

# CRediT your co-authors



Contributor Roles Taxonomy

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UiO : UB – Library of medicine and science

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**“Things like collaboration, open science and reproducibility drive a field forward, but it is numbers of papers, positions in author lists and funding that advances academic careers.”**

**Liz Allen, F1000**

in an article by Fleming 2021

## THE AUTHOR LIST: GIVING CREDIT WHERE CREDIT IS DUE

**The first author**  
Senior grad student on the project. Made the figures.

**The third author**  
First year student who actually did the experiments, performed the analysis and wrote the whole paper. Thinks being third author is "fair".

**The second-to-last author**  
Ambitious assistant professor or post-doc who instigated the paper.

Michaels, C., Lee, E. F., Sap, P. S., Nichols, S. T., Oliveira, L., Smith, B. S.

**The second author**  
Grad student in the lab that has nothing to do with this project, but was included because he/she hung around the group meetings (usually for the food).

**The middle authors**  
Author names nobody really reads. Reserved for undergrads and technical staff.

**The last author**  
The head honcho. Hasn't even read the paper but, hey, he/she got the funding, and their famous name will get the paper accepted.

JORGE CHAM © 2005

WWW.PHDCOMICS.COM

file: "Author List" - originally published 3/13/2005

"Piled Higher and Deeper" by Jorge Cham

[www.phdcomics.com](http://www.phdcomics.com)

<https://phdcomics.com/comics/archive.php?comid=562>

# Questionable and inappropriate authorships

- Ghost authorship: non-contributed actual writer of the paper
- Orphan authorship: authors who contributed to the work but are omitted unfairly by the writing author
- Honorary/Gift authorship: contributed “author” who did not do a thing
- Conscripted authorship: co-authors of a publication without their permission
- Fake co-authors: Stronzo Bestiale as a co-author of physicists Bill Moran and William G. Hoover
  - Kids as co-authorship: South Koreans’ example
  - Pets as coauthors: Afgan hound Galadriel Mirkwood (by immunologist Polly Matzinger)

# Authorship order

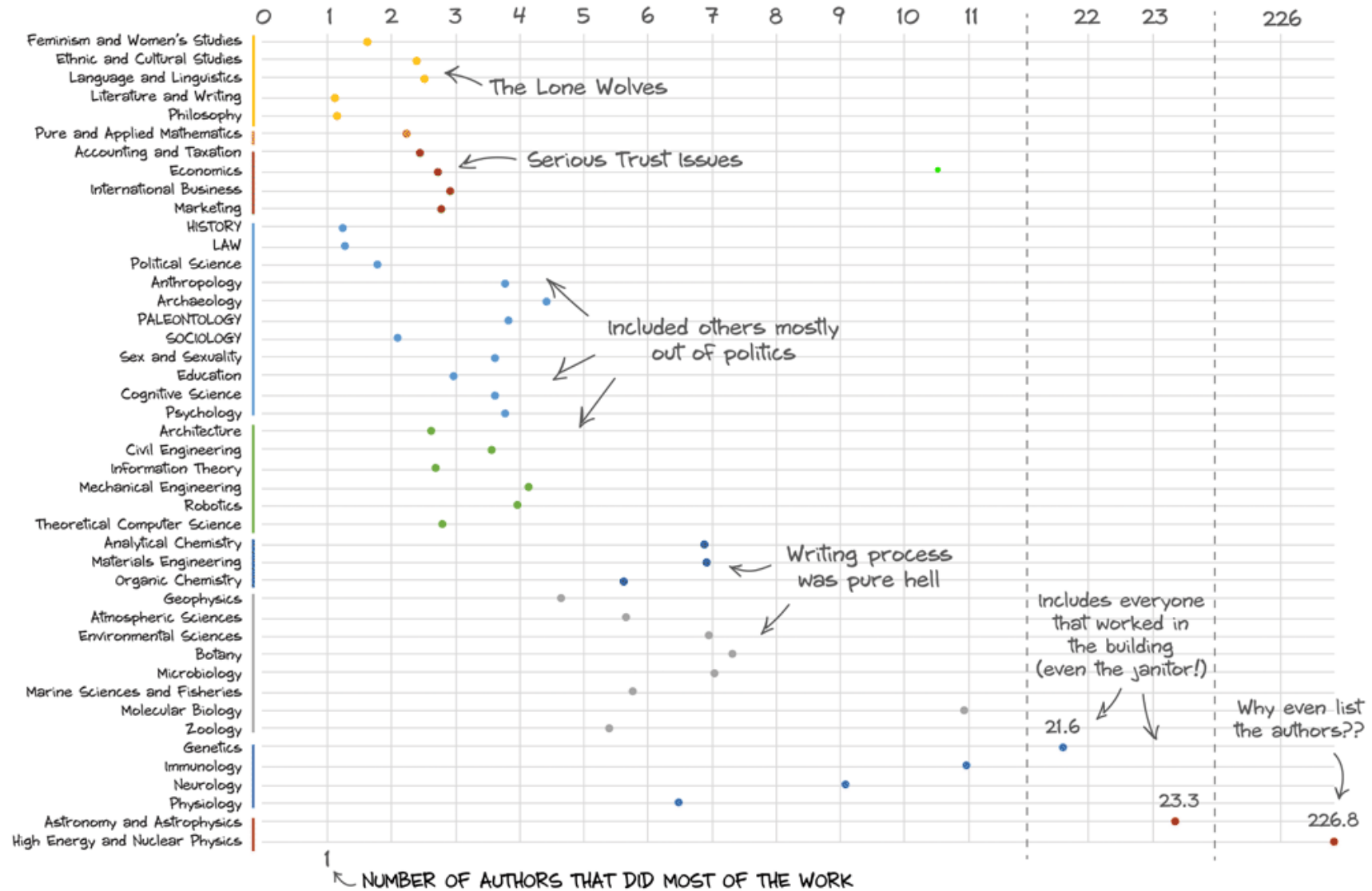
- Different practices across disciplines:
  - Alphabetically listed authors: high-energy particle physics, economics
  - Authors' order determined by contribution level: most other disciplines
  - Fun ways of deciding authorship order
    - by basketball skills;
    - based on a 25 game croquet series;
    - by the outcome of a backgammon contest lasting two days;
    - by an arm-wrestling competition;
    - by classic coin flip;
    - by one round of Game of Chicken;
    - by rock-paper-scissors;
    - by height;
    - by brownie bake-off;
    - by dog randomization...

