National Aeronautics and Space Administration

NASA

A NASA OPEN-SOURCE SCIENCE MISSION: TOPS: TRANSFORM TO OPEN SCIENCE

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A NASA OPEN-SOURCE SCIENCE INITIATIVE:
TOPS: TRANSFORM TO OPEN SCIENCE

New Funding Opportunity!

$3 million/year: to advance adoption of Open Science

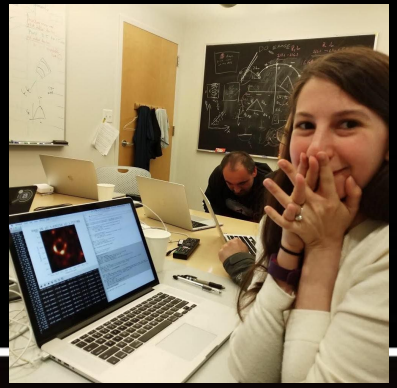
F.14 Transform to Open Science Training (TOPST)

1) Develop ScienceCore
2) OpenCore summer schools
3) OpenCore virtual cohorts

Nov 3, 2022 – Office Hours
Nov 10, 2022 – (Optional) Notice of Intent Due
Dec 8, 2022 – Proposal Due

SCAN ME

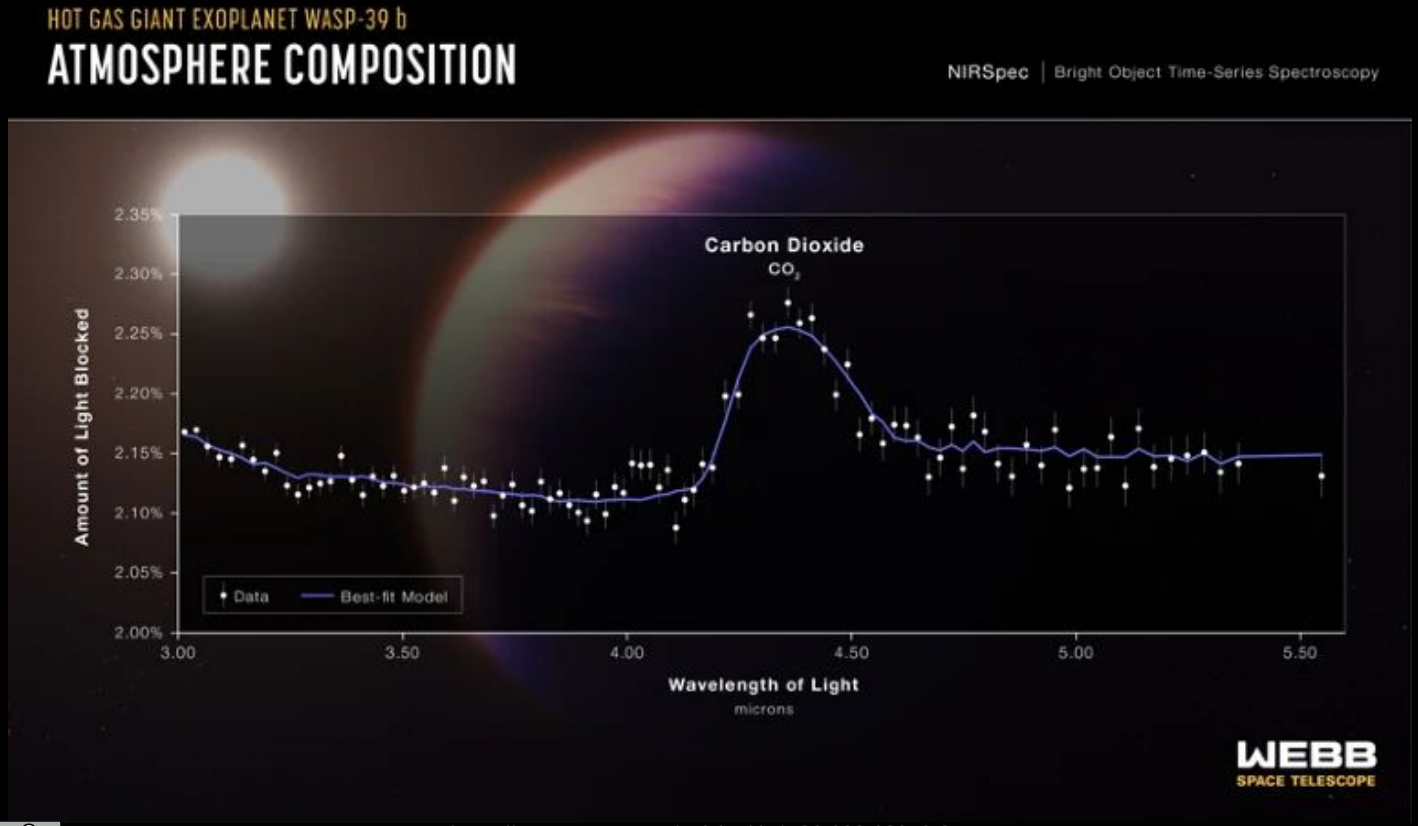
Breakthrough discoveries: First image of a black hole



