence and reputation. No matter how many co-authors you have, the more times your name appears on a scientific publication, the more productive you are assumed to be, and the more worthy of support. It can even be shown that Lotka's law predicts the ranking distribution of an author within an author list, and their climb up the scientific ladder.

The only natural force opposing the utility of Lotka's law has been Goodhart's law, from the economist Charles Goodhart: "Any observed statistical regularity will tend to collapse once pressure is placed upon it for control purposes." Once citation counting became established as a means to determine prominence, players began to 'game the system' based on their knowledge of that standard, and the metric ceased to have a close relation to the outcome it was designed to measure. Such attempts led to the somewhat occult business of impact factors, impact journals, author rank within a paper, and other such countermeasures to re-establish the utility of citation counting.

Until very recently, the combination of Lotka's law and impact factors at least held such 'author gaming' to a draw. Now cracks are appearing in the system. It seems that Lotka's law applies only when papers with 100 or more authors are rare. When these become common, the disjunction between the number of papers being counted and the number of authors entering the system per paper becomes so large that the power-law distribution of multiple authorships breaks down.

The ability of Lotka's law to equate frequency of authorship with scientific rank is buckling as more and more areas of science — genomics, proteomics, climate modelling and particle physics are the most prominent — regularly produce papers with more than 100 authors. Further evolution of the system is likely in the short term.

I predict that in those fields where multiple authorship endangers the author credit system we shall soon see institutionally initiated restriction on the number of authors. Paradoxically, this is likely to be endorsed by all parties as preferable to cinema-style specification of who actually did what. Most will prefer full credit for a few papers to little or no credit for many, considering where it matters most: university committees in charge of tenure, promotion and salary increments based on scholarly production. Given *Nature*'s role in determining, as well as chronicling, how science is reported (see *Nature* **450,** 1; 2007), interested parties could watch these pages to see whether a trend towards more restricted authorship is emerging. ■

Mott Greene is John Magee professor of science and values at the University of Puget Sound, Tacoma, Washington, USA.

This Essay is part of a history website celebrating the launch next month of the complete online archive of *Nature*.
www.nature.com/nature/history

ESSAY

THE WORLD UNIVERSITY RANKINGS

PROFESSIONAL JOBS EVENTS RANKINGS STUDENT

Authorship: are the days of the lone research ranger numbered?

Data suggest that single authorship is continuing to decline across the world, but will it always have a place?