# Authorship order

- Author lists are getting longer, leading to smaller proportion of researchers are obtaining coveted first-authorship

# NUMBER OF LISTED AUTHORS

AVERAGE NUMBER OF AUTHORS PER PAPER BY DISCIPLINE



Averages taken from the latest 10 papers in each of the top five journals per field as measured by their h-index on Google Scholar. © 2016 JORGE CHAM

WWW.PHDCOMICS.COM

# Authorship order

- Author lists are getting longer, leading to smaller proportion of researchers are obtaining coveted first-authorship
  - Hyperauthorship (term used in 2001 by Blaise Cronin)

[Published: 13 May 2015](#)

## Fruit-fly paper has 1,000 authors

[Chris Woolston](#)

[Nature](#) 521, 263 (2015) | [Cite this article](#)

1668 Accesses | 12 Citations | 971 Altmetric | [Metrics](#)

**Genomics paper with an unusually high number of authors on social media.**

[Published: 15 May 2015](#)

## Physics paper sets record with more than 5,000 authors

[Davide Castelvecchi](#)

[Nature](#) (2015) | [Cite this article](#)

**Detector teams at the Large Hadron Collider collaborated for a more precise estimate of the size of the Higgs boson.**



# Authorship disputes

- Female researchers are more likely to experience authorship conflicts than male
- Early career researchers are more affected than more-senior ones
- Disagreements about who to include are 50% more common in the medical sciences than in the natural sciences, while disputes over authors' order are nearly 70% more common
- Multidisciplinary teams less likely to be involved in either type of conflict

# Authorship disputes

- Some reading tips if you end up in authorship dispute:

CAREER FEATURE | 14 June 2021

## The authorship rows that sour scientific collaborations

Team science suffers when junior researchers see their career-defining contributions to a paper downplayed. Here's how to tackle disputes.

[Nic Fleming](#)

*Nature* 594, 459-462 (2021)

doi: <https://doi.org/10.1038/d41586-021-01574-y>

*The COPE Report 2003*

## How to handle authorship disputes: a guide for new researchers

Tim Albert, trainer in medical writing,  
Elizabeth Wager, freelance writer



Guidance ▾

Member resources ▾

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## Authorship and contributorship

Clear policies (that allow for transparency around who contributed to the work and in what capacity) should be in place for requirements for authorship and contributorship as well as processes for managing potential disputes

# Authorship recommendations

- The Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals were drawn up by the International Committee of Medical Journal Editors (ICMJE)
- 1978. in Vancouver, Canada → commonly referred to as **the Vancouver Recommendations**
- “The ICMJE recommends that authorship be based on the **following 4 criteria**:
  - 1.** Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; **AND**
  - 2.** Drafting the work or revising it critically for important intellectual content; **AND**
  - 3.** Final approval of the version to be published; **AND**
  - 4.** Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.”

# Authorship recommendations

- Are the Vancouver Recommendations enough? Or do they need an addition?
  - Author lists are getting longer
  - Projects (and therefore also articles) are getting more interdisciplinary
  - Contributions are getting more versatile as research methods and approaches change

- What is it?
  - Standard widely adopted across a range of publishers to improve accessibility and visibility of the range of contribution to published research outputs
  - “...provides a high-level classification of the diverse roles performed in the work leading to a published research output in the sciences...” (Brand et al 2015)

- Why is it created?

- Already in 1997 Rennie et al. wrote:

“The system of authorship, while appropriate for articles with only one author, has become inappropriate as the average number of authors of an article has increased; as the work of coauthors has become more specialized and relationships between them have become more complex; and as both credit and, even more, responsibility have become obscured and diluted. Credit and accountability cannot be assessed unless the contributions of those named as authors are disclosed to readers, so the system is flawed.”

- What is it based on?
  - In mid-2012 the Wellcome Trust and Harvard University co-hosted “**The International Workshop on Contributorship and Scholarly Attribution**” to bring together members of the academic, publishing, and funder communities interested in exploring alternative contributorship and attribution models

- Who made it?
  - The workshop resulted in a creation of a **sub-group with focus to devise a high-level contributor role taxonomy for the sciences**, and, subsequently, in an article “Publishing: Credit where credit is due” in 2014

#### Authors and Affiliations

**Liz Allen and Jo Scott are at the Wellcome Trust in London, UK.,**

Liz Allen & Jo Scott

**Amy Brand is at Digital Science in Cambridge, Massachusetts, USA.,**

Amy Brand

**Marjorie Hlava is at Access Innovations in Albuquerque, New Mexico, USA.,**

Marjorie Hlava

**Micah Altman is at the MIT Libraries, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA.,**

Micah Altman



- Timeline:
  - 2012 – The workshop
  - 2014 – The Nature article published and launching of the CRediT
  - 2016 – Scientific journals started implementing it
  - 2021 – ORCID started supporting CRediT roles
  - 2022 – Awarded ANSI/NISO standard Z39.104-2022 (work started in 2020)

## ■ How does it look like?

<https://credit.niso.org/contributor-roles-defined/>

Term	Definition
Conceptualisation	Ideas; formulation or evolution of overarching research goals and aims.
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.
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.
Funding acquisition	Acquisition of the financial support for the project leading to this publication.
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.
Methodology	Development or design of methodology; creation of models.
Project administration	Management and coordination responsibility for the research activity planning and execution.
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.
Validation	Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.
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.

## ■ Who are adopters?

### Publishers

American Association for Cancer Research	Duke University Press
American Association of Petroleum Geologists	eLife
American Chemical Society	Elsevier
American Speech-Language-Hearing Association	Evidence Based Communications
BMJ	F1000 Research
British Psychological Society	Geological Society of London
Cambridge University Press	Health & Medical Publishing Group
Cell Press	IGI Global
The Company of Biologists	International Centre of Insect Physiology and Ecology
“CPC” Business Perspectives	The Journal of Bone & Joint Surgery
Dartmouth Journal Services	KAMJE Press
De Gruyter Open	Lippincott Williams & Wilkins
	MA Healthcare

MDPI
MIT Press
Oman Medical Specialty Board
Oxford University Press
Public Library of Science (PLOS)
SAE International
SAGE Publishing
SLACK Incorporated
Springer
Springer Publishing Company
TU Delft OPEN Publishing
University of Toronto Press
Virtus Interpress

Wiley VCH
Wolters Kluwer

### Institutions

University of Glasgow
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### Integrators

- [Allen Press/ Peer Track](#)
- [Aries Systems/ Editorial Manager](#)
- [Clarivate Analytics/ ScholarOne](#)
- [Coko/ PubSweet](#)
- [eJournal Press](#)
- [HighWire/ JCore & BenchPress](#)
- [Manuscripts](#)
- [OA Switchboard](#)
- [OpenConf](#)
- [Rescognito](#)
- [River Valley/ReView](#)
- [Tenzing](#)
- [Worktribe](#)

### Publishing Outlets

- [Gates Open Research](#)
- [HRB Open Research](#)
- [Wellcome Open Research](#)

- How can you implement it?