"We're deeply grateful to all the open source contributors who made our work possible."
- Dr. Katie Bouman

Photo: EHT collaboration; NASA/CXC/Villanova University

Astronomers see CO2 on exoplanet for first time

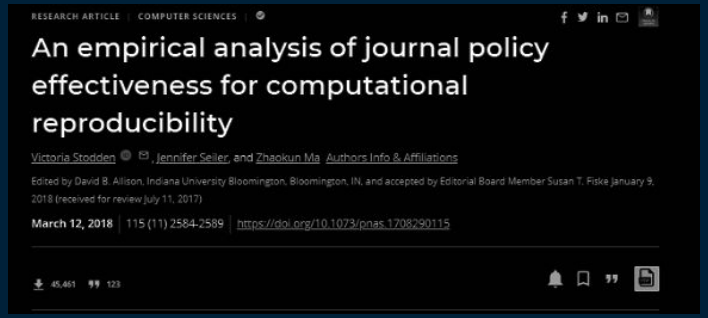


"NASA's open science guiding principles are centered in our Early Release Science work, supporting an inclusive, transparent, and collaborative scientific process."
- co-author Dr. Natasha Batalha

https://www.nature.com/articles/d41586-022-02350-2

Is all of science this awesome?

Can we build-on and extend results?


RESEARCH ARTICLE | COMPUTER SCIENCES

An empirical analysis of journal policy effectiveness for computational reproducibility

Victoria Stodden, Jennifer Seiler, and Zhaokun Ma Authors Info & Affiliations

Edited by David B. Allison, Indiana University Bloomington, Bloomington, IN, and accepted by Editorial Board Member Susan T. Fiske January 9, 2018 (received for review July 11, 2017)

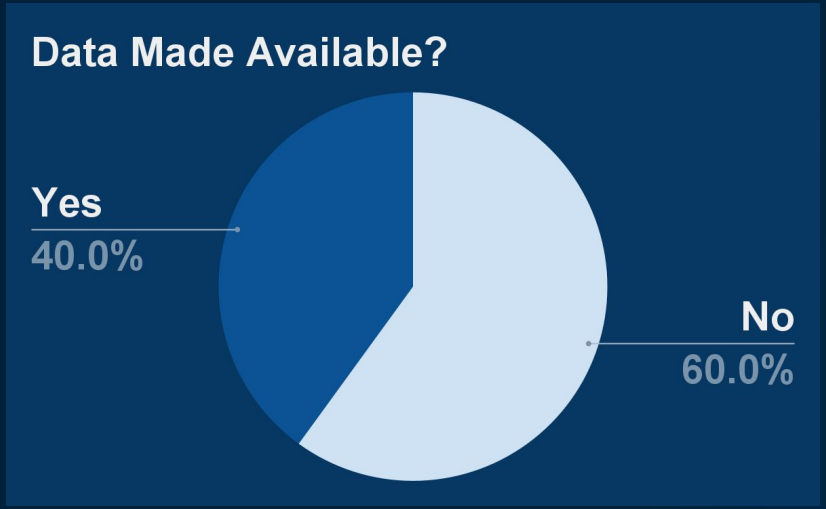
March 12, 2018 | 115 (11) 2584-2589 | https://doi.org/10.1073/pnas.1708290115

45,461 123

Tested 204 scientific papers published in AAAS Science (top journal):

-Data?

