Big Idea for a Big Challenge: Influencing **Reproducibility** on an Institutional Scale

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AUG

30

2005

Open access, freely available online

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among the relationships probed in each scientific field. In this framework, a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical modes; when there is greater financial and other

factors that influence this problem and some corollaries thereof.

Modeling the Framework for False Positive Findings

Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of confirmation) of research discoveries is a consequence of the convenient, yet ill-founded strategy of claiming conclusive research findings solely on the basis of a single study assessed by formal statistical significance, typically for a *p*-value less than 0.05. Research is not most appropriately represented and summarized by *p*-values, but, unfortunately, there is a widespread notion that medical research articles

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity, circumscribed fields where either there is only one true relationship (among many that can be hypothesized) or the power is similar to find any of the several existing true relationships. The pre-study probability of a relationship being true is $R/(R + 1)$. The probability of a study finding a true relationship reflects the power $1 - \beta$ (one minus the Type II error rate). The probability of claiming a relationship when none

Lies, Damned Lies, and Medical Science

Much of what medical researchers conclude in their studies is misleading, exaggerated, or flat-out wrong. So why are doctors—to a striking extent—still drawing upon misinformation in their everyday practice? Dr. John Ioannidis has spent his career challenging his peers by exposing their bad science.

Dutch Cell Culture Contamination Renders Six-decades Worth of Studies False

Is Science Broken?

Or is it self-correcting?

Science Isn't Broken

It's just a hell of a lot harder than we give it credit for.

Unreliable research

Trouble at the lab

Scientists like to think of science as self-correcting. To an alarming degree, it is not

Problems with scientific research

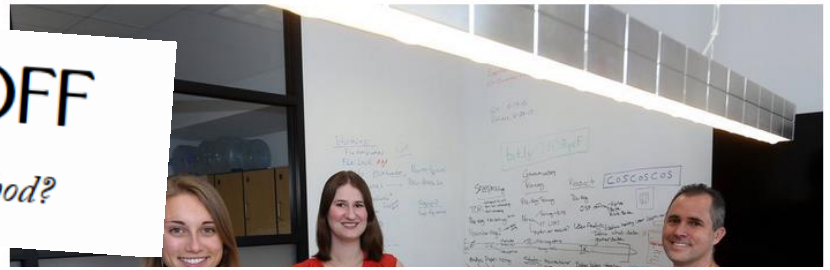
How science goes wrong

Scientific research has changed the world. Now it needs to change itself

SCIENCE

Many Psychology Findings Not as Strong as Claimed, Study Says

By BENEDICT CAREY AUG. 27, 2015



RELATED COVERAGE

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JUNE 15, 2015

THE TRUTH WEARS OFF

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Biomedical researchers lax about validating antibodies for experiments

Failure to test common research component could undermine reproducibility of results.

A Credibility Crisis in Food Science

The fall of a prominent behavioral scientist tells of a system where research is judged not on merit, but on the attention it gets.

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THE CHRONICLE OF HIGHER EDUCATION

RESEARCH

Amid a Sea of False Findings, the NIH Tries Reform

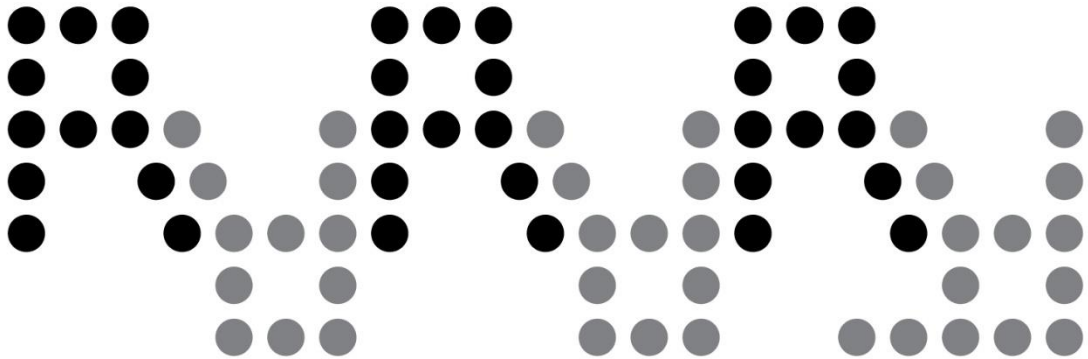
When in doubt, educate

Step 1:

Be completely surprised that your grant application for a conference was funded.