July 3, 2019

By Simon Baker

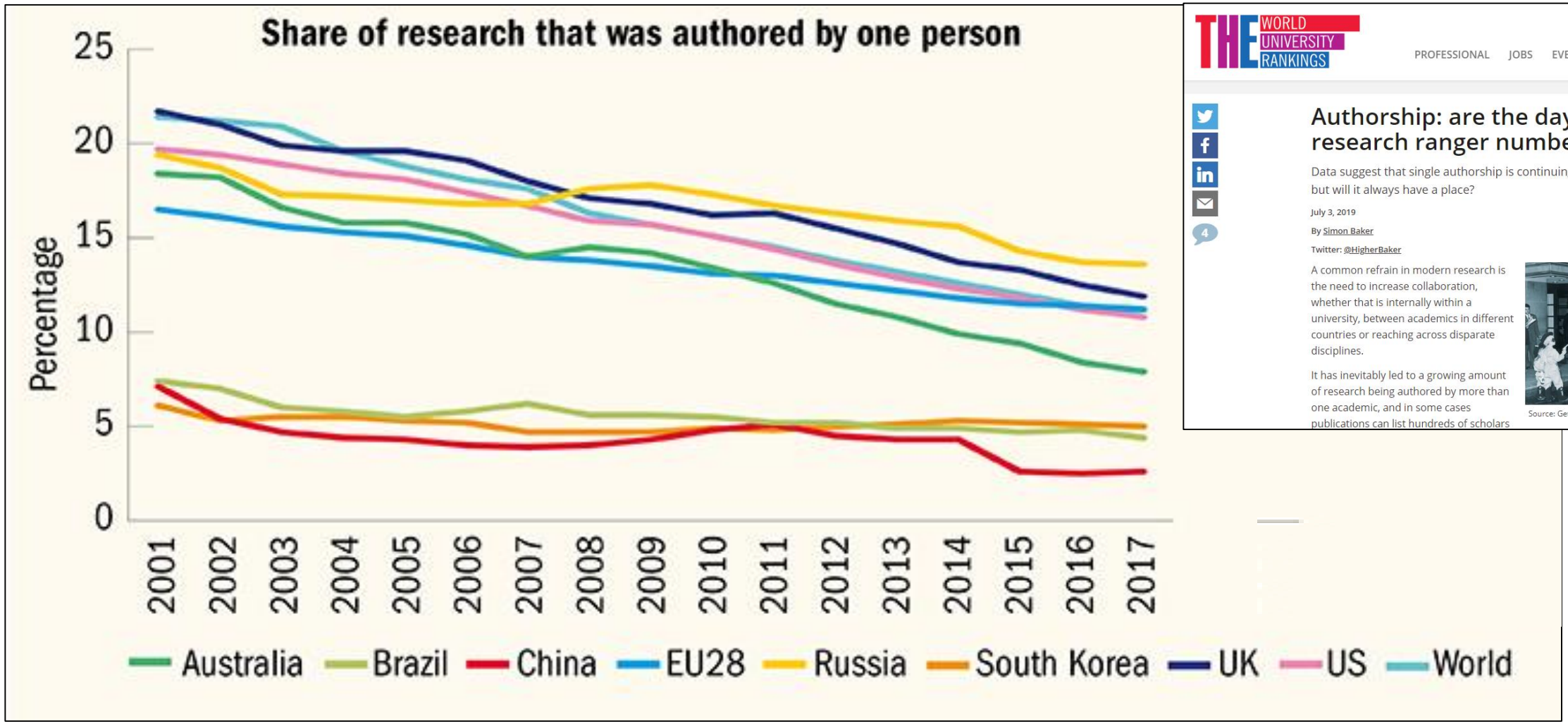
Twitter: @HigherBaker

A common refrain in modern research is the need to increase collaboration, whether that is internally within a university, between academics in different countries or reaching across disparate disciplines.

It has inevitably led to a growing amount of research being authored by more than one academic, and in some cases publications can list hundreds of scholars

Source: Getty

Shrinking share of solo-authored papers



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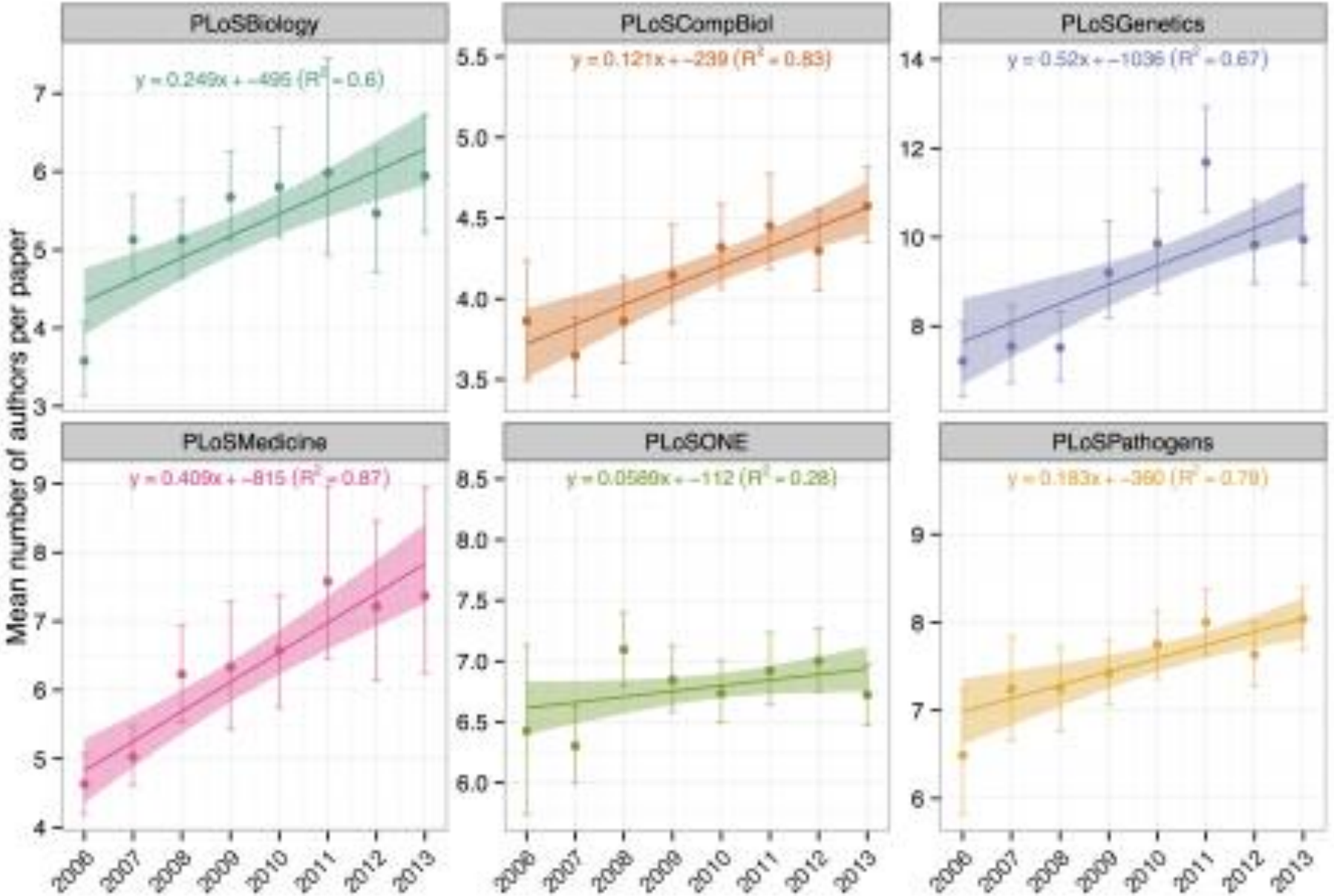
Source: Getty

Source: https://www.timeshighereducation.com/news/authorship-are-days-lone-research-ranger-numbered

