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Prepared for  
*Enhanced Data Citation Information for the Data Documentation Initiative*  
(DDI)  
Dagstuhl  
October 2014

# A Proposed Standard for Describing Research Contributions

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# DISCLAIMER

These opinions are my own, they are not the opinions of MIT, Brookings, any of the project funders, nor (with the exception of co-authored previously published work) my collaborators

*Secondary disclaimer:*

“It’s tough to make predictions, especially about the future!”

-- Attributed to Woody Allen, Yogi Berra, Niels Bohr, Vint Cerf, Winston Churchill, Confucius, Disreali [sic], Freeman Dyson, Cecil B. DeMille, Albert Einstein, Enrico Fermi, Edgar R. Fiedler, Bob Fourer, Sam Goldwyn, Allan Lamport, Groucho Marx, Dan Quayle, George Bernard Shaw, Casey Stengel, Will Rogers, M. Taub, Mark Twain, Kerr L. White, etc.

# Collaborators & Co-Conspirators

- Amy Brand, Digital Science
- Liz Allen, Wellcome Trust
- Marjorie M.K. Hlava, Access Innovations
- Jo Scott, Wellcome Trust

## Research Support

Thanks to the Wellcome Trust, Digital Science

# Related Work

- IWCSA Report (2012). Report on the International Workshop on Contributorship and Scholarly Attribution, May 16, 2012. Harvard University and the Wellcome Trust.
- Liz Allen, Jo Scott, Amy Brand, Marjorie M.K. Hlava, Micah Altman (2014), Beyond authorship: recognising the contributions to research; *Nature*.
- Data Synthesis Task Group. 2014. *Joint Principles for Data Citation*.
- CODATA Data Citation Task Group, 2013. Out of Cite, Out of Mind: The Current State of Practice, Policy and Technology for Data Citation. *Data Science Journal*. 2013;12:1–75.
- Altman M, Crosas M. 2014. The Evolution of Data Citation: From Principles to Implementation. IASSIST Quarterly.

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# Generic Talk

\* Authorship problems \*

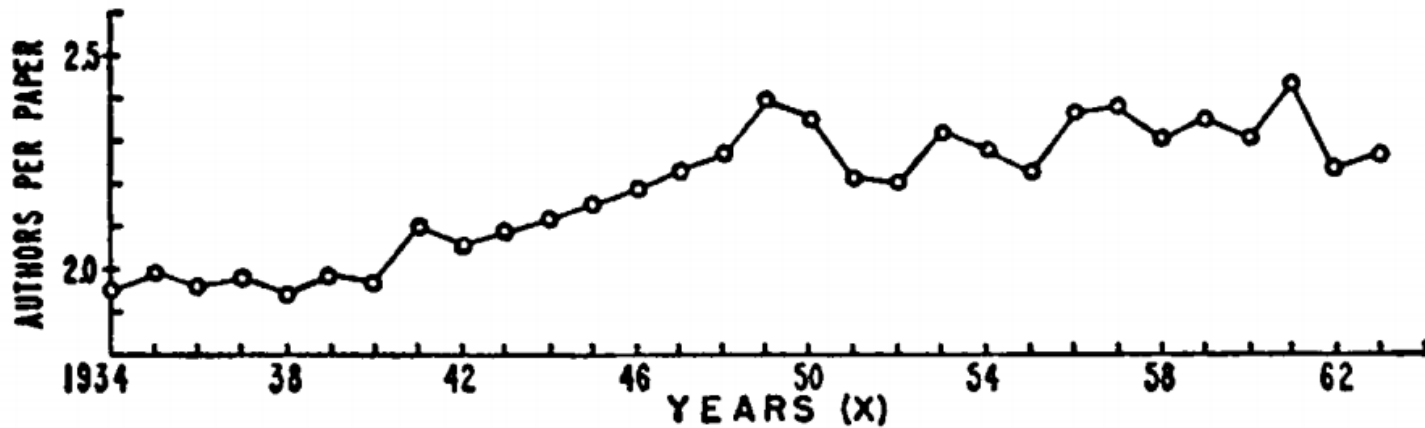
\* Examining Contributor Roles\*

\* Future research (Discussion)\*

# The State of the Practice

A Proposed Standard for Describing Research  
Contributions

# Then



Clarke, Beverly L. "Multiple authorship trends in scientific papers." *Science* 143.3608 (1964): 822-824.



# Later

- By 1980, average number of authors in high-ranked medical journals was 4.5
- By 2000, average number of authors was 6.9

[Weeks et al. 2004]

# Now



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Science 7 May 2010:  
Vol. 328 no. 5979 pp. 710-722  
DOI: 10.1126/science.1188021

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### RESEARCH ARTICLE

## A Draft Sequence of the Neandertal Genome

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¶ These authors contributed equally to this work. Contributions

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# More Than Seven Authors – APA style

List by **last names and initials**; commas separate author names. After the sixth author's name, **use an ellipses in place of the author names**. Then provide the final author name. There should be no more than seven names:

Green, R. E., Krause, J., Briggs, A. W., Maricic, T., Stenzel, U., Kircher, M., . . . Paabo, S. (2010). A Draft Sequence of the Neandertal Genome. *Science*, 328, 710-722.