-Reproduce?



https://www.pnas.org/doi/full/10.1073/pnas.1708290115

Can we rapidly iterate and resolve problems?

Global cooling in upper atmosphere reported

Analysis of satellite data showed cooling, therefore global warming is a farce

1990

1998

Error in analysis discovered

Authors didn't account for orbital decay and other effects - introduced an artificial cooling trend

2003

New version released

Closed code. Took 5 years & lots of funding a different group to re-do analysis

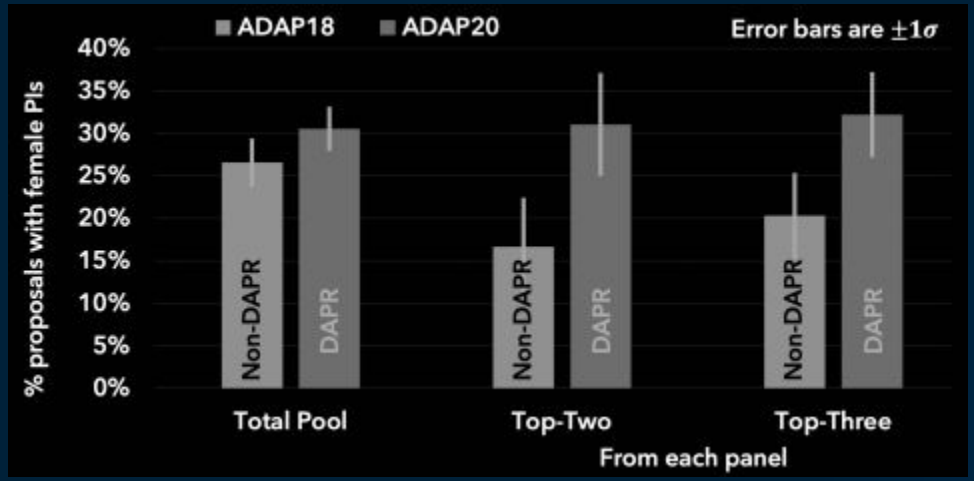
https://digitalcommons.unl.edu/cgi/viewcontent.cgi?article=1318&context=usdeptcommercepub

Can anyone participate?

access to journals worldwide via Wiley licenses

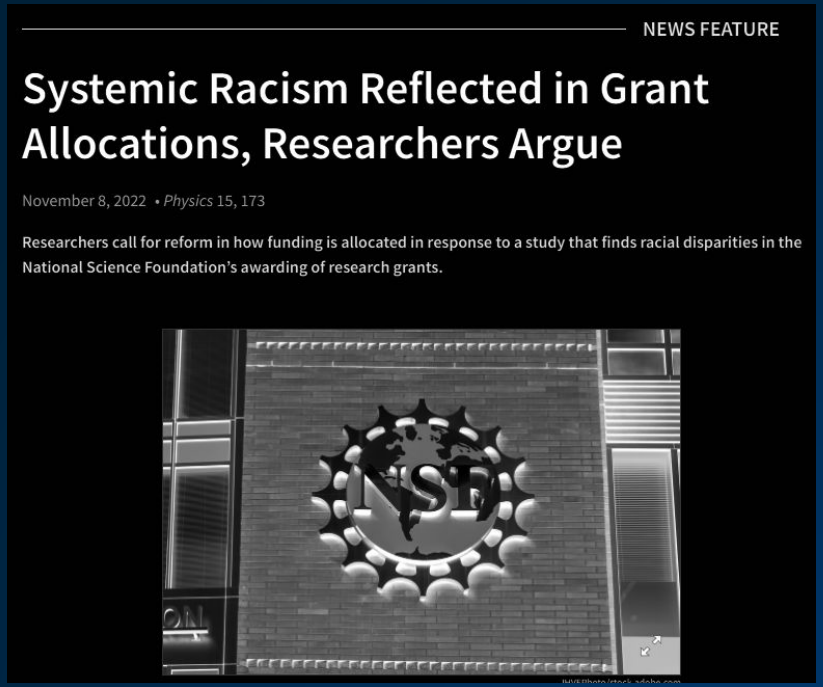
WILEY

Is it a level playing field?