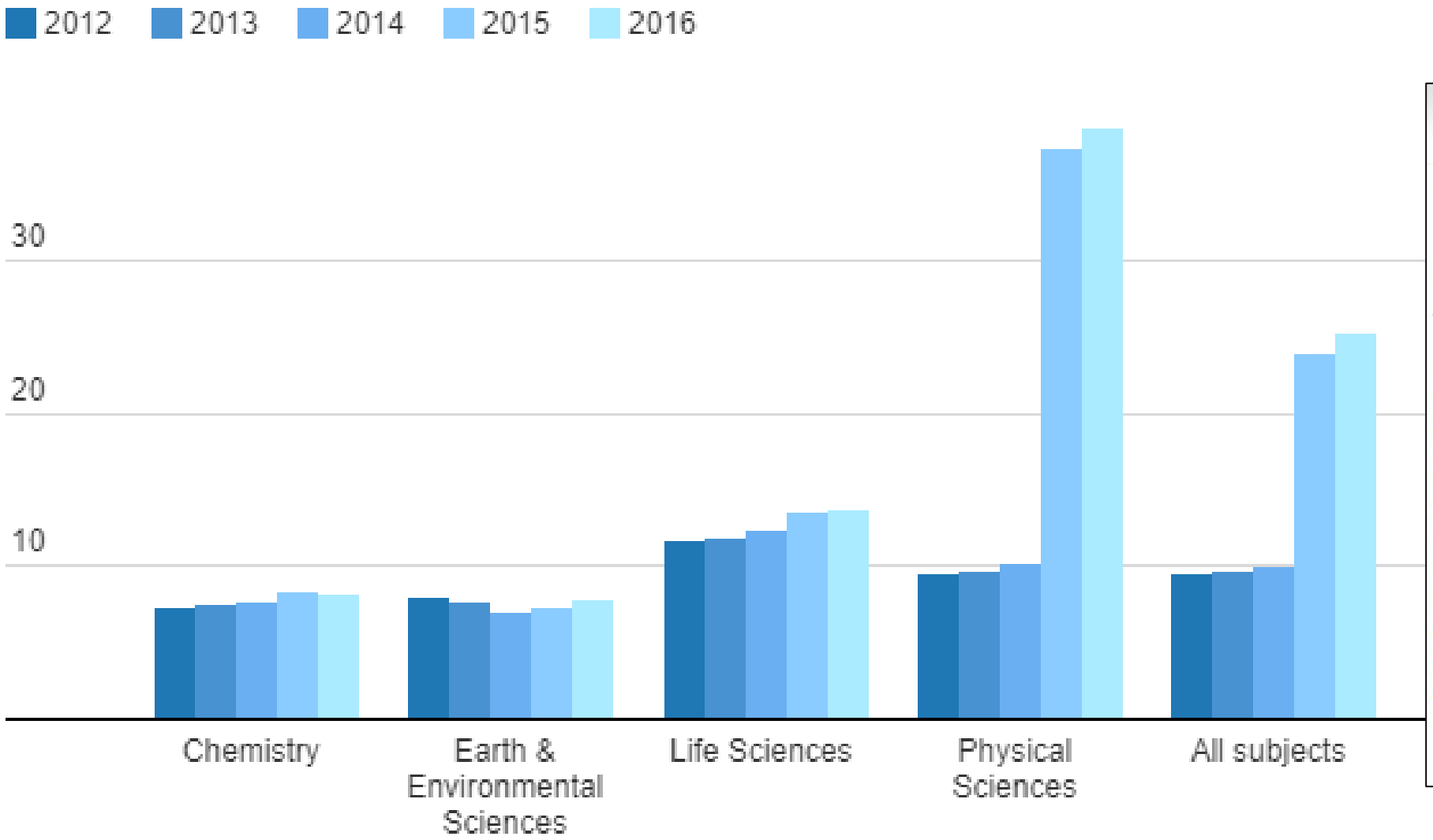
Problems with authorship in scholarly publishing

1. Authorship doesn't reflect range and nature of contribution
2. … nor support accountability.
3. There has been a demise of the lone author (in most disciplines)
4. **… and a trend to Team Science (in many disciplines).**

Trend in collaborative and ‘Team Science’



The jump in average number of authors listed on a paper is driven by the physical sciences.



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Paper authorship goes hyper

A single field is behind the rise of thousand-author papers

30 January 2018

Smriti Mallapaty

ATLAS Experiment (c) 2007 CERN

The team operating the ATLAS detector at CERN, Switzerland, authored a 5,000 author paper in 2016.

https://www.natureindex.com/news-blog/paper-authorship-goes-hyper

Extreme Team Science!

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Journal of Instrumentation

SISSA

2,926 authors from 169 research institutions!