# The order of authorship has no generally agreed upon meaning

- Readers – including appointment and funding evaluators – implicitly apportion credit, and they do so in the absence of any well-defined standards



# Authorship Trends, Issues, & Questions

Trend	Potential Authorship Issues	Questions
Increase in number of coauthors	<ul style="list-style-type: none"> <li>- 'honorary' authorship</li> <li>- 'ghost' authorship</li> <li>- disputes</li> </ul>	<ul style="list-style-type: none"> <li>- How to disambiguate author names?</li> <li>- How to communicate attribution in citation?</li> <li>- <b>How to describe contributions to work?</b></li> <li>- How to evaluate and predict impact?</li> <li>- Who is responsible?</li> </ul>
Shift from academic publishing in books to journals	<ul style="list-style-type: none"> <li>- loss of sole-author-book as a evaluation measure</li> </ul>	<ul style="list-style-type: none"> <li>- How to integrate name authority and researcher identifier systems?</li> </ul>
Decreasing granularity of publications	<ul style="list-style-type: none"> <li>- persistence of "nano" publication vs. authorship</li> </ul>	<ul style="list-style-type: none"> <li>- How to document authorship over substructure of work?</li> </ul>
Dynamic documents	<ul style="list-style-type: none"> <li>- version misattribution</li> </ul>	<ul style="list-style-type: none"> <li>- How to document authorship over time?</li> </ul>
Increasing diversity in citable scholarly outputs	<ul style="list-style-type: none"> <li>- citation cannibalization, overcounting</li> </ul>	<ul style="list-style-type: none"> <li>- How to cite data, software, presentations(?), blogs (?), tweets (?)</li> </ul>

# Improved analytics?

- Reduce error in standard analytics
  - impact factors, citation indices
- New measures become feasible
  - collaboration analysis
- Measures including new research objects
  - grants, datasets, software
- Measure of new populations
  - graduate students, postdocs, citizen scientists
- Measures of new connections
  - new maps of science, revealing “dark matter”



# State of the Practice

A Proposed Standard for Describing Research  
Contributions

# Ambiguous Signals

- Citation is ambiguous
  - meaning of first author?
  - meaning of last author?
  - collective authorship?
  - corresponding author?
  - (semi-) alphabetical ordering
- Acknowledgements  $\neq$  Authorships
  - sometimes honorary
  - sometimes strategic
  - sometimes non-intellectual contribution
- Authorship Statements
  - typically qualitative
  - rarely published
  - motivation is often on misconduct, not scholarly

*Authorship Norms Vary by Journal, even within same field...*

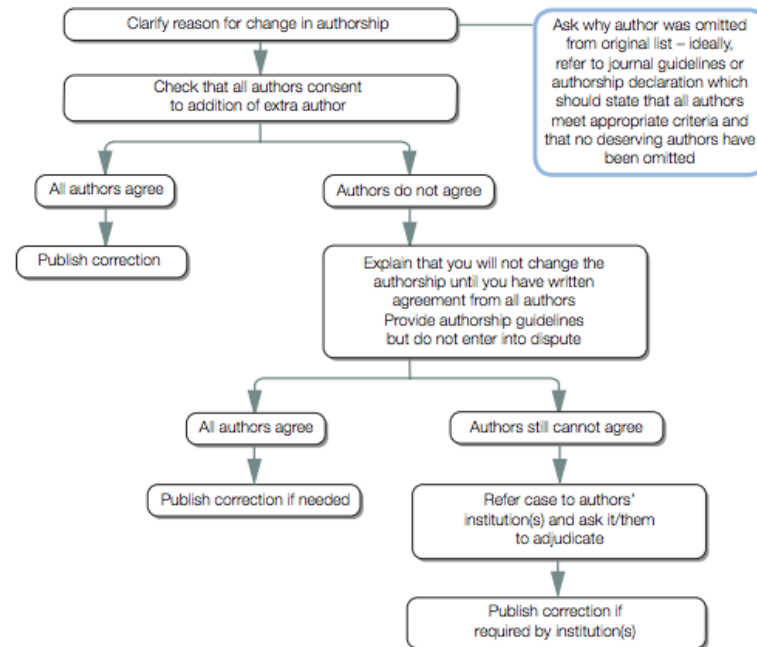
- **PNAS**: “Authorship must be limited to those who have contributed substantially to the work.”
- **Harvard Medical School**: “Everyone who has made substantial intellectual contributions to the work should be an author. Everyone who has made other substantial contributions should be acknowledged.”
- **ICMJE**: “Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND Drafting the work or revising it critically for important intellectual content; AND Final approval of the version to be published; AND 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.”

[Sadler 2011]

# Authorship Guidelines & Best Practices

- Typically created by publisher community
- Many to choose from
- Oriented to BioMedical disciplines
- Primarily proscriptive, not descriptive/empirical
- Even when author statements are collected, they are typically not published/available (and never in structured form)
- Notable examples:
  - Wager & Kleiner 2011 (Committee on Publication Ethics)
  - ICMJE 2013

## Changes in authorship (c) Request for addition of extra author after publication

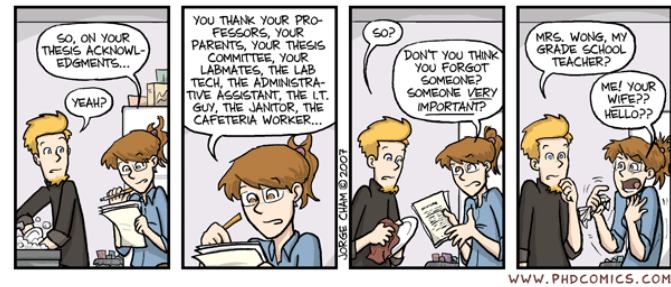


To prevent future problems:  
(1) Before publication, get authors to sign statement that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted  
(2) Publish details of each person's contribution to the research and publication

[COPE Flowcharts <http://publicationethics.org/resources/flowcharts> ]

# Empirical Work

- Small but interesting body of work [Khabsa et al 2012]; [Cronin 2001]; [Peng 2010] on acknowledgment texts – which are publicly available
- Name order effects in economics [Einan and Yarik 2006]
- Acknowledgement is different both in kind and degree from named authorship ...