## For academics

Just begin allocating the terms appropriately to your contributors within research outputs. Advocate that your institution and any publications taxonomy.

RESEARCH ARTICLE

### Documenting contributions to scholarly articles using CRedit and *tenzing*

Alex O. Holcombe<sup>1\*</sup>, Marton Kovacs<sup>2</sup>, Frederik Aust<sup>3,4</sup>, Balazs Aczel<sup>2</sup>

<sup>1</sup> School of Psychology, University of Sydney, Sydney, Australia, <sup>2</sup> Institute of Psychology, ELTE, Eotvos Lorand University, Budapest, Hungary, <sup>3</sup> University of Cologne, Cologne, Germany, <sup>4</sup> University of Amsterdam, Amsterdam, Netherlands

\* [alex.holcombe@sydney.edu.au](mailto:alex.holcombe@sydney.edu.au)

“We discuss the emerging CRedit standard for documenting contributions and describe a web-based app and R package called *tenzing* that is designed to facilitate its use. *tenzing* can make it easier for researchers on a project to plan and record their planned contributions and to document those contributions in a journal article.”

## ■ How can you implement it?

### tenzing Documenting contributorship with CRediT

#### 1. Create your contributors table

Duplicate and edit the [contributors table template](#)




#### 2. Load your contributors table

Local file  URL

Choose the spreadsheet on your computer

Browse... No file selected

Use the spreadsheet 



#### 3. Download the output

Show author contributions text

Show author list with affiliations

Show XML file (for publisher use)

Show *papaja* YAML

Show funding information



#### 1. Create your contributors table

- Copy the contributors table template in your Google Drive *File* -> *Make a copy*
- Fill out your copy of the contributors table
- You can share it with your collaborators to make the process faster

#### 2. Upload your contributors table

- Use the share URL of your contributors table and click "Upload from URL" OR
  - The share links should be made viewable
- Upload your contributors table in a .csv, .tsv or .xlsx format
  - Download your filled out contributors table to your computer (if you use .xlsx format the contributorship information should be on the first sheet)
  - Click the "Browse" button, locate your contributors table on your computer, and click "Upload from local file"
- To verify that your contributors table was imported correctly click "Review contributors table"

#### 3. Download the output

- You can generate 5 types of outputs:
  - A human-readable report of the contributions with the "Author Contributions text"
  - The contributors affiliation page information for the manuscript with the "Annotated author list with affiliations"
  - JATS XML containing the contributions with the "XML (for publishers only)"
  - *papaja* compatible YAML code of the contributor roles
  - Funding information section of the manuscript

- How can you implement it?

## tenzing Documenting contributorship with CRediT

contributors\_table\_template ☆ 📄 🔄

File Edit View Insert Format Data Tools Extensions Help

🖨️ 100% View only

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1	Order in publication	Firstname	Middle name	Surname	Conceptualization	Data curation	Formal analysis	Funding acquisition	Investigation	Methodology	Project administration	Resources	Software	Supervision	Validation	Visualization	Writing - original draft	Writing - review & editing	Email address	Primary affiliation	Secondary affiliation	Funding	ORCID iD	Corresponding author?
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7	6				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>
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Add 1000 more rows at bottom.

- What are benefits?
  - “Helping to reduce the potential for author disputes.”<sup>1</sup>
  - “Supporting adherence to authorship/contributorship processes and policies.”<sup>1</sup>
  - “Enabling visibility and recognition of the different contributions of researchers, particularly in multi-authored works – across all aspects of the research being reported (including data curation, statistical analysis, etc.).”<sup>1</sup>
  - “Showcase interdisciplinarity of the published research.”<sup>2</sup>
  - “Support identification of peer reviewers and specific expertise.”<sup>1</sup>
  - “Support grant making by enabling funders to more easily identify those responsible for specific research products, developments or breakthroughs.”<sup>1</sup>
  - “Improving the ability to track the outputs and contributions of individual research specialists and grant recipients.”<sup>1</sup>
  - “Easy identification of potential collaborators and opportunities for research networking.”<sup>1</sup>
  - “Further developments in data management and nano-publication.”<sup>1</sup>
  - “Inform ‘science of science’ (‘meta-research’) to help enhance scientific efficacy and effectiveness.”<sup>1</sup>
  - “Enable new indicators of research value, use and re-use, credit and attribution.”<sup>1</sup>

- What are challenges and criticisms?
  - “The CRedit taxonomy provides a summary or snapshot of contributor roles, but does not allow for additional detail on exactly what each author did, including microattributions for figures, models, or datasets.” ([McNutt et al 2018, PNAS](#))
  - “Into which category of the CRedit contributor role taxonomy does an (extensive) literature review go?” (asked by [“Christoph” at Academia Stack Exchange](#), a Q&A site for academics)



## ■ How does it look like?

<https://credit.niso.org/contributor-roles-defined/>

Term	Definition
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→ 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.
→ Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyze or synthesize study data.
Funding acquisition	Acquisition of the financial support for the project leading to this publication.
→ Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.
Methodology	Development or design of methodology; creation of models.
Project administration	Management and coordination responsibility for the research activity planning and execution.
→ Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.
Software	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.
Validation	Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.
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.

## ■ What are challenges and criticisms?

- “The CRedit taxonomy provides a summary or snapshot of contributor roles, but does not allow for additional detail on exactly what each author did, including microattributions for figures, models, or datasets.” ([McNutt et al 2018, PNAS](#))
- “Into which category of the CRedit contributor role taxonomy does an (extensive) literature review go?” (asked by “[Christoph](#)” at [Academia Stack Exchange](#), a Q&A site for academics)
- “Are there important differences between authors and contributors that we need to retain and how does CRedit support these?” ([Gadd 2020, LSE Impact Blog](#))
  - “But what is not too clear is whether CRedit seeks to capture contributions to the *paper*, or contributions to the *research*. It might sound like I’m being picky, but in legal terms there is a big difference between these two. Because, someone who writes the paper is technically an author and has rights as such and someone who only contributes to the underlying research is not. So, whilst an author is always a contributor, a contributor is not always an author.”

## ■ What are challenges and criticisms?

- “The CRedit taxonomy provides a summary or snapshot of contributor roles, but does not allow for additional detail on exactly what each author did, including microattributions for figures, models, or datasets.” ([McNutt et al 2018, PNAS](#))
- “Into which category of the CRedit contributor role taxonomy does an (extensive) literature review go?” (asked by “[Christoph](#)” at [Academia Stack Exchange](#), a Q&A site for academics in 2020)
- “Are there important differences between authors and contributors that we need to retain and how does CRedit support these?” ([Gadd 2020, LSE Impact Blog](#))
- “Is a focus on credit-seeking what the community needs, or will this end up embedding the status quo around problematic output-based evaluation?” ([Gadd 2020, LSE Impact Blog](#))
  - “There are a lot of problems in the scholarly communications space caused by credit-seeking behaviours. For instance, publishing only headline-grabbing results, not publishing null results, publishing too hastily with subsequent retractions, and irreproducible science.”