Dual anonymous peer review (DAPR) analysis

https://science.nasa.gov/researchers/dual-anonymous-peer-review



NEWS FEATURE

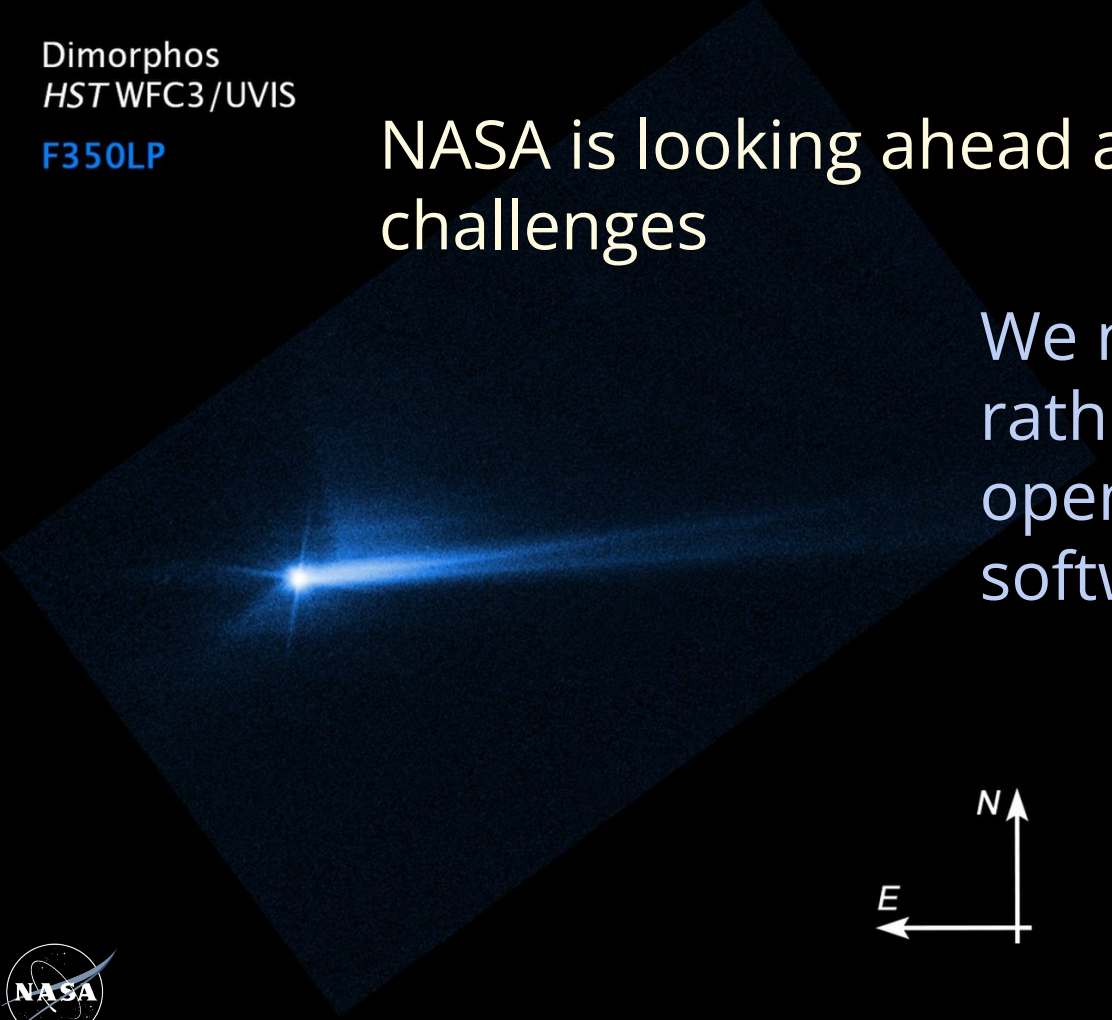
Systemic Racism Reflected in Grant Allocations, Researchers Argue

November 8, 2022 • *Physics* 15, 173

Researchers call for reform in how funding is allocated in response to a study that finds racial disparities in the National Science Foundation's awarding of research grants.

https://physics.aps.org/articles/v15/173

Looking forward



NASA is looking ahead at really big challenges

We need ***more*** WE science rather than ME science[1]– openly sharing data, software, & results