Eg : NSF, Microsoft, God, Edsger Dijkstra

[\[http://ackseer.ist.psu.edu/\]](http://ackseer.ist.psu.edu/)

# Developing a Standard

A Proposed Standard for Describing Research  
Contributions

# IWCSA Workshop 2012

International Workshop on Contributorship and Scholarly Attribution

Hosted by IQSS at Harvard on Wednesday May 16, 2012



PRESENTATIONS AGENDA PARTICIPANTS BACKGROUND READINGS RELATED LINKS LOCATION REGISTRATION

## Workshop Goals

This invitation-only workshop brought together members of the academic, publishing, and funder communities interested in exploring alternative contributorship and attribution models. Bibliographic conventions for representation of authorship lag behind the semantic capabilities of the web and tend to obfuscate the contributions of those involved in collaborative research and writing endeavors. As a result, publication credit is often misunderstood, and often misapportioned by traditional impact measures.


There is growing interest among researchers, funding agencies, academic institutions, editors, and publishers in increasing the transparency of research contributions, and in more granular tracking of attribution and associated credit. Many publishers now require contribution disclosures upon article submission - some in structured form, some in free-text form - at the same time that funders are developing more scientifically rigorous ways to track the outputs and impact of their research investments.


Our objectives as a group were to explore the pros and cons of alternative approaches, and to converge on a roadmap toward the creation of contributorship and attribution models and technologies that have the potential to:


- Facilitate authorship/contributorship disclosure processes and policies
- Identify good practices for tracking authorship in portions and versions of work
- Minimize authorship disputes
- Enable appropriate credit for contributions in multi-authored works – across all aspects of the research being reported (including data curation, statistical analysis, etc.)
- Improve automated tracking of funding outcomes and impact
- Support new forms of social and research networking
- Further developments in data management and nanopublication
- Inform the “science of science”, e.g. studies of productivity over a career trajectory
- Enable new metrics of credit and attribution


## Workshop Report


 [iwcsa\\_report\\_final\\_18sept12.pdf](#) 708.72 KB

 scholarlyattrib Our workshop report is published [t.co/teivE9cW](#)  
International Workshop on Contributorship and Scholarly Attribution  
2 years 1 month ago.

 scholarlyattrib What does authorship mean? How do you communicate your research? Please help us build data with a 10min survey, thanks [t.co/3UE57szc](#)  
2 years 6 months ago.

 scholarlyattrib We're collecting data on attitudes towards scholarly attribution and contributorship, 10 min survey - [t.co/3UE57szc](#)  
2 years 6 months ago.

 scholarlyattrib Micro-attribution workshop is at capacity, check out our evolving agenda at [t.co/teiAbJdQ](#).  
2 years 6 months ago.

 scholarlyattrib Workshop website is now up on [t.co/teiAbJdQ](#)  
2 years 7 months ago.

*Workshop report summarizes*

- Environmental scan
- Gaps
- Survey of researcher attitudes

[projects.iq.harvard.edu/attribution\\_workshop/](http://projects.iq.harvard.edu/attribution_workshop/)

A Proposed Standard for Describing Research Contributions

# Goals for a Prototype Taxonomy:

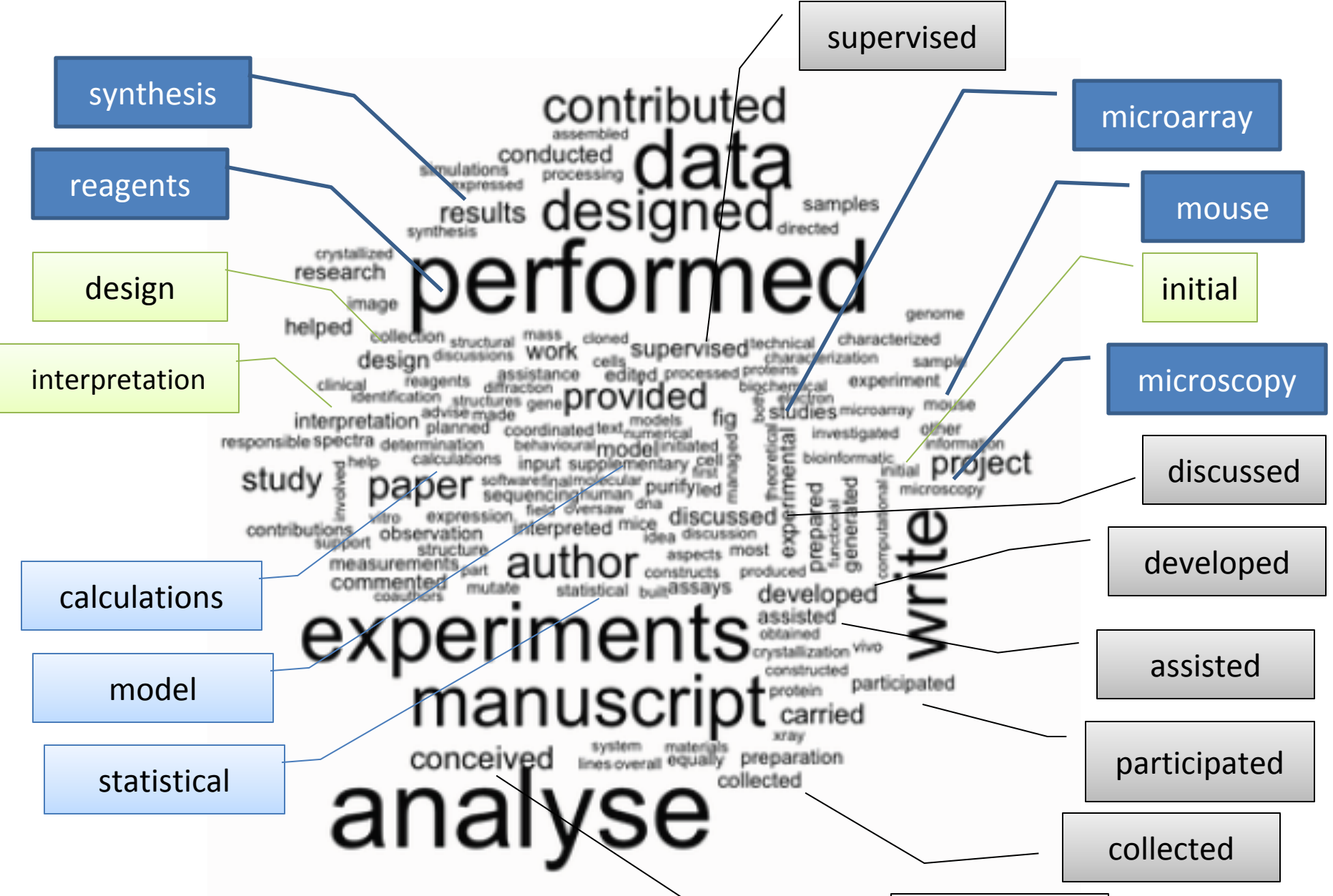
- Describe types of contributions
- Covers broad domain of research: natural, medical, physical, health, social sciences
- Theoretically justified
- Aligned with researcher behavior/attitudes
- Usable in publication environment