Step 2:

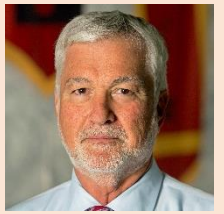
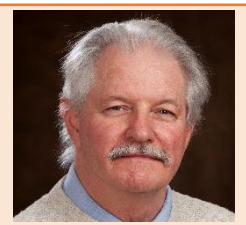
Figure out how to spend the funds.



RESEARCH REPRODUCIBILITY

#MakeResearchTrue

#UTAHRR 18

Opening Remarks: Melissa Rethlefsen, Andrew Weyrich	 
Keynote #1: **Victoria Stodden**: Reproducibility in Computational and Data-enabled Science	
Panel #1: **What Universities Do (and Don't Do) to Influence (or not) Research Reproducibility** Moderator: Victoria Stodden; Tom Parks, Randolph Hall, Brian Avery	   
Panel #2: **Research Integrity and Journal Publishing** Moderator: Mollie Cummins; Justin Cherny, Eric Eide, John Ryan	   
Panel #3: **How to Call Out Non-Reproducible Research** Moderator: Scott Aberegg; Ed Dudek, Hilda Bastian, Ivan Oransky	   
Keynote #2: **Ivan Oransky**: Retractions, Post-Publication Peer Review, and Fraud: Scientific Publishing's Wild West	


EXIT
Research Reproducibility
A Conceptual Architecture for Reproducible On-demand Data Integration for Complex Diseases

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RESEARCH REPRODUCIBILITY

#UTAHRR 18

SUBMIT A POSTER PROPOSAL

The Research Reproducibility Conference poster session will showcase cutting-edge research and works-in-progress in pursuit of making research reproducible.

Presenting a poster is a great opportunity, especially for students and new researchers, to obtain interesting and valuable feedback on ongoing research from conference attendees.

More info at: campusguides.lib.utah.edu/UtahRR18/proposal

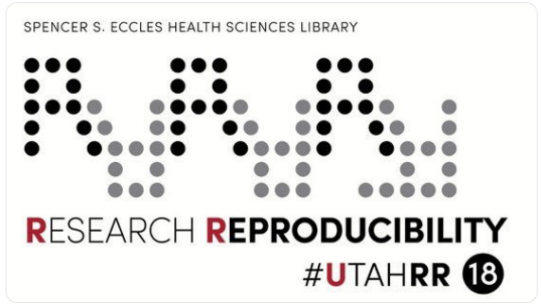
COURSE
June 11–15, 2018

CONFERENCE
June 15, 2018

HEALTH
UNIVERSITY OF UTAH

John Ryan
@JJRyanMD
Following

Mediterranean Diet retracted and republished- coincides with Research Reproducibility being held tomorrow with @victoriastodden @ivanoransky @MRCutah, me & others. @EHSLibrary #makeresearchtrue #utahRR18 campusguides.lib.utah.edu/UtahRR18 nejm.org/doi/full/10.10 ...



9:02 AM - 14 Jun 2018

2 Retweets 5 Likes

Julie Kiefer
@JulieCKiefer
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What are some ways that @EHSLibrary is approaching the research reproducibility problem? Listen to find out on @TheScopeRadio @UofUHealth

Science is Unreliable. What Can We Do About It? #UtahRR18 #MakeResearchTrue healthcare.utah.edu/the-scope/show ...

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To ask any questions from the live stream use slido.com with the code #N673 #UtahRR18 #MakeResearchTrue #Reproducibility #medlibs #datalibs

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9:46 AM - 15 Jun 2018

2 Retweets

1 2

CCTS Utah
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Tackling how we present methodology in scientific journals will contribute to improved research reproducibility #UtahRR18 Listen to the livestream of the afternoon panel, Research Integrity and Journal Publishing youtube.com/watch?v=OVeUcL... #UtahRR18

2018 Research Reproducibility Conference: Building Res...
The conference will be held June 15, 2018 at The University of Utah S. J. Quinney College of Law, with internationally-known guest speakers, panelists, a pos...
youtube.com