Journal of Instrumentation > Volume 3 > August 2008

The ATLAS Collaboration *et al* 2008 *JINST* **3** S08003 doi:10.1088/1748-0221/3/08/S08003

The ATLAS Experiment at the CERN Large Hadron Collider

OPEN ACCESS THE CERN LARGE HADRON COLLIDER: ACCELERATOR AND EXPERIMENTS

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5. **Demand for information to support research assessment**
6. **… accompanied by a 'publish or perish' culture.**

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Modelling sci trustworthine publish or pe

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John P. A. Ioannidis[4,5,6,7,8]

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Research

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Subject Category:
Mathematics

Subject Areas:
mathematical modelling/computer modelling and simulation/statistics

Keywords:
research ethics, research fraud, science trustworthiness, public trust in science, publish or perish

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1. Introduction

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THE ROYAL SOCIETY PUBLISHING

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Review

Perish or Publish Dilemma: Challenges to Responsible Authorship

Vygintas Aliukonis, Margarita Poškutė and Eugenijus Gefenas *

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check for updates

Abstract: Controversies related to the concept and practice of responsible authorship and its misuse have been among the most prominent issues discussed in the recent literature on research integrity. Therefore, this paper aims to address the factors that lead to two major types of unethical authorship, namely, honorary and ghost authorship. It also highlights negative consequences of authorship misuse and provides a critical analysis of different authorship guidelines, including a recent debate on the amendments of the International Committee of Medical Journal Editors (ICMJE) authorship definition. Empirical studies revealed that honorary authorship was the most prevalent deviation from the responsible authorship standards. Three different modalities of honorary authorship were distinguished: *gift authorship*, *guest authorship*, and *coercive authorship*. Prevalence of authorship misuse worldwide and in Europe was alarmingly high, covering approximately one third of all scientific publications. No significant differences were reported in authorship misuse between different health research disciplines. The studies conducted in North America highlighted the most effective means to cope with unethical authorship. These were training in publishing ethics, clear authorship policies developed by medical schools, and explicit compliance with the authorship criteria required by the medical journals. In conclusion, more empirical research is needed to raise awareness of the high prevalence of authorship misuse among scientists. Research integrity training courses, including publication ethics and authorship issues should be integrated into the curricula for students and young researchers in medical schools. Last but not least, further discussion on responsible authorship criteria and practice should be initiated.

Keywords: authorship; authorship misuse; honorary authorship; ghost authorship; publication ethics; research integrity

1. Introduction

Modern health care research must be navigated within the complex framework of normative guidelines. This framework covers two major fields of rather different, however, interconnected ethical issues. On the one hand, researchers must protect the rights and welfare of research participants. This is the core of what has been called research ethics since the emergence of the Nuremberg Code in 1948 and the adoption of the first version of the Declaration of Helsinki in 1964. On the other hand, another set of normative issues has become very prominent since the beginning of the 21th century. These are research integrity concerns focusing on research misconduct cases, such as fabrication or falsification of research data, and plagiarism as well as the so-called questionable research practices, such as mentorship, conflicts of interest and responsible authorship to mention but a few.

In this paper, we have concentrated on the controversies related to the concept and practice of responsible authorship and its misuse, which has recently been among the most prominent issues discussed in the literature on research integrity. Education rather than sanctions has been seen as a

THALMIC & PHYSIOLOGICAL OPTICS
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g and the SPU: Publish or Perish?

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resented data from lens A v B and
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s,[6] the data from lens B could be

included twice and distort the findings. In some cases, these papers do not provide a full description of their methodology and only indicate that lens A v B was assessed or lens B v C. This means that the complete methods are not available to the editor, reviewer or reader. A study of lens A v B is not the same as a study of A v B v C: Could there be some interaction effects? Learning effects? Fatigue effects? What was the order of measurements of the various assessments for A v B v C? We do not know. The repetition also wastes readers' time, as well as those of reviewers and editors.[4] From this perspective, it is something that journals need to be aware of and attempt to prevent publication. In this respect, we used to rely on reviewers to highlight these issues if they were aware of them, but that is clearly an ineffective procedure.[5] Recently, our publishers Wiley, have provided us with access to plagiarism software, *iThenticate*, which is very useful for spotting potential salami-slicing as well as plagiarism or redundancy.[2] Any paper that has more than 30% replicated from another paper suggests it should be looked at more carefully. Mojon-Azzi and Mojon suggest that salami slicing is a form of scientific misconduct.[5] However, of the seven 'salami-sliced' papers that I have overseen as editor in the last year or so, the submissions have always cited the previous studies (lets say the submission presented data of lens B v C and they cited the paper that published data of lens A v B). This suggests there is no intentional deceit taking place, just an assumption that this practice is perfectly acceptable. Of course, the first paper in a salami-sliced production can be very difficult to spot if the authors do not describe the full methodology of the study that the data have been taken from.

Quality or quantity in research publications?

The other reason why researchers should not submit salami-sliced papers is that they are probably not in their best interests. First, they could damage the author's reputation. Second, judgements of academic staff for appointment, tenure and promotion seem nowadays to be based on the quality of publications rather than the quantity.[7] As an example of this change in emphasis, the quality of the research of Departments and Schools in UK Universities is assessed on a ~ 5-yearly cycle in the Research Assessment Exercise (RAE, or Research Excellence Framework or REF as it has been renamed for 2014). This is used to determine Government funding of research in subsequent years, provide accountability for public investment in research and "establishes reputational yardsticks." In 1992, the RAE included an assessment of the quantity of publications from

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4. … and a trend to Team Science (in many disciplines).
5. Demand for information to support research assessment
6. … accompanied by a 'publish or perish' culture.
7. Space limitations have gone away!
8. And information about what 'authors' actually did is useful!