# Developing a Prototype

- Informed by existing specifications and practices
- Empirical analysis of practice
  - Pilot attitudinal survey
  - Analysis of NPG contributor statements
  - Analysis acknowledgement statements in CiteSeer and Elsevier journals
- Pilot testing with select publishers







Micah Altman, MIT Libraries

A Proposed Standard for Describing Research Contributions

# Harvard-Wellcome draft taxonomy:



Taxonomy category	Description of role
Study conception	Ideas; formulation of research question; statement of hypothesis.
Methodology	Development or design of methodology; creation of models.
Computation	Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms.
Formal analysis	Application of statistical, mathematical or other formal techniques to analyse study data.
Investigation: performed the experiments	Conducting the research and investigation process, specifically performing the experiments.
Investigation: data/evidence collection	Conducting the research and investigation process, specifically data/evidence collection.
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation or other analysis tools.
Data curation	Management activities to annotate (produce metadata) and maintain research data for initial use and later re-use.
Writing/manuscript preparation: writing the initial draft	Preparation, creation and/or presentation of the published work, specifically writing the initial draft.
Writing/manuscript preparation: critical review, commentary or revision	Preparation, creation and/or presentation of the published work, specifically critical review, commentary or revision.
Writing/manuscript preparation: visualization/data presentation	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.
Supervision	Responsibility for supervising research; project orchestration; principal investigator or other lead stakeholder.
Project administration	Coordination or management of research activities leading to this publication.
Funding acquisition Contributions	Acquisition of the financial support for the project leading to this publication.

# Pilot Study methodology

## Aim

- To test whether authors' contributions to recent journal articles can be assigned/classified into a series of specified roles (taxonomy)

## Method

- An online survey was designed to collect author contribution information
- 6 journals/publishers selected a number of their recently published journal articles
- The survey was sent to corresponding authors of these articles by the journals/publishers
- The Evaluation Team at the Wellcome Trust ran the online survey and carried out the initial data analysis.

## Timing

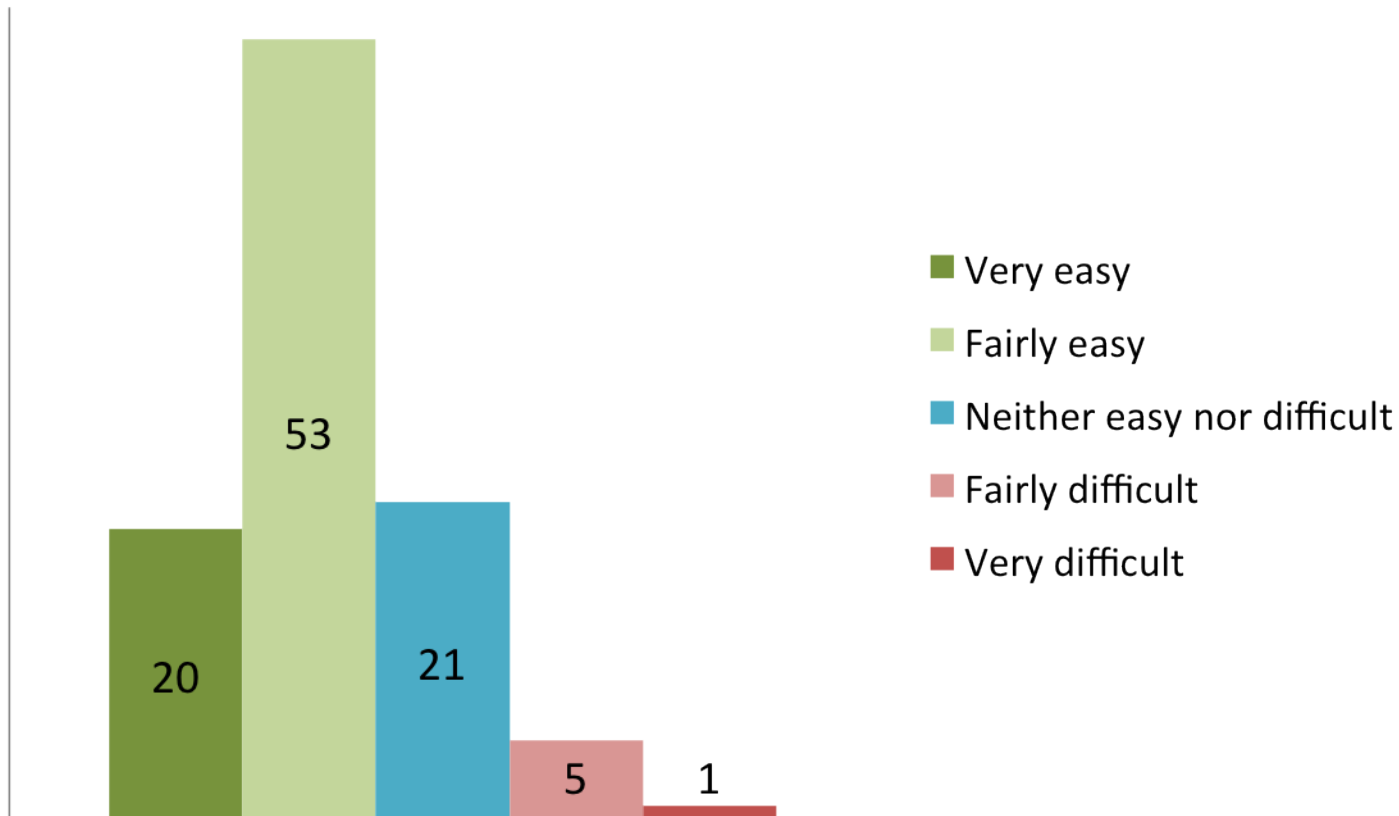
- The survey was live between August and November 2013.