1:59 PM - 15 Jun 2018

2 Retweets 1 Like

2 1

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UNIVERSITY OF UTAH S.J. QUINNEY COLLEGE OF LAW

2018 Research Reproducibility Conference: Building Research Integrity Through Reproducibility

424 views

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Event summary report

2018 Research Reproducibility Conference: Building Research Integrity Through Reproducibility

Active users	Questions	Poll votes
51	109	0
Engagement score 160	Likes / dislikes 203 / 0	Polls created 0
Engagement per user 3.1	Anonymous rate 78%	Votes per poll 0

Popular questions

Ed Dudek
15 Jun, 4:49pm — 0 — 12

Comment on: The elephant in the room is that reproducibility and rigor receive little or no consideration (compared to innovation and "high profile") by recruitment and tenure committees and grant review panels.

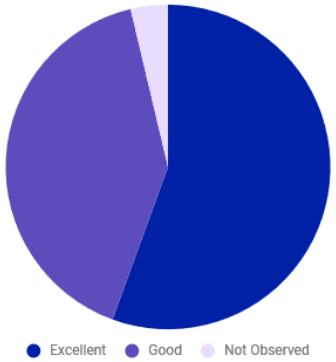
Anonymous
15 Jun, 8:44pm — 0 — 8

How can undergrad/grad lab members encourage reproducible practices in labs with less than willing PIs?