## ■ What are challenges and criticisms?

- “The CRedit taxonomy provides a summary or snapshot of contributor roles, but does not allow for additional detail on exactly what each author did, including microattributions for figures, models, or datasets.” ([McNutt et al 2018, PNAS](#))
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- “Are there important differences between authors and contributors that we need to retain and how does CRedit support these?” ([Gadd 2020, LSE Impact Blog](#))
- “Is a focus on credit-seeking what the community needs, or will this end up embedding the status quo around problematic output-based evaluation?” ([Gadd 2020, LSE Impact Blog](#))
- “Are we going to end up with new forms of CRedit-based evaluation that might have negative systemic effects?” ([Gadd 2020, LSE Impact Blog](#))
  - “Are we going to see some roles prized above others? Will some roles literally ‘count’ and some roles not? And what impact will this have on those early career researchers in project administration and literature searching roles that CRedit seeks to give previously unacknowledged credit to? Will they, in another terrible fit of irony, be excluded from some forms of credit altogether?”

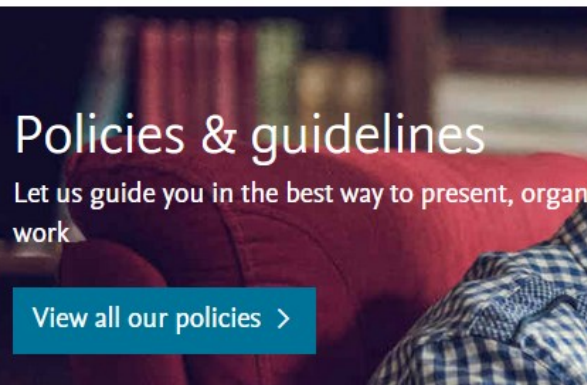
- Examples
  - Difficult to find in certain research fields
  - Not all articles in the same journal have “Authors’ contributions”

## ■ Examples



ELSEVIER

Home > Authors > Policies & guidelines



**Policies & guidelines**  
Let us guide you in the best way to present, organize your work

[View all our policies >](#)

### Ethical publishing



The publication of an article in a peer-reviewed journal is an essential building block in the development of a coherent and respected network of knowledge. It is a direct reflection of the quality of work of the author and the institutions that support them. Peer-reviewed articles support and embody the scientific method. It is therefore important to agree upon standards of expected ethical behavior.

Find information about how to publish ethically under the "Ethics" topic on [Elsevier Researcher Academy](#) . Other useful information specifically developed for editors but useful for anyone with a deep interest in the topic is the [Publishing Ethics Resource Kit](#).

Ethics topics to consider when publishing:

- **Authorship of the paper:** Authorship should be limited to those who have made a significant contribution to the conception, design, execution, or interpretation of the reported study. Transparency about the contributions of authors is encouraged, for example in the form of a [CRediT author statement](#).



## ■ Examples

Aczel et al. *Research Integrity and Peer Review* (2021) 6:14  
<https://doi.org/10.1186/s41073-021-00118-2> Research Integrity and Peer Review

**RESEARCH** **Open Access**

### A billion-dollar donation: estimating the cost of researchers' time spent on peer review

Balazs Aczel<sup>1\*</sup> , Barnabas Szasz<sup>1\*</sup> and Alex O. Holcombe<sup>2</sup>


**Authors' contributions**  
 Conceptualization: BA and BS. Formal Analysis: BA and BS. Methodology: BA and BS. Writing - Original Draft Preparation: BA, BS, and AOH. The author(s) read and approved the final manuscript.



International Journal of Economic Policy Studies  
<https://doi.org/10.1007/s42495-022-00091-8>


**RESEARCH ARTICLE**

### Macroeconomic determinants of emigration from India to the United States

Rasheed M. Abdul<sup>1</sup> · Muhammed Ashiq Villanthenkodath<sup>2</sup>  · S. Shibinu<sup>1,3</sup>

Received: 21 August 2022 / Accepted: 2 November 2022  
 © Japan Economic Policy Association (JEPA) 2022

**Author contributions** AR developed the design of the manuscript and prepared the draft manuscript. MAV conducted the data curation, software, and manuscript preparation. SS final input and supervision.



■ Examples

Trends in Psychology (2022) 30:729–744  
<https://doi.org/10.1007/s43076-022-00169-4>

ORIGINAL ARTICLE

### Differences in Attitudes and Perceptions Between Educators With or Without Knowledge in Neuroscience

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**Author contribution** All authors made substantial contributions, described as follows:

- (1) The conception and design of the study: De Micheli D and Coelho DM.
- (2) Acquisition of data: Coelho DM.
- (3) Analysis and interpretation of data: Andrade AL and Lopes FM.
- (2) Writing-original draft of the article: De Micheli D, Lopes FM, Carvalho CF and Silva AM.
- (3) Revising it critically for important intellectual content: Lopes FM, Carvalho, CF and De Micheli D.
- (4) Editing the final approval of the version to be submitted: Lopes FM and Carvalho CF.
- (5) Supervision: De Micheli D and Lopes FM.

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Cell

### Article

## A Zika virus-specific IgM elicited in pregnancy exhibits ultrapotent neutralization

Tulika Singh,<sup>1,2</sup> Kwan-Ki Hwang,<sup>1</sup> Andrew S. Miller,<sup>3</sup> Rebecca L. Jones,<sup>1</sup> Cesar A. Lopez,<sup>4</sup> Sarah J. Dulson,<sup>4</sup> Camila Giuberti,<sup>5</sup> Morgan A. Gladden,<sup>1</sup> Itzayana Miller,<sup>1,6</sup> Helen S. Webster,<sup>1</sup> Joshua A. Eudailey,<sup>1,6</sup> Kan Luo,<sup>1</sup> Tarra Von Holle,<sup>1</sup> Robert J. Edwards,<sup>1</sup> Sarah Valencia,<sup>1</sup> Katherine E. Burgomaster,<sup>7</sup> Summer Zhang,<sup>8</sup> Jesse F. Mangold,<sup>1,11</sup> Joshua J. Tu,<sup>1</sup> Maria Dennis,<sup>1</sup> S. Munir Alam,<sup>1</sup> Lakshmanane Premkumar,<sup>4</sup> Reynaldo Dietze,<sup>5,9</sup> Theodore C. Pierson,<sup>7</sup> Eng Eong Ooi,<sup>8</sup> Helen M. Lazear,<sup>4</sup> Richard J. Kuhn,<sup>3</sup> Sallie R. Permar,<sup>6,12,13,\*</sup> and Mattia Bonsignori<sup>10,12,13,14,\*</sup>