# Journals/publishers included

- Total of 229 complete responses (out of 1252 corresponding authors contacted):
  - eLife, n=43
  - Elsevier, n=38
  - Nature, n=123
  - PLoS, n=23
  - AAAS, n=2

# Assigning the contributions of the authors using the taxonomy

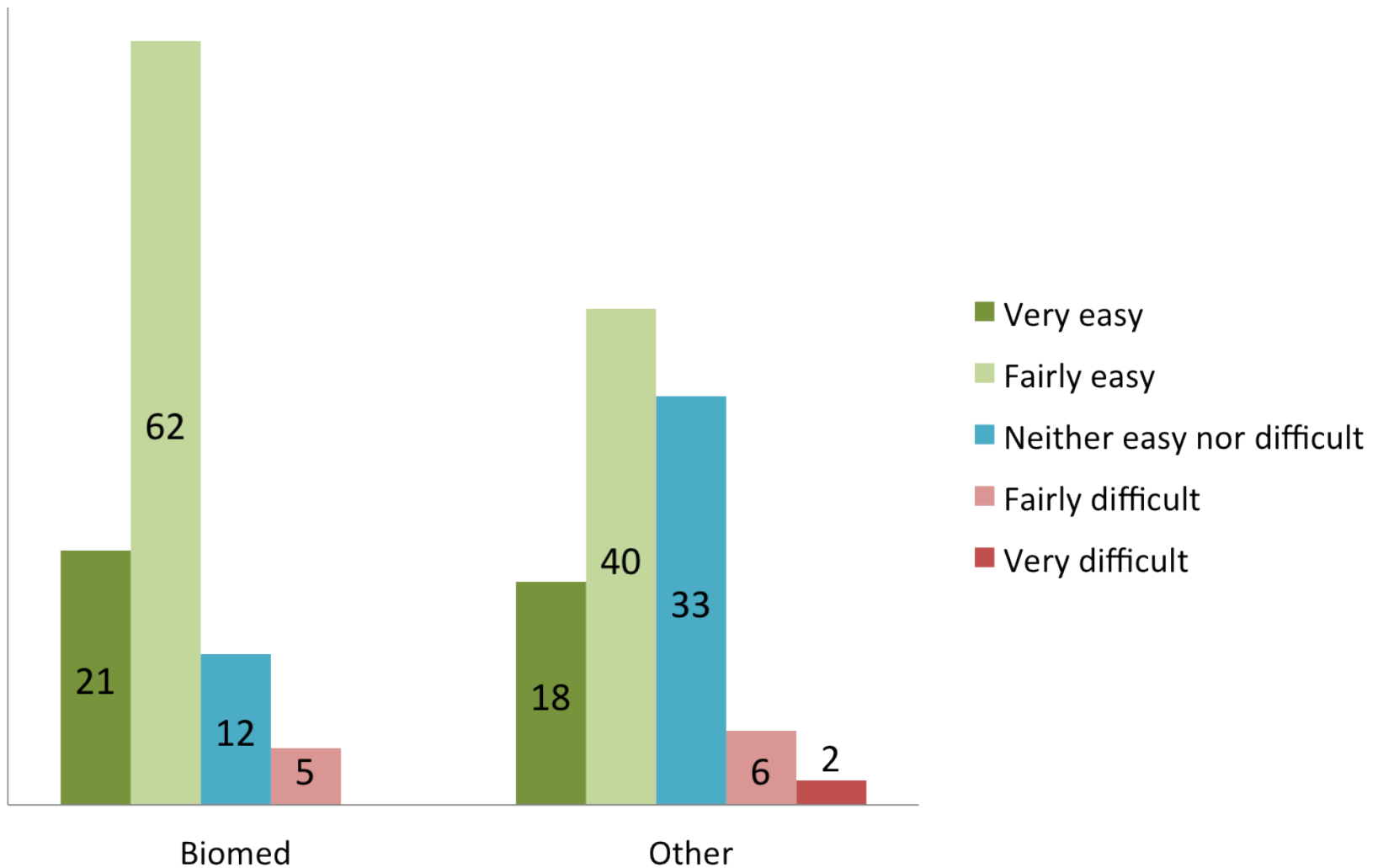
## (1) AGGREGATE RESPONSE: ALL RESPONDENTS (%)



How easy or difficult did you find it to assign the contributions of the authors on '<sup>f('publicationname')</sup>' using the taxonomy in the previous questions?