COMMENT

Credit where credit is due

Liz Allen, Amy Brand, Jo Scott, Micah Altman and Marjorie Hlava are trialling digital taxonomies to help researchers to identify their contributions to collaborative projects.

Research today is rarely a one-person job. Original research papers with a single author are — particularly in the life sciences — a vanishing breed. Partly, the inflation of author numbers on papers has

Through the endorsement of individuals' contributions, researchers can start to move beyond 'authorship' as the dominant measure of esteem. For funding agencies, better information about the contributions of grant applicants would aid the decision-making

journal articles could be classified using a 14-role taxonomy (see 'Who did what?'). The survey was sent to 1,200 corresponding authors of work published in PLOS journals, Nature Publishing Group journals, Elsevier journals, *Science* and *eLife*. Corresponding authors were asked to indicate the contribu-

Nature 508, 312–313 (17 April 2014) doi:10.1038/508312a

CRediT

CRediT is high-level taxonomy, including 14 roles, that can be used to represent the roles typically played by contributors to scientific scholarly output. The roles describe each contributor's specific contribution to the scholarly output.

Background

CRediT grew from a practical realization that bibliographic conventions for describing and listing authors on scholarly outputs are increasingly outdated and fail to represent the range of contributions that researchers make to published output. Furthermore, there is growing interest among researchers, funding agencies, academic institutions, editors, and publishers in increasing both the transparency and accessibility of research contributions.

https://www.niso.org/standards-committees/credit

Term	Definition
Conceptualization	*Ideas; formulation or evolution of overarching research goals and aims.*
Methodology	*Development or design of methodology; creation of models.*
Software	*Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.*
Validation	*Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.*
Formal Analysis	*Application of statistical, mathematical, computational, or other formal techniques to analyse or synthesize study data.*
Investigation	*Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.*
Resources	*Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.*
Data Curation	*Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later re-use.*
Writing – Original Draft	*Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).*
Writing – Review & Editing	*Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages.*
Visualization	*Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.*
Supervision	*Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.*
Project Administration	*Management and coordination responsibility for the research activity planning and execution.*
Funding Acquisition	*Acquisition of the financial support for the project leading to this publication.*

What I am going to cover

1. Origins of the Contributor Roles Taxonomy (CRediT)

2. **Adoption and implementation**

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Home / Standards Committees

CRediT

NISO has launched its work to formalize the Contributor Role Taxonomy (CRediT) as an ANSI/NISO standard. Initially, a small working group will focus on the 14 contributor roles in the existing CRediT taxonomy. Once the ANSI/NISO approval process has completed, a NISO CRediT Standing Committee will be set up to provide a forum for discussion and community feedback, support further implementations and use cases for CRediT, and to consider how CRediT can be further developed and expanded to support contributions in a wider range of subject areas.

This page will be updated with additional resources as the project progresses.

https://www.niso.org/standards-committees/credit

Implementation in the scholarly publishing workflow

PERSPECTIVE

Transparency in authors' contributions and responsibilities to promote integrity in scientific publication

Marcia K. McNutt[a,1], Monica Bradford[b], Jeffrey M. Drazen[c], Brooks Hanson[d], Bob Howard[e], Kathleen Hall Jamieson[f], Véronique Kiermer[g], Emilie Marcus[h], Barbara Kline Pope[i,2], Randy Schekman[j,k], Sowmya Swaminathan[l], Peter J. Stang[m], and Inder M. Verma[n]

Edited by Karen S. Cook, Stanford University, Stanford, CA, and approved January 18, 2018 (received for review August 30, 2017)

eLIFE

PLOS

ELSEVIER

F1000Research

BMJ Journals

SAGE Publishing

… and many more!

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

More than 75 percent decline over 27 years in total flying insect biomass in protected areas

Caspar A. Hallmann, Martin Sorg, Eelke Jongejans, Henk Siepel, Nick Hofland, Heinz Schwan, Werner Stenmans, Andreas Müller, Hubert Sumser, Thomas Hörren, Dave Goulson, Hans de Kroon

Published: October 18, 2017 • https://doi.org/10.1371/journal.pone.0185809 In Library

Abstract

Global declines in insects have sparked wide interest among scientists, politicians, and the general public. Loss of insect diversity and abundance is expected to provoke cascading effects on food webs and to jeopardize ecosystem services. Our understanding of the extent and underlying causes of this decline is based on the abundance of single species or taxonomic groups only, rather than changes in insect biomass which is more relevant for ecological functioning. Here, we used a standardized protocol to measure total insect biomass using Malaise traps, deployed over 27 years in 63 nature protection areas in Germany (96 unique

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Caspar A. Hallmann, Martin Sorg, Eelke Jongejans, Henk Siepel, Nick Hofland, Heinz Schwan, Werner Stenmans, ...oon

Roles: Conceptualization, Formal analysis, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing

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Roles: Formal analysis, Resources, Software, Validation

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Check for updates

RESEARCH ARTICLE

REVISED The age of heterozygous *telomerase* mutant parents influences the adult phenotype of their offspring irrespective of genotype in zebrafish [version 2; referees: 2 approved]