**AUTHOR CONTRIBUTIONS**

Conceptualization: T.S., S.R.P., and M.B.; data analysis: T.S. and M.B. Funding acquisition: R.D., S.R.P., and M.B.; investigation: T.S., K.-K.H., R.L.J., M.A.G., K.L. and M.B. Monoclonal antibody isolation, characterization, and production: T.S., I.M., H.S.W., J.A.E., T.V.H., S.V., K.B., S.Z., J.F.M., J.J.T., M.D., and S.M.A. Functional studies: R.J.E. Negative-stain electron microscopy: C.G. Clinical samples: C.A.L. and S.J.D. Mouse studies: A.S.M. (structural studies). Methodology: T.S., S.R.P., and M.B.; resources: L.P. (reference antibodies); R.D. (clinical samples), T.C.P. (RVP-based ADE assay), and E.E.O. (ADE plaque assays and fluorescent Zika virion). Supervision: H.M.L. (animal model), R.J.K. (structural studies), S.R.P., and M.B.; visualization: T.S., A.S.M., H.M.L. and M.B.; writing: original draft: T.S. and M.B.; editing: T.S., S.R.P., and M.B.; review: all authors.



- Can it be taken further?

**Nick Steinmetz**  
@SteinmetzNeuro

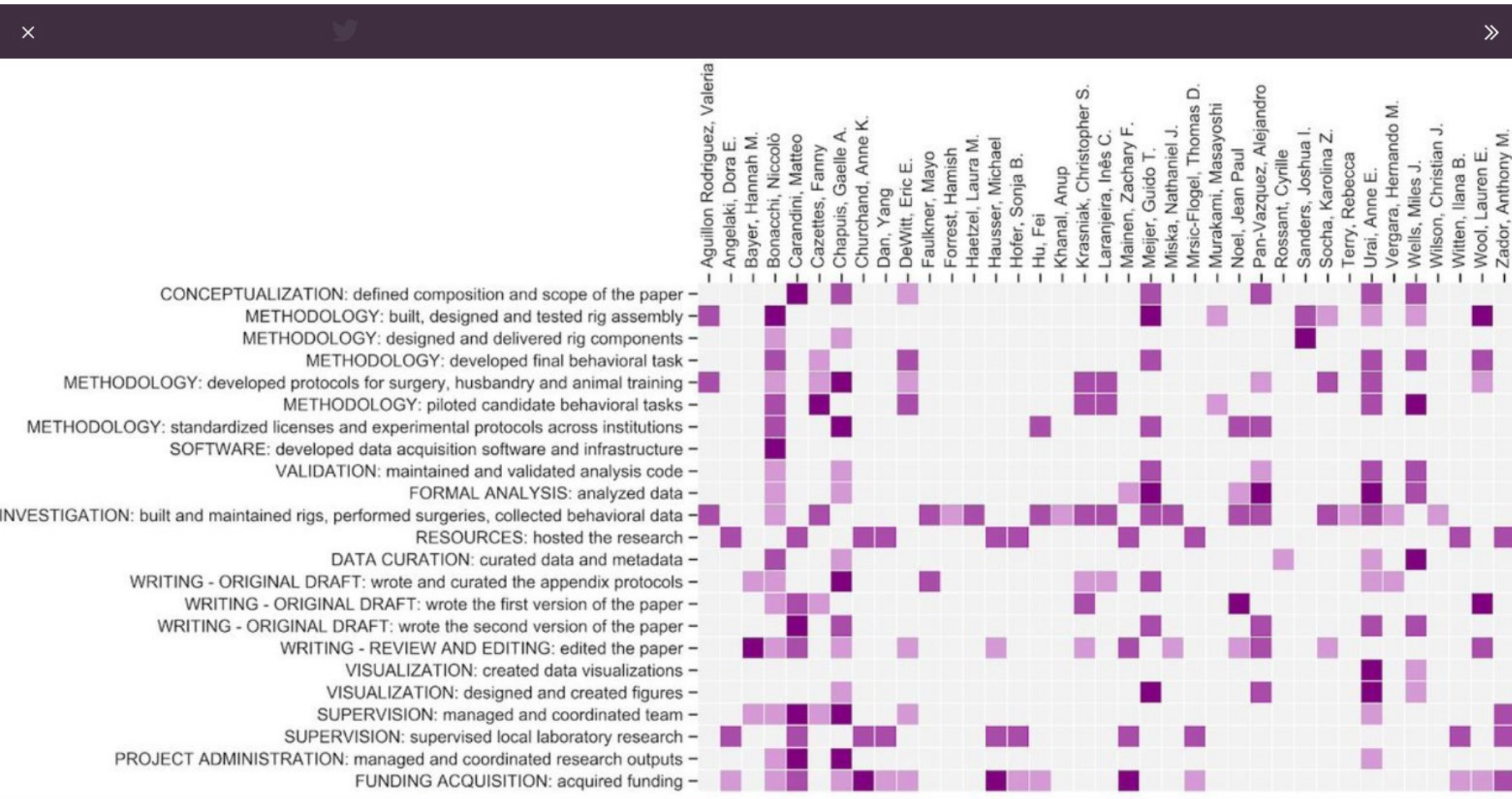
As scientific teams grow, our model of credit assignment (1st author, last, or everyone else) becomes increasingly outdated. One impediment is ineffectiveness of author contributions text. Here's a suggestion for a better way: the contributions table. A thread; feedback welcome.

	CS*	MP*	NAS	CBR	MCT†	KDHT
Conceptualization	■	■	■	□	■	■
Funding Acquisition	□	□	□	□	■	■
Investigation	■	■	■	■	□	□
Methodology	■	■	□	□	□	□
Resources	□	□	□	□	■	■
Software	■	■	□	□	□	□
Writing	■	■	■	□	■	■

\*, † these authors contributed equally

## Can it be taken further?

<https://twitter.com/AnneEUrai/status/1327934115618959361/photo/1>



What to do?  
I'm a big fan of detailed contribution tables e.g. [doi.org/10.1101/2020.0...](https://doi.org/10.1101/2020.0...) (see [twitter.com/SteinmetzNeuro...](https://twitter.com/SteinmetzNeuro...) for more).