Base: All, n=229

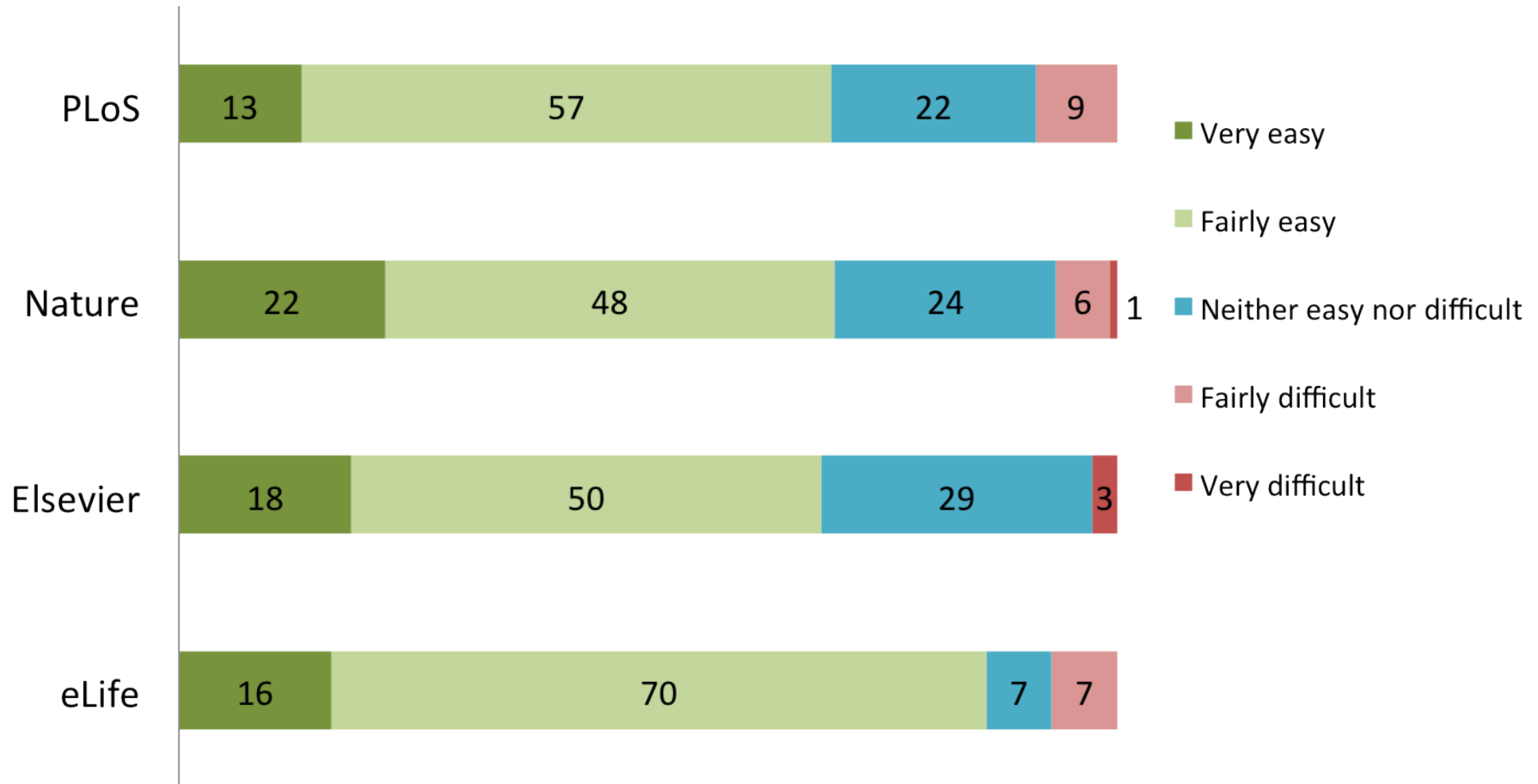
## (2) RESPONSE: BIOMED vs OTHER (%)



How easy or difficult did you find it to assign the contributions of the authors on '<sup>f(publicationname)</sup>' using the taxonomy in the previous questions?

Base: Biomed, n=130; Other, n=99

### (3) RESPONSE: BY JOURNAL (%)



How easy or difficult did you find it to assign the contributions of the authors on '<sup>f('publicationname')</sup>' using the taxonomy in the previous questions?

Base: eLife, n=43; Elsevier, n=38; Nature, n=123; PLoS, n=23; AAAS, n=2 (not shown)



## Positive comments about contributorship allocation

- **Assigning contributorship using the taxonomy was generally clear/well defined/comprehensive/intuitive/complete (n=14)**

*“...The different tasks seemed to cover the study pretty well.” (eLife)*

*“The terms provided are clear and comprehensive.” (Nature)*

*“The questions were appropriate and clear.” (PLoS)*

*“Well done! Seems to capture most aspects, and fairly well.” (Nature)*

*“I think once you get used to this scheme it would be "very easy". For the first time, "fairly easy“.” (Nature)*

*“I found the taxonomy very intuitive and complete.” (Nature)*

*“The taxonomy is comprehensive.” (eLife)*

**Please use this space to provide any comments to explain the rating you have given above.**

(How easy or difficult did you find it to assign the contributions of the authors on '<sup>f</sup>(publicationname)^(<sup>i</sup>)' using the taxonomy in the previous questions?)

