

Give researchers the *CRediT* they deserve

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(he/him)

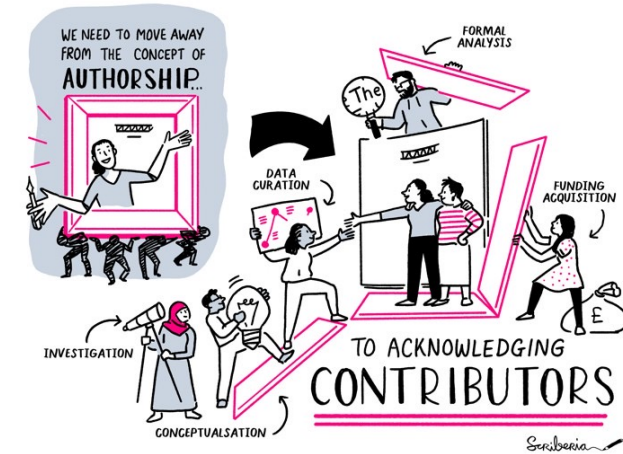
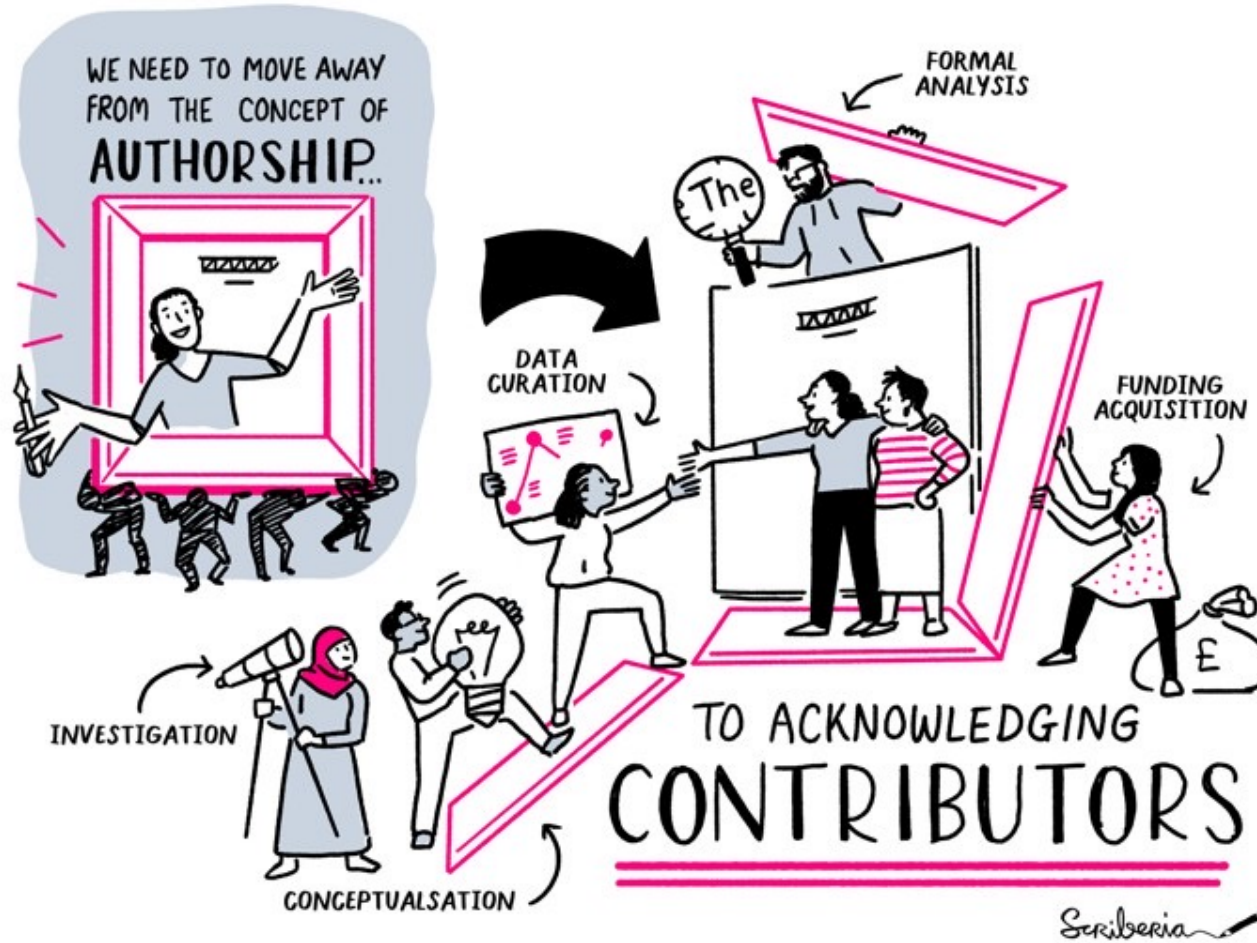


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The theme for this talk



Authorship is outdated

- Science has progressed a long way since the first scientific journals in 1665
 - Scientific research was often conducted by an individual who had solely conducted the experiment and written the communication of their findings
 - Authorship may have been a pretty good way to attribute and recognize the scientific contributions in those times...
- Modern science is collaborative
 - A scientific paper is the result of the contributions of many researchers
 - And these contributions can be varied in many ways

Our **incentives** are defined around **authorship**

- Scientists value **first-author publications** which signify being the lead on the research project
- **Secondary authorship** recognizes contributions to a degree
 - But they have little value to the scientist as they are not actively considered on grant or job applications
- This encourages **pursuing solo research projects, dismissing collaborative projects, and taking on all research components** rather than specializing

The ICMJE criteria for authorship

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.