Catherine M. Scahill[1], Zsofia Digby[1,2], Ian M. Sealy[1], Richard J. White [1], Neha Wali[1], John E. Collins[1], Derek L. Stemple[1], Elisabeth M. Busch-Nentwich [1,3]

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Neha Wali
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John E. Collins
Roles: Conceptualization

Derek L. Stemple
Roles: Funding Acquisition, Resources

Elisabeth M. Busch-Nentwich
Roles: Conceptualization, Funding Acquisition, Resources, Supervision, Writing – Original Draft Preparation, Writing – Review & Editing

Grant information

Open Peer Review

Referee Status: ✓ ✓

Version(s)	Invited Referees 1	2
REVISED Version 2 published 22 Feb 2018	✓ read report	✓ read report
Version 1 published 04 Sep 2017	? read report	? read report

1 **Noriyoshi Sakai**, National Institute of Genetics, Japan
2 **Karl-Lenhard Rudolph**, Leibniz Institute For Age Research, Germany

All reports (4), Responses and comments (2)

Comments on this article

All comments (0)

Add a Comment

Association of Learned & Professional Society Publishers
LEARNED PUBLISHING

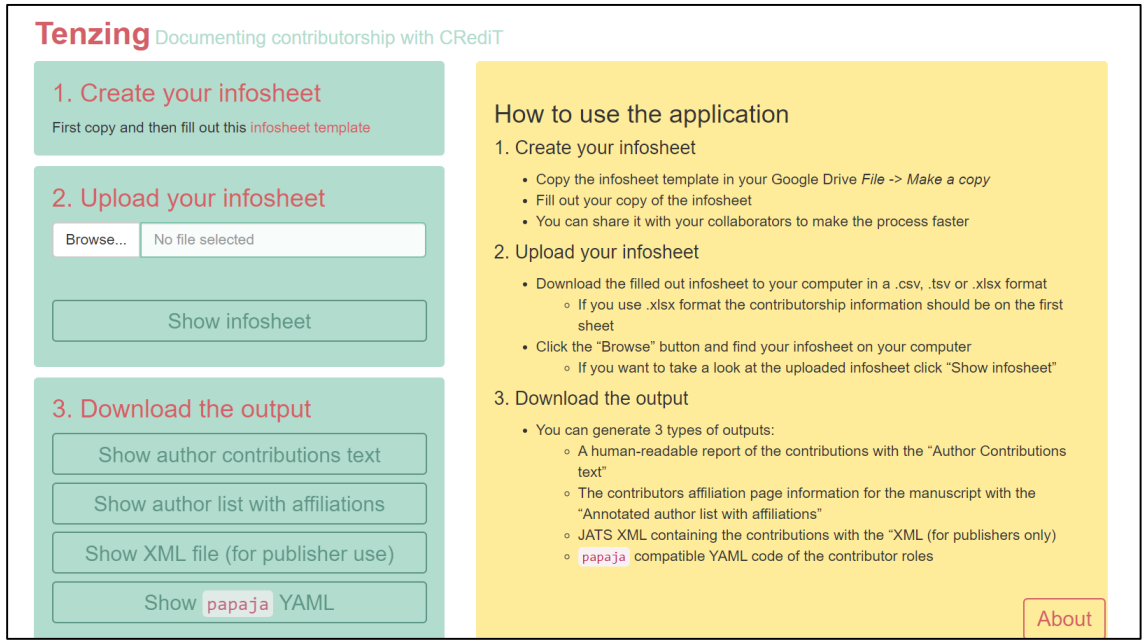
Industry Update

How can we ensure visibility and diversity in research contributions? How the Contributor Role Taxonomy (CRediT) is helping the shift from authorship to contributorship

Liz Allen ✉, Alison O'Connell, Veronique Kiermer

First published: 24 January 2019 | https://doi.org/10.1002/leap.1210 | Citations: 15

Implementation in the other parts of the research system …



University of Glasgow

VIA VERITAS VITA

Got a DOI? Claim and Give Some CRediT!

rescognito

What I am going to cover

1. Origins of the Contributor Roles Taxonomy (CRediT)

2. Adoption and implementation

3. **Putting a lens on authorship ('research on research')**

Research on research: focus on contributions

Gender and diversity in research

> Acad Med. 2016 Aug;91(8):1136-42. doi: 10.1097/ACM.0000000000001261.

Is Science Built on the Shoulders of Women? A Study of Gender Differences in Contributorship

Benoit Macaluso [1], Vincent Larivière, Thomas Sugimoto, Cassidy R Sugimoto

Affiliations + expand

PMID: 27276004 DOI: 10.1097/ACM.0000000000001261

Transparency and recognition

Taylor & Francis

Accountability in Research

Policies and Quality Assurance

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/gacr20

Is authorship sufficient for today's collaborative research? A call for contributor roles

Nicole A. Vasilevsky , Mohammad Hosseini , Samantha Teplitzky , Violeta Ilik , Ehsan Mohammadi , Juliane Schneider , Barbara Kern , Julien Colomb , Scott C. Edmunds , Karen Gutzman , Daniel S. Himmelstein , Marijane White , Britton Smith , Lisa O'Keefe , Melissa Haendel & Kristi L. Holmes

Division of labour and evolution of roles

PLOS ONE

OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

The rise of the middle author: Investigating collaboration and division of labor in biomedical research using partial alphabetical authorship

Philippe Mongeon, Elise Smith, Bruno Joyal, Vincent Larivière

Published: September 14, 2017 • https://doi.org/10.1371/journal.pone.0184601 • >> See the preprint

'Politics' of collaboration and 'Team Science'!