Base: n=72

- **Formalising the process is a good idea (n=5)**

*"I think formalizing this process is an excellent idea." (eLife)*

*"The exercise is excellent and shall be done by all authors each time we have a scientific paper to submit." (Nature)*

*"I think that using the taxonomy as part of the submission is an excellent idea!" (Nature)*

- **All contributors should be recognised for the work they do (n=2)**

*"I think there is an unstated belief in Biology that only the person acquiring the funding should be the corresponding author. However, the students and postdocs who contribute to the conceptual design of the project could be considered corresponding authors also, should they so desire." (eLife)*

*"It was easy because we have collectively agreed that this process is open to abuse by senior authors and made sure that all authors contributed equally to the project and paper." (Nature)*

- **Lead/supporting division is good (n=1)**

*"I think the division into leading and supporting role is a good one..." (eLife)*

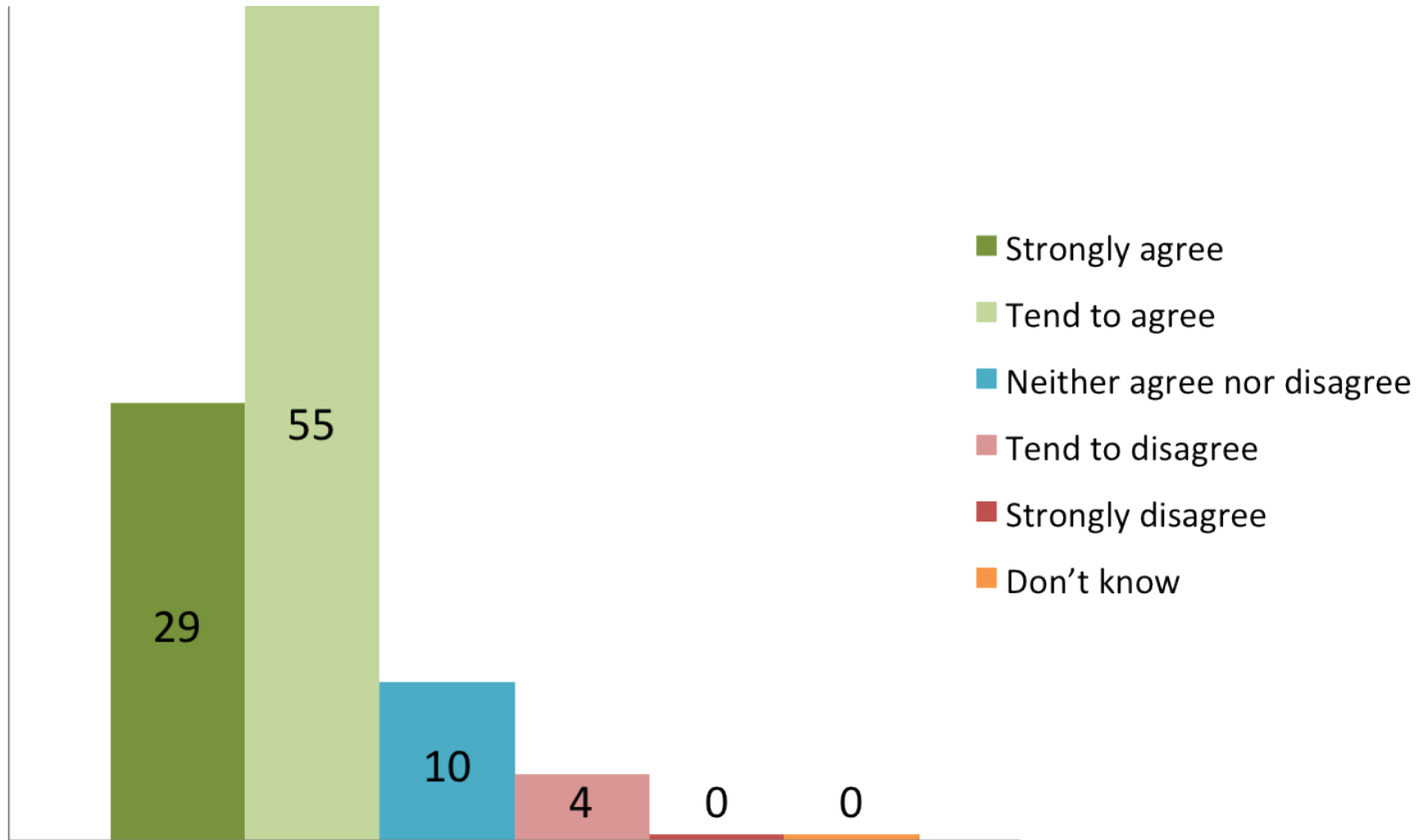
**Please use this space to provide any comments to explain the rating you have given above.**

(How easy or difficult did you find it to assign the contributions of the authors on '<sup>f</sup>(publicationname)<sup>f</sup>' using the taxonomy in the previous questions?)

Base: n=72

# Comprehensiveness of the taxonomy

## (1) AGGREGATE RESPONSE: ALL RESPONDENTS (%)



Overall, to what extent do you agree or disagree that the taxonomy is comprehensive i.e. it includes all roles in which an author could have contributed?

Base: All, n=229

- **Some roles missing/suggestions for additional roles (n=5)**

*“Should also include a role for critical discussion of results and interpretation of data.” (Elsevier)*

*“In general it contains most of the items. However, there are issues not included like: - Selection of appropriate journal - Manuscript formatting based on author guidelines - Critical roles in incorporating reviewer comments - Encouragement and emotional support - Literature review” (PLoS)*

- **Too comprehensive/detailed (n=3)**

*“Our paper was solely done in my lab so the category seems a bit too detailed. But I agree that it would be important for the works done in multiple labs/institutes.” (Nature)*