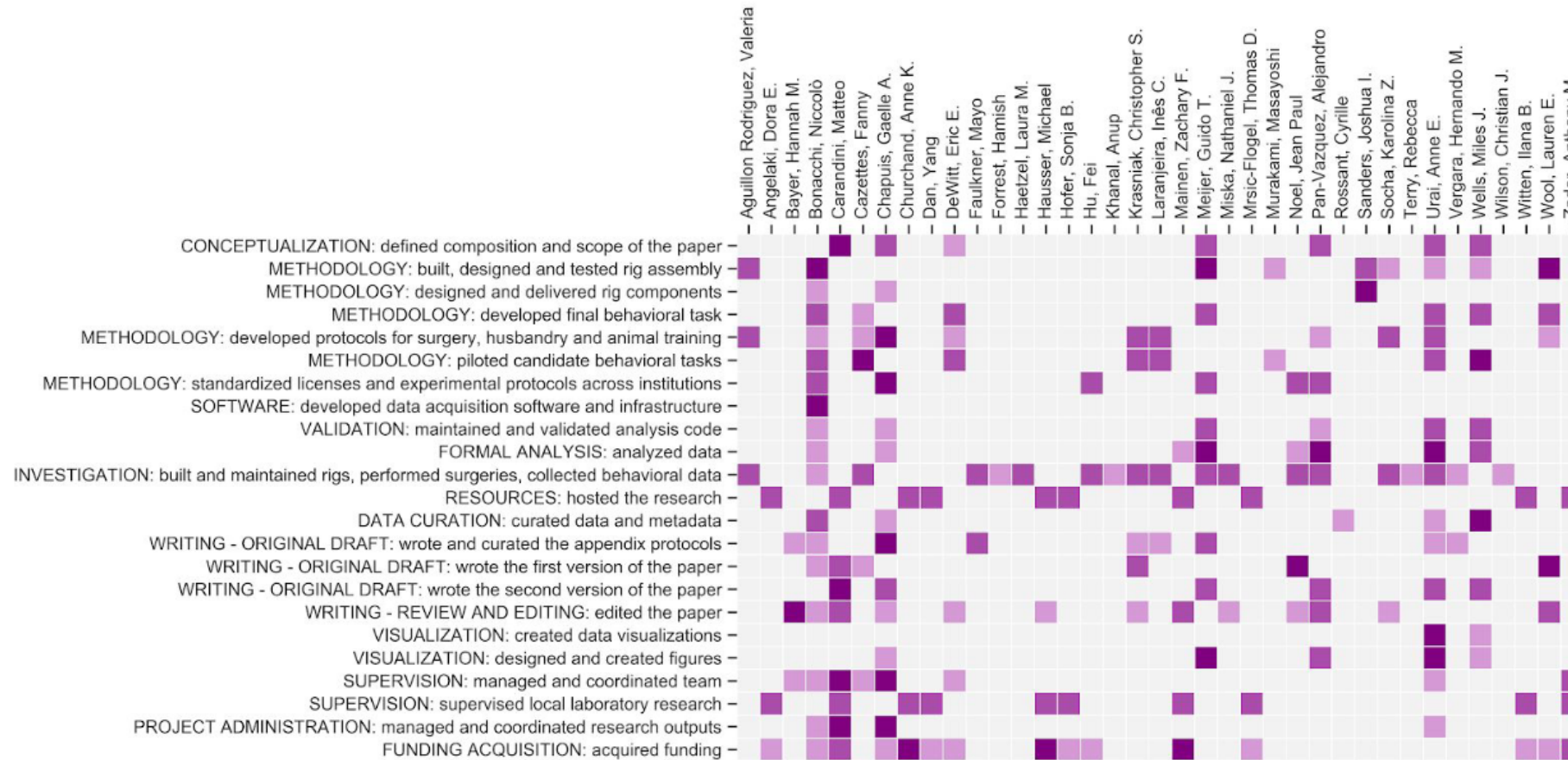
Perhaps we need another dimension for levels of responsibility, to complement [casrai.org/credit/](https://casrai.org/credit/) 10/n

**Nick Stei...** @Steinme... · Jul 5, 2019  
As scientific teams grow, our model of credit assignment (1st author, last, or everyone else) becomes increasingly outdated. One impediment is ineffectiveness of author contributions text. Here's a suggestion for a better way: the contributions table. A thread; feedback welcome. [pic.twitter.com/SKOYYdmceO](https://pic.twitter.com/SKOYYdmceO)  
[Show this thread](#)

12:18 PM · Nov 15, 2020 · Twitter Web App

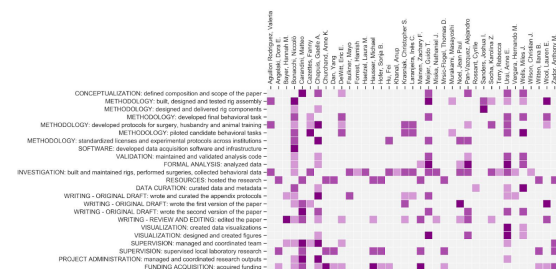
22 Retweets 10 Quote Tweets 156 Likes

- Can it be taken further?



**Supplement 1. Author contributions, listed using CRedit taxonomy categories. Purple squares indicate a contribution, with levels 'support' (light), 'equal' (medium) and 'lead' (dark). See below for the full description of each author's contribution.**

## Can it be taken further?



Supplement 1. Author contributions, listed using CRediT taxonomy categories. Purple squares indicate a contribution, with levels 'support' (light), 'equal' (medium) and 'lead' (dark). See below for the full description of each author's contribution.

### Contribution statement

Valeria Aguilón Rodríguez: METHODOLOGY: built, designed and tested rig assembly (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (equal); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal)

Dora E. Angelaki: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (support)

Hannah M. Bayer: WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (support); WRITING - REVIEW AND EDITING: edited the paper (lead); SUPERVISION: managed and coordinated team (support)

Niccolò Bonacchi: METHODOLOGY: built, designed and tested rig assembly (lead); METHODOLOGY: designed and delivered rig components (support); METHODOLOGY: piloted candidate behavioral tasks (equal); METHODOLOGY: developed final behavioral task (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (support); METHODOLOGY: standardized licenses and experimental protocols across institutions (equal); SOFTWARE: developed data acquisition software and infrastructure (lead); VALIDATION: maintained and validated analysis code (support); FORMAL ANALYSIS: analyzed data (support); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (support); DATA CURATION: curated data and metadata (equal); WRITING - ORIGINAL DRAFT: wrote the first version of the paper (support); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (support); WRITING - REVIEW AND EDITING: edited the paper (support); SUPERVISION: managed and coordinated team (support); PROJECT ADMINISTRATION: managed and coordinated research outputs (support); FUNDING ACQUISITION: acquired funding (support)