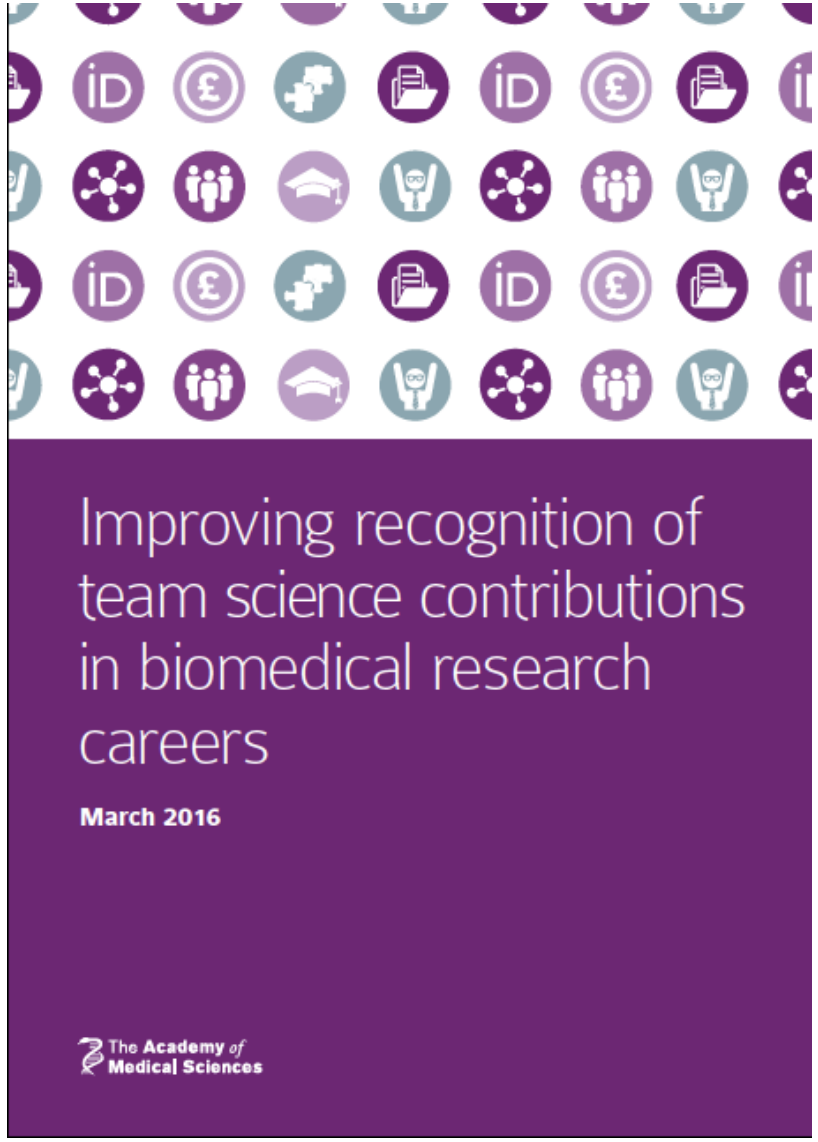
OPINION

Opinion: Authors overestimate their contribution to scientific work, demonstrating a strong bias

Noa Herz, Orrie Dan, Nitzan Censor, and Yair Bar-Haim

PNAS March 24, 2020 117 (12) 6282-6285; https://doi.org/10.1073/pnas.2003500117

Initiatives to encourage ‘Team Science’