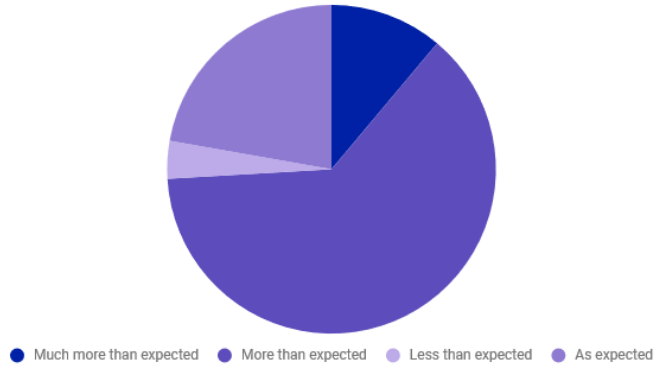
Anonymous
15 Jun, 3:21pm — 0 — 8

Do you see the culture found in many scientific fields to publish original,

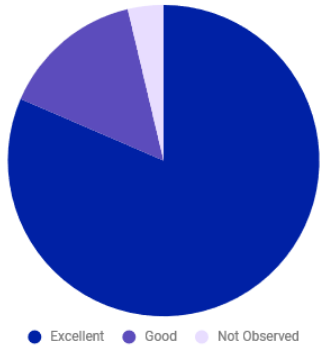
Topics



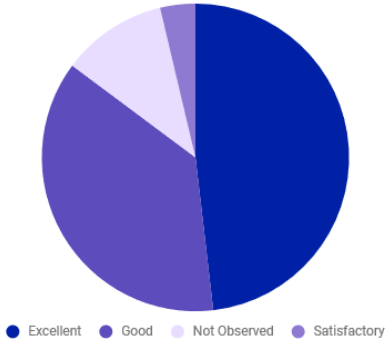
Overall Quality



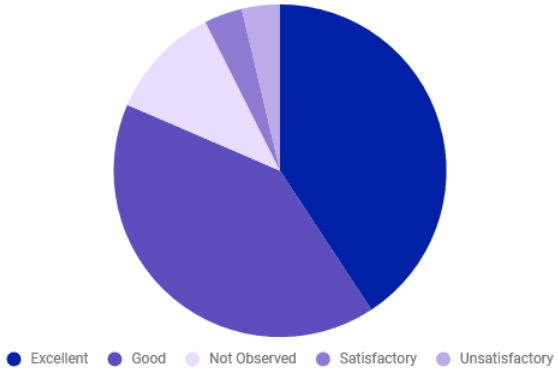
Amount Learned



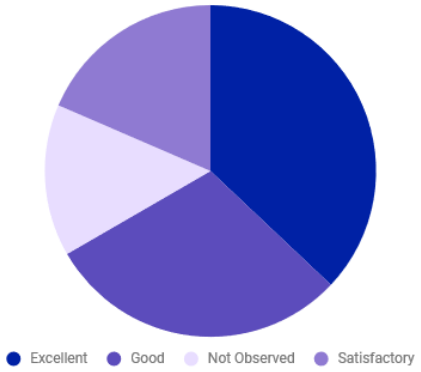
Victoria Stodden



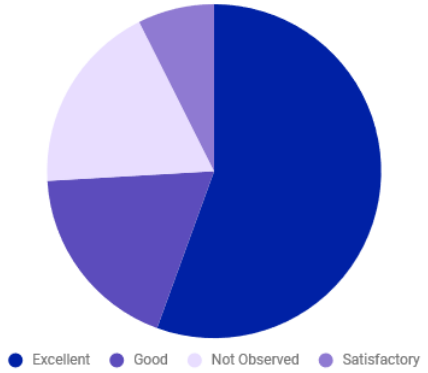
Panel #1



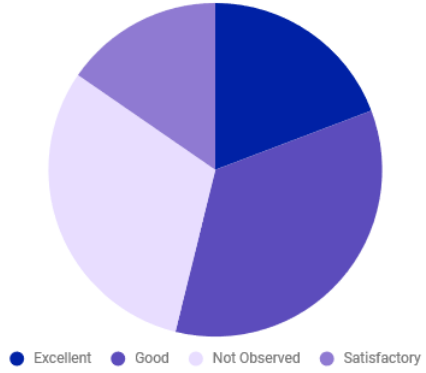
Panel #2



Panel #3



Ivan Oransky



Poster Session

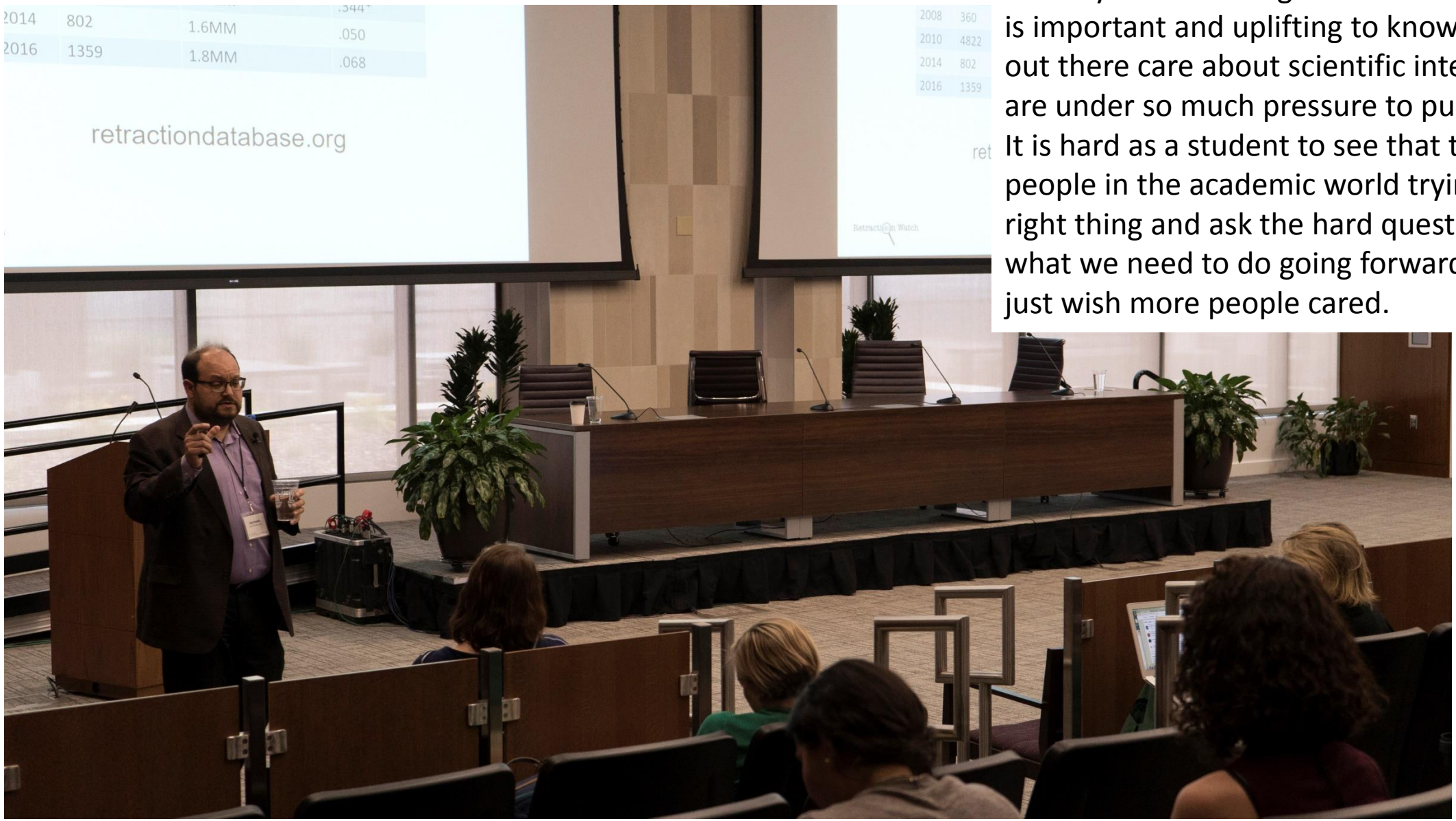
It was great! I look forward to the next one! I'd love to see this annually rather than every 2 years!