Matteo Carandini: CONCEPTUALIZATION: defined composition and scope of the paper (lead); RESOURCES: hosted the research (equal); WRITING - ORIGINAL DRAFT: wrote the first version of the paper (equal); WRITING - ORIGINAL DRAFT: wrote the second version of the paper (lead); WRITING - REVIEW AND EDITING: edited the paper (equal); SUPERVISION: supervised local laboratory research (equal); SUPERVISION: managed and coordinated team (lead); PROJECT ADMINISTRATION: managed and coordinated research outputs (lead); FUNDING ACQUISITION: acquired funding (equal)

Fanny Cazeztes: METHODOLOGY: piloted candidate behavioral tasks (lead); METHODOLOGY: developed final behavioral task (support); METHODOLOGY: developed protocols for surgery, husbandry and animal training (support); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote the first version of the paper (support); SUPERVISION: managed and coordinated team (support)

Gaëlle A. Chapuis: CONCEPTUALIZATION: defined composition and scope of the paper (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (lead); METHODOLOGY: designed and delivered rig components (support); METHODOLOGY: standardized licenses and experimental protocols across institutions (lead); VALIDATION: maintained and validated analysis code (support); FORMAL ANALYSIS: analyzed data (support); DATA CURATION: curated data and metadata (support); WRITING - ORIGINAL DRAFT: wrote the second version of the paper (equal); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (lead); WRITING - REVIEW AND EDITING: edited the paper (support); VISUALIZATION: designed and created figures (support); SUPERVISION: managed and coordinated team (lead); PROJECT ADMINISTRATION: managed and coordinated research outputs (lead); FUNDING ACQUISITION: acquired funding (support)

Anne K. Churchland: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (lead)

Yang Dan: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (support)

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Mayo Faulkner: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (equal)

Hamish Forrest: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (support)

Laura M. Haetzl: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal)

Michael Hausser: RESOURCES: hosted the research (equal); WRITING - REVIEW AND EDITING: edited the paper (support); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (lead)

Sonja B. Hofer: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (support)

Fei Hu: METHODOLOGY: standardized licenses and experimental protocols across institutions (equal); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); FUNDING ACQUISITION: acquired funding (support)

Anup Khanal: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (support)

Christopher S. Krasniak: METHODOLOGY: piloted candidate behavioral tasks (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (equal); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote the first version of the paper (equal); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (support); WRITING - REVIEW AND EDITING: edited the paper (support)

Inês C. Laranjeira: METHODOLOGY: piloted candidate behavioral tasks (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (equal); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (support)

Zachary F. Mainen: FORMAL ANALYSIS: analyzed data (support); RESOURCES: hosted the research (equal); WRITING - REVIEW AND EDITING: edited the paper (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (lead)

Guido T. Meijer: CONCEPTUALIZATION: defined composition and scope of the paper (equal); METHODOLOGY: developed final behavioral task (equal); METHODOLOGY: built, designed and tested rig assembly (lead); METHODOLOGY: standardized licenses and experimental protocols across institutions (equal); VALIDATION: maintained and validated analysis code (equal); FORMAL ANALYSIS: analyzed data (lead); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote the second version of the paper (equal); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (equal); VISUALIZATION: designed and created figures (lead)

Nathaniel J. Mist: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - REVIEW AND EDITING: edited the paper (support)

Thomas D. Mrsic-Flogel: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (support)

Masayoshi Murakami: METHODOLOGY: built, designed and tested rig assembly (support); METHODOLOGY: piloted candidate behavioral tasks (support)

Jean Paul Noel: METHODOLOGY: standardized licenses and experimental protocols across institutions (equal); FORMAL ANALYSIS: analyzed data (support); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote the first version of the paper (lead); WRITING - REVIEW AND EDITING: edited the paper (support)

Alejandro Pan-Vazquez: CONCEPTUALIZATION: defined composition and scope of the paper (equal); METHODOLOGY: standardized licenses and experimental protocols across institutions (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (support); VALIDATION: maintained and validated analysis code (support); FORMAL ANALYSIS: analyzed data (lead); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - ORIGINAL DRAFT: wrote the second version of the paper (equal); WRITING - REVIEW AND EDITING: edited the paper (equal); VISUALIZATION: designed and created figures (equal)

Cyrille Rossant: DATA CURATION: curated data and metadata (support)

Joshua I. Sanders: METHODOLOGY: designed and delivered rig components (lead); METHODOLOGY: built, designed and tested rig assembly (equal)

Karolina Z. Socha: METHODOLOGY: developed protocols for surgery, husbandry and animal training (equal); METHODOLOGY: built, designed and tested rig assembly (support); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); WRITING - REVIEW AND EDITING: edited the paper (support)

Rebecca Terry: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (support)

Anne E. Urai: CONCEPTUALIZATION: defined composition and scope of the paper (equal); METHODOLOGY: built, designed and tested rig assembly (support); METHODOLOGY: piloted candidate behavioral tasks (equal); METHODOLOGY: developed final behavioral task (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (equal); VALIDATION: maintained and validated analysis code (equal); FORMAL ANALYSIS: analyzed data (lead); INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (equal); DATA CURATION: curated data and metadata (support); WRITING - ORIGINAL DRAFT: wrote the second version of the paper (equal); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (support); VISUALIZATION: designed and created figures (lead); VISUALIZATION: created data visualizations (lead); SUPERVISION: managed and coordinated team (support); PROJECT ADMINISTRATION: managed and coordinated research outputs (support)

Hernando M. Vergara: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (support); WRITING - ORIGINAL DRAFT: wrote and curated the appendix protocols (support)

Miles J. Wells: CONCEPTUALIZATION: defined composition and scope of the paper (equal); METHODOLOGY: built, designed and tested rig assembly (support); METHODOLOGY: piloted candidate behavioral tasks (lead); METHODOLOGY: developed final behavioral task (equal); VALIDATION: maintained and validated analysis code (equal); FORMAL ANALYSIS: analyzed data (equal);

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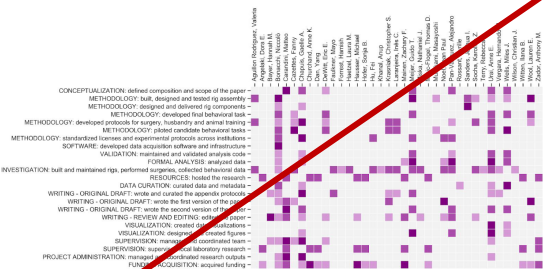
Christian J. Wilson: INVESTIGATION: built and maintained rigs, performed surgeries, collected behavioral data (support)

Ilana B. Witten: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); FUNDING ACQUISITION: acquired funding (support)

Lauren E. Wool: METHODOLOGY: built, designed and tested rig assembly (lead); METHODOLOGY: developed final behavioral task (equal); METHODOLOGY: developed protocols for surgery, husbandry and animal training (support); WRITING - ORIGINAL DRAFT: wrote the first version of the paper (lead); WRITING - REVIEW AND EDITING: edited the paper (equal); FUNDING ACQUISITION: acquired funding (support)