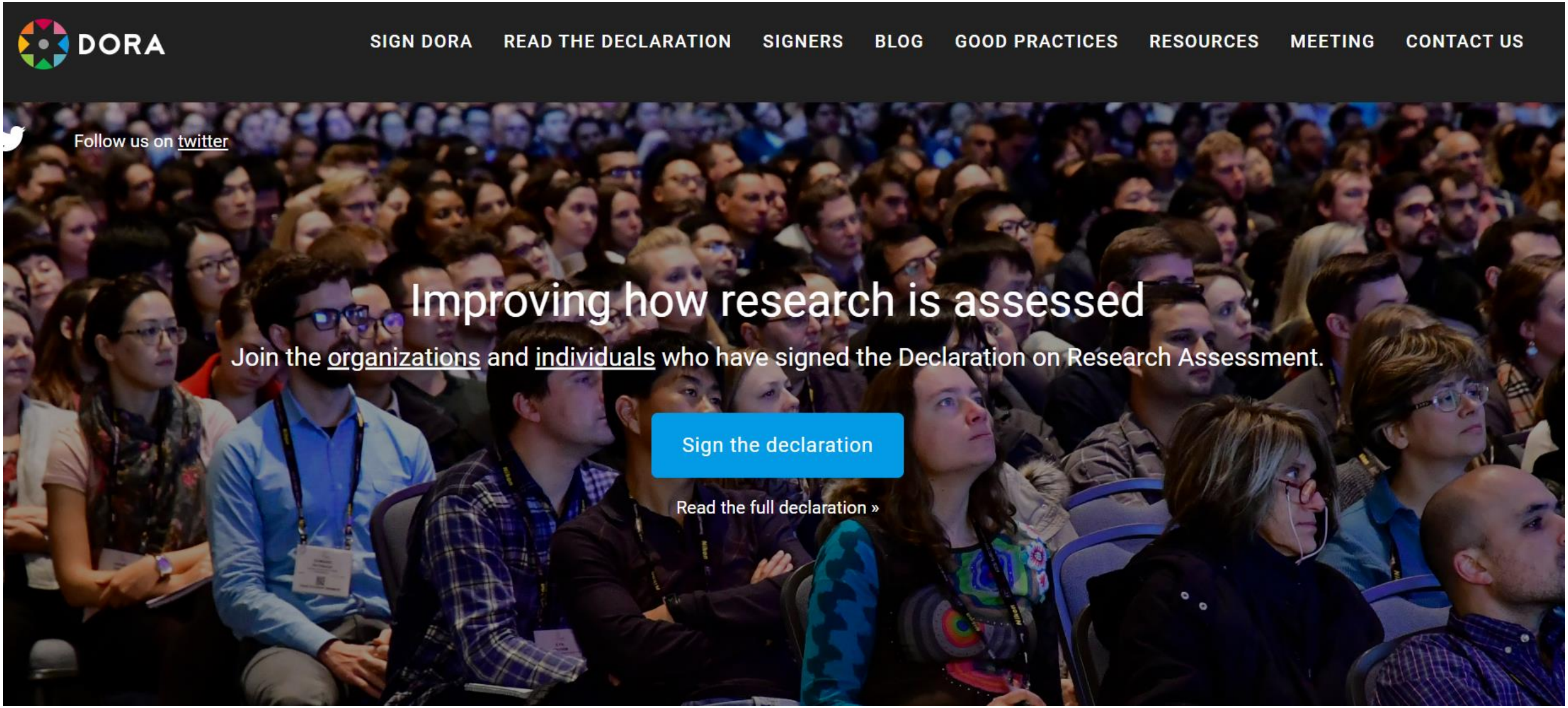


Included recommendations for

1. Open, transparent, standardized and structured **contribution** information.
2. Open and transparent research information infrastructure which links all **research inputs** and outputs to **individual contributors**
3. Minimise researchers’ **administrative burden** and should be interoperable.

https://acmedsci.ac.uk/policy/policy-projects/team-science

“Encourage responsible authorship practices and the provision of information about the specific contributions of each author.”



https://sfdora.org/

What I am going to cover

1. Origins of the Contributor Roles Taxonomy (CRediT)

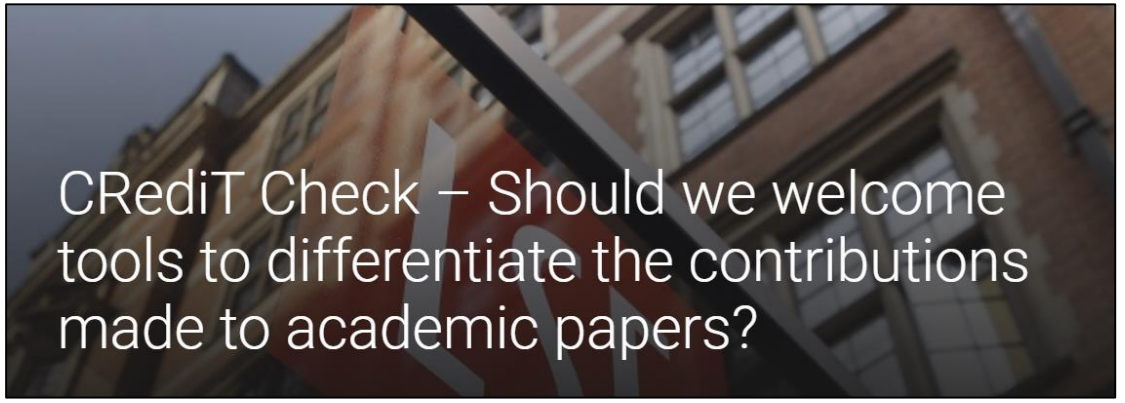
2. Adoption, implementation & road map

3. Putting a lens on authorship ('research on research')

4. Debate & discussion

Intended and unintended consequences?

1. **Intention vs implementation**
    - **a detail too far?**
    - **CRediT-based evaluation system?**
    - **Level of effort?**
    - **Fractionlisation???**
    - **Copyright?**
2. **Focus on ‘CRediT- seeking’**
3. **Keeping it simple vs value across fields**
4. **Need to keep any taxonomy up to date!**



https://blogs.lse.ac.uk/impactofsocialsciences

https://www.niso.org/standards-committees/credit

CRediT Community Interest Group coming soon!

Get involved!

What do you think?

Liz Allen

Director of Strategic Initiatives, F1000

@allen_liz

RIOT Science Club | July 2020