*“Does it need to be so comprehensive?” (Nature)*

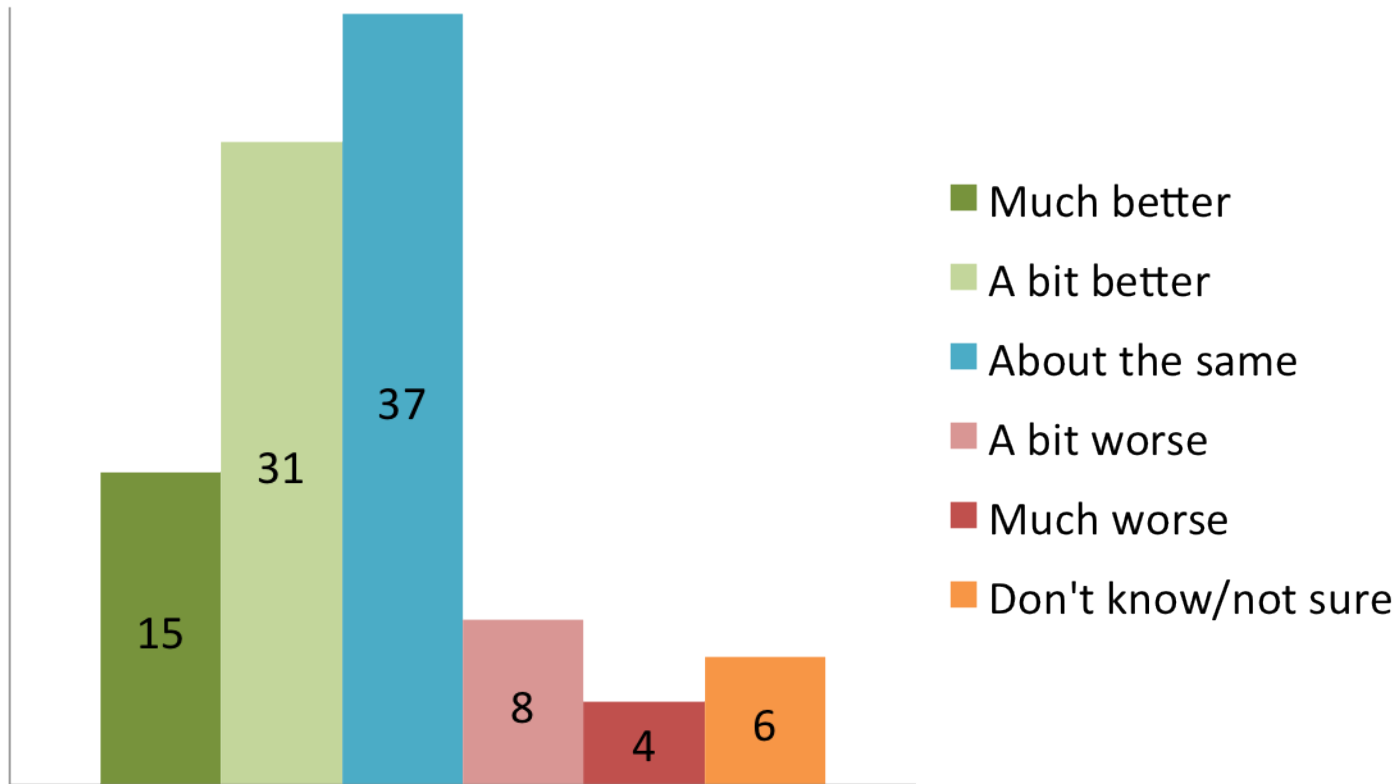
**Please use this space to provide any comments to explain the rating you have given above.**

(Overall, to what extent do you agree or disagree that the taxonomy is comprehensive i.e. it includes all roles in which an author could have contributed?)

Base: n=32

# Comparison of this structured list with how author contribution information is usually provided

(1) AGGREGATE RESPONSE: ALL RESPONDENTS (%)



How does this structured list compare with how you provided author contribution information on your most recent submission to <sup>f('journalname')</sup>, in terms of accuracy of contributions?

Base: All, n=229

	Reliably clarifies contribution for reader	Has potential to inform automated contribution report
Author name list		
Free-text contribution statements	✓	
Proprietary (journal/field specific) CRV	✓	
Standardized CRV tagging	✓	✓

# **Next steps:** Wellcome and Digital Science engaging CASRAI and NISO in a multi-phase standards process

- Phase 1: Rapid-progress consortial standards, leading to up to workshop December 2014, in conjunction with CNI
  - Formation of expert task group
  - Requirements gathering, analysis, update
  - **Community review – select reviewers**
  - Community review – meeting at CNI
  - Publish to dictionary
- Phase 2: Pilot implementations (2015)
- Phase 3: Longer-term 'accredited' standardization

# Goals of phase 1 (June-Dec 2014)

- Implementable science-oriented contributor role taxonomy, including terms and definitions
- Best practices for use of the taxonomy, including detailed guidelines for one or more implementation options (e.g., within manuscript submission system; within laboratory management system)
- Socialize the proposed taxonomy within the broader scientific community



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# Questions?

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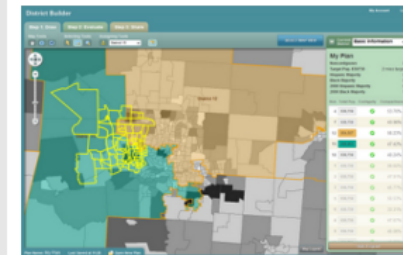
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The Program on Information Science seeks to solve emerging problems in information management that are essential to support new and innovative services, and to amplify the impact that MIT can have on the development of information science, information policy, and scholarly communication through participation the development of standards, policy, and methods related to information science and information management.

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[New Models of Scholarly Communication for Digital Scholarship \(Brown Bag Talk\)](#)

10/28/2014 12:00pm to 1:00pm

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September 30, 2014

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[NSF Awards Grants to MIT Libraries to Advance Learning through Analysis of Digital Scholarship](#)

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3 days 2 hours ago.



[drmaltman](#) Second annual release of ORCID open data: [t.co/yDV0mdmjoG](http://t.co/yDV0mdmjoG)

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4 days 2 hours ago.

A Proposed Standard for Describing Research Contributions