Failures to recognize contributions

- Researchers who worked on a project but were not involved in the writing or editing of the manuscript may be left off (known as 'ghost' authorship)
 - Often those who provide technical contributions like programming or specialized data collection
 - And these are often conducted by early-career researchers (Lariviere, 2016)
 - And addresses 'honorary' authorship (often demanded by senior researchers)
- Authorship norms are varied amongst researchers and often not explicit
 - Doing what "seems to be the right thing" (Seeman & House, 2010)
 - Creates inequities between researchers – some will get authorship whereas others will not

Larivière, V., Desrochers, N., Macaluso, B., Mongeon, P., Paul-Hus, A., & Sugimoto, C. R. (2016). Contributorship and division of labor in knowledge production. *Social Studies of Science*, 46(3), 417–435. <https://doi.org/10.1177/0306312716650046>

Seeman, J. I., & House, M. C. (2010). Influences on authorship issues: An evaluation of receiving, not receiving, and rejecting credit. *Accountability in research*, 17(4), 176-197.

Contributorship, not authorship

- Recognition of **all** substantial contributions to a research project by listing who did what
- Removes the **requirement** of writing of the manuscript for authorship
- **Improves research integrity and equity** as well as aligns *the Incentives* with progress in science

McNutt, M. K., Bradford, M., Drazen, J. M., Hanson, B., Howard, B., Jamieson, K. H., ... & Verma, I. M. (2018). Transparency in authors' contributions and responsibilities to promote integrity in scientific publication. *Proceedings of the National Academy of Sciences*, 115(11), 2557-2560

Contributor Roles Taxonomy (CRediT)

- A standardized **high-level taxonomy** used to represent the contributions to scientific scholarly output
 - **Machine-readable**, providing valuable metadata for meta-science (finding out who did what!)
 - Increasingly adopted by scientific journals
- **14 roles**:
 - Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

Conceptualization	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 and editing	Preparation, creation, and/or representation of the published work by those from the original research group, specifically critical review, commentary or revision—including pre- or post-publication stages

Contributorship benefits early-career researchers

- Aligns expectations between collaborators on a research project, often the ECR and their primary supervisor
 - Clarifies any hidden “unwritten rules” of authorship held by the principal investigator
 - Protects against disagreements between collaborators
 - Which would likely be decided along power differentials, leaving ECRs vulnerable (Andes & Mabrouk, 2018)
 - CRediT provides a useful framework to have these discussions

Contributorship promotes progress in science

- Appropriate recognition of all research contributions encourages collaborations rather than 'hero' science
 - Promotes participating in large-scale collaborations, such as multi-lab replication efforts
 - Promotes multi-disciplinary collaborations (Holcombe, 2019a)
- Can create an incentive for specialization in research
 - Generates utility for secondary authorship publications
 - Addresses shortage of researchers with specialized skills such as programming or statistics (Holcombe, 2019b)

Adoption of contributorship/CRediT

- An increasing number of scientific journals are using CRediT
- Can be established as a standard within a department or within a lab or on an individual research project
 - A transparent framework to discuss authorship or expectations of contributions to the research project amongst collaborators
- Can be added to an academic CV to detail what you did

Publications (Contributions listed according to CRediT.)

Ngiam, W.X.Q., Adam, K.C.S., Quirk, C., Vogel, E.K., Awh, E. (2021). Estimating the statistical power to detect set size effects in contralateral delay activity. *Psychophysiology*, 58:e13791. <https://doi.org/10.1111/psyp.13791>

(Contribution: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Visualization, Writing original draft, Writing review and editing).

Ngiam, W.X.Q., Brissenden, J.A., Awh, E. (2019) "Memory compression" effects in visual working memory are contingent on explicit long-term memory. *Journal of Experimental Psychology: General*, 148(8), 1373. <http://dx.doi.org/10.1037/xge0000649>

(Contribution: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Visualization, Writing original draft, Writing review and editing)

Ngiam, W.X.Q., Khaw, K.L.C., Holcombe, A.O., Goodbourn, P.T. (2019). Visual working memory for letters varies with familiarity but not complexity. *Journal of Experimental Psychology: Learning, Memory and Cognition*, 45(10), 1761-1775.

<http://dx.doi.org/10.1037/xlm0000682>

(Contribution: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Visualization, Writing original

Summary

- Contributorship is a more equitable way to recognize researchers and their contributions, especially for early-career researchers!
- Contributorship aligns incentives towards progress in science!
- CRediT can be adopted at various levels including at the individual level!



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