Anthony M. Zador: RESOURCES: hosted the research (equal); SUPERVISION: supervised local laboratory research (equal); SUPERVISION: managed and coordinated team (equal); FUNDING ACQUISITION: acquired funding (equal)

## Can it be taken further?



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Writing - Review and editing: edited the paper (support); Anne E Urai, Conceptualization: defined composition and scope of the paper (equal); Methodology: built, designed and tested rig assembly (support); piloted candidate behavioral tasks (equal); developed final behavioral task (equal); developed protocols for surgery, husbandry and animal training (equal); Validation: maintained and validated analysis code (equal); Formal analysis: analyzed data (lead); Investigation: built and maintained rigs, performed surgeries, collected behavioral data (equal); Data curation: curated data and metadata (support); Writing - Original draft: wrote the second version of the paper (equal); wrote and curated the appendix protocols (support); Visualization: designed and created figures (lead); Supervision: managed and coordinated team (support); Project administration: managed and coordinated research outputs (support); Hernando Vergara, Investigation: built and maintained rigs, performed surgeries, collected behavioral data (support); Writing - Original draft: wrote and curated the appendix protocols (support); Miles Wells, Conceptualization: defined composition and scope of the paper (equal); Methodology: built, designed and tested rig assembly (support); piloted candidate behavioral tasks (lead); developed final behavioral task (equal); Validation: maintained and validated analysis code (equal); Formal analysis: analyzed data (equal); Data curation: curated data and metadata (lead); Writing - Original draft: wrote the second version of the paper (equal); Visualization: designed and created figures (support); created data visualizations (support); Lauren E Wool, Methodology: built, designed and tested rig assembly (lead); developed final behavioral task (equal); developed protocols for surgery, husbandry and animal training (support); Writing - Original draft: wrote the first version of the paper (lead); Writing - Review and editing: edited the paper (equal); Funding acquisition: acquired funding (support); Anthony M Zador, Resources: hosted the research (equal); Supervision: supervised local laboratory research (equal); managed and coordinated team (equal); Funding acquisition: acquired funding (equal)

- Comments? Questions?

- How does a journal implement both the Vancouver Recommendations and CRedit?
  - The British Medical Journal (BMJ): Authors Authorship & contributorship  
<https://www.bmj.com/about-bmj/resources-authors/article-submission/authorship-contributorship>
  - eLife: Authors guide → Full Submission → Submission Metadata: Complete Author Information  
<https://reviewer.elifesciences.org/author-guide/full>

- Not the only taxonomy!
  - Example:
    - TaDiRAH: Taxonomy of Digital Research Activities in the Humanities
      - “...designed to help community-driven sites and projects structure their digital humanities (DH) content and gain better visibility. TaDiRAH provides terminology for DH research activities as well as scope notes that also explain the methods associated with them....”



- Can it be taken even further?
  - Ontologies:
    - SCoRO – the Scholarly Contributions and Roles Ontology (2017)
    - CRO – Contributor Role Ontology (FORCE11, 2019) – based on CRedit

- Articles, reports and blogposts (in the order of appearance):

Fleming, N. 2021. The authorship rows that sour scientific collaborations. *Nature* 594: 459-462.

Albert T., Wager E. 2003. How to handle authorship disputes: a guide for new researchers. *The COPE Report 2003*.

Duffy, M. 2016. Fun ways of deciding authorship order. *Dynamic ecology* blog. <https://dynamicecology.wordpress.com/2016/09/21/fun-ways-of-deciding-authorship-order/>

Castelvecchi, D. 2015. Physics paper sets record with more than 5,000 authors. *Nature*. <https://doi.org/10.1038/nature.2015.17567>

ICMJE. 2022. Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. <https://www.icmje.org/>

Brand et al. 2015. Beyond authorship: attribution, contribution, collaboration, and credit. *Learned Publishing* 28: 151–155. doi:10.1087/20150211

Rennie et al. 1997. When Authorship Fails: A Proposal to Make Contributors Accountable. *JAMA* 278(7): 579-585. doi:10.1001/jama.1997.03550070071041

IWCSA Report. 2012. Report on the International Workshop on Contributorship and Scholarly Attribution, May 16, 2012. Harvard University and the Wellcome Trust. [http://projects.iq.harvard.edu/attribution\\_workshop](http://projects.iq.harvard.edu/attribution_workshop)

Allen et al. 2014. Publishing: Credit where credit is due. *Nature* 508: 312–313. <https://doi.org/10.1038/508312a>

Holcombe et al. 2020. Documenting contributions to scholarly articles using CRedit and *tenzing*. *PLOS ONE* 15(12): e0244611. <https://doi.org/10.1371/journal.pone.0244611>

McNutt et al. 2018. Transparency in authors' contributions and responsibilities to promote integrity in scientific publication. *PNAS* 115(11): 2557-2560. <https://www.pnas.org/doi/pdf/10.1073/pnas.1715374115>

Gadd, E. 2020. CRedit Check – Should we welcome tools to differentiate the contributions made to academic papers? *LSE Impact Blog*. <https://blogs.lse.ac.uk/impactofsocialsciences/2020/01/20/credit-check-should-we-welcome-tools-to-differentiate-the-contributions-made-to-academic-papers/>

- Websites, apps and tweets (most important, in the order of appearance):

COPE. Authorship and cotributorship. <https://publicationethics.org/authorship>

National Reserach Ethics Committees. The Vancouver Recommendations. <https://www.forskningsetikk.no/en/resources/the-research-ethics-library/legal-statutes-and-guidelines/the-vancouver-recommendations/>

CRedit. <https://credit.niso.org/>

tenzing. Documenting contribution with CRedit. <https://rollercoaster.shinyapps.io/tenzing/>

Univesity of Kent. CRedit – Contributor Roles Taxonomy. <https://www.kent.ac.uk/guides/credit-contributor-roles-taxonomy#benefits>

TU Delft. CRedit and collaboration. <https://www.tudelft.nl/en/library/library-for-researchers/library-for-researchers/publishing-outreach/credit-and-collaboration>

Academia Stack Exchange. Into which category of the CRedit contributor role taxonomy does an (extensive) literature review go? <https://academia.stackexchange.com/questions/159382/into-which-category-of-the-credit-contributor-role-taxonomy-does-an-extensive>

Elsevier for Authors. Policies & guidelines. <https://www.elsevier.com/authors/policies-and-guidelines>

Steinmetz, N. 2019/7/5. <https://twitter.com/SteinmetzNeuro/status/1147241128858570752>

Urai, A. 2020/11/15. <https://twitter.com/AnneEUrai/status/1327934115618959361>



**Thank you!**