I loved [Dr. Stodden]'s talk. It made me think about challenging questions I hadn't thought of before and redefined the question of reproducibility for me in a really eye-opening way.

It is actually a tough problem. It can't be solved unilaterally by U of U without adverse consequences to the status of U of U (i.e. through the reduction of overall publication volume). So, tracking what other universities are doing and keeping pace will probably produce a practical outcome.

I thought the Research Integrity and Journal Publishing panel was the best panel, in part because of the personalities of the panelists, but also the way the audience questions were answered, and how well the panel covered the questions many of us have regarding publishing manuscripts.

Panel 3 focused on too much of the "big hitter" items and they were not prepared to have a discussion on the small issue of reproducibility that affect most people. The vast majority of scientists are not blatantly falsifying or plagiarizing, but they are making small tweaks to data or arguments that make it "mostly" ok. Also the issue of superiority and power- struggle in science affects the ability to stand up for integrity of research was touched on but **no one has any answers for this and it makes me frustrated that that conversation is too hard to even have in a panel like this one**



Thank you for making this discussion happen. It is important and uplifting to know that people out there care about scientific integrity when PIs are under so much pressure to publish or perish. It is hard as a student to see that there are people in the academic world trying to do the right thing and ask the hard questions about what we need to do going forward as a field. I just wish more people cared.

The poster session seemed to have several people that had to catch flights before it finished. Having the session at the beginning of the conference might be better.

Did we achieve institutional change?

Not yet. But it’s a start.

Funders & Support

- We'd like to thank our funders for #UtahRR18:
  - Office of Research Integrity: Department of Health and Human Services (ORIIR170034)
  - Vice President for Research Office, University of Utah
  - Center for Clinical and Translational Science, University of Utah (UL1TR001067)
  - Spencer S. Eccles Health Sciences Library, University of Utah
  - Department of Philosophy, University of Utah
  - MidContinental Region of the National Network of Libraries of Medicine (UG4LM012344 Subaward)

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More Resources

- Rethlefsen ML, Lackey MJ, Zhao S. Building capacity to encourage research reproducibility and #MakeResearchTrue. **Journal of the Medical Library Association**, 106(1):113–9, 2018. doi:https://doi.org/10.5195/jmla.2018.273.
- Research Reproducibility 2018: Building Research Integrity Through Reproducibility: https://www.youtube.com/watch?v=OVeUcLRWaq4
- Research Reproducibility 2018 LibGuide: http://campusguides.lib.utah.edu/UtahRR18/Conference
- Rethlefsen ML, Ayala P, Cherney J. Librarians Improve Science: Impacting Research Quality through Transparency and Reproducibility: http://www.choice360.org/librarianship/webinars/librarians-improve-science
- Rethlefsen ML. Research reproducibility and open science: https://video.dartmouth-hitchcock.org/media/Research+Reproducibility+and+Open+Science/1_8p0d4rnf

Thank you! Questions?

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