Credit: Science: Nasa, ESA, Jian-Yang Li (PSI); animation: Alyssa Pagan (STScI)

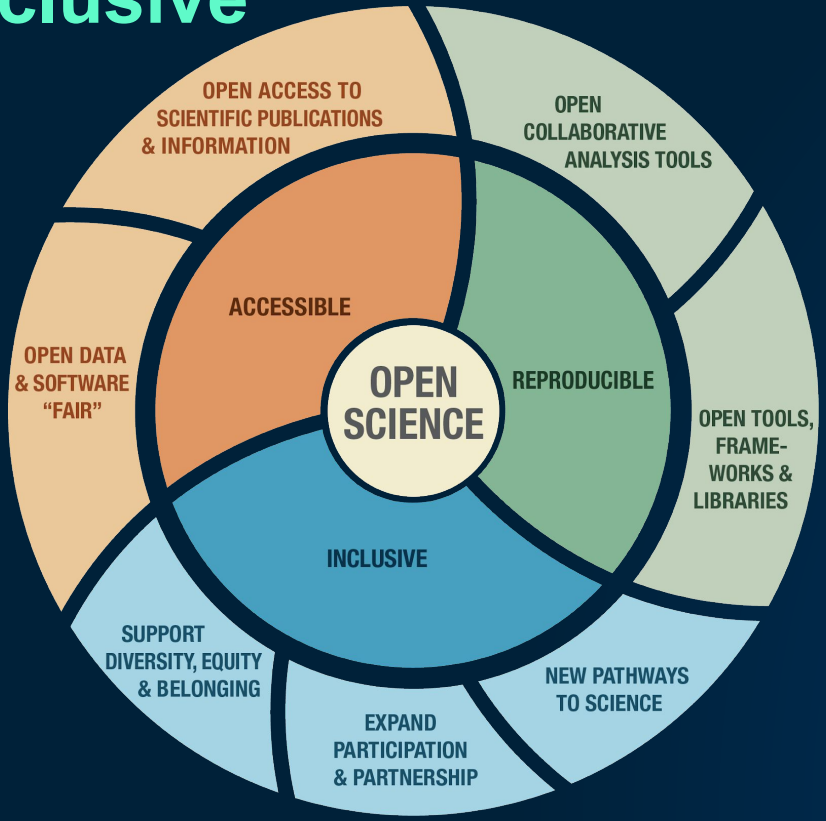
1: quote from Harlan Krumholz, Yale School of Medicine at 2022 CZI meeting

We need ***more*** people - more hands, more eyes, more brains - with diverse experiences to participate so that we ask the best questions and find the best solutions

Image credit: JPL

What can we do about this?

Open Science is Accessible, Reproducible & Inclusive



Creates research that is:

- Cited more
- Creates a bigger impact
- Increases transparency
- Generates more scholarly collaborations

Inclusive science means more:

- Collaborative projects
- Access to 'hidden knowledge'
- Equitable Systems
- Participation

Policy

Infrastructure

NASA's Open-Source Science Initiative $20M/year

Funding

Outreach

NASA is Leading the Path to Open Science

NASA's Transform to Open Science (TOPS) is a $40 million 5-year mission to accelerate adoption of open science

TOPS Strategic Goals:

- Support 20K researchers to earn NASA's open science badge
- Double the participation of historically excluded groups across NASA science
- Enable five major scientific discoveries through open science principles

Engagement

Capacity Sharing

Incentives

Moving to Openness

Join us as we embark on the 2023 Year of Open Science with NASA TOPS!

2023 is NASA's Year of Open Science

NASA Science has designated 2023 as the Year of Open Science. Throughout the year NASA will be energizing and uplifting open science across the scientific community through:

Engagement

Open Science everywhere: Articles, announcements, Twitter Spaces, conferences

2023 Big annual meetings Open Science Themes, integrated into society comms

Capacity Sharing

Online, free, Open Science curriculum on Open edX

Workshops, events, virtual cohorts, science team meetings, hackathons

Many paths to Open Science

Incentives

Open Science Badge/Certification

High profile prizes and challenges

High profile awards in support of open science research

Moving to Openness

Require open data, open software, open access

Funding decisions consider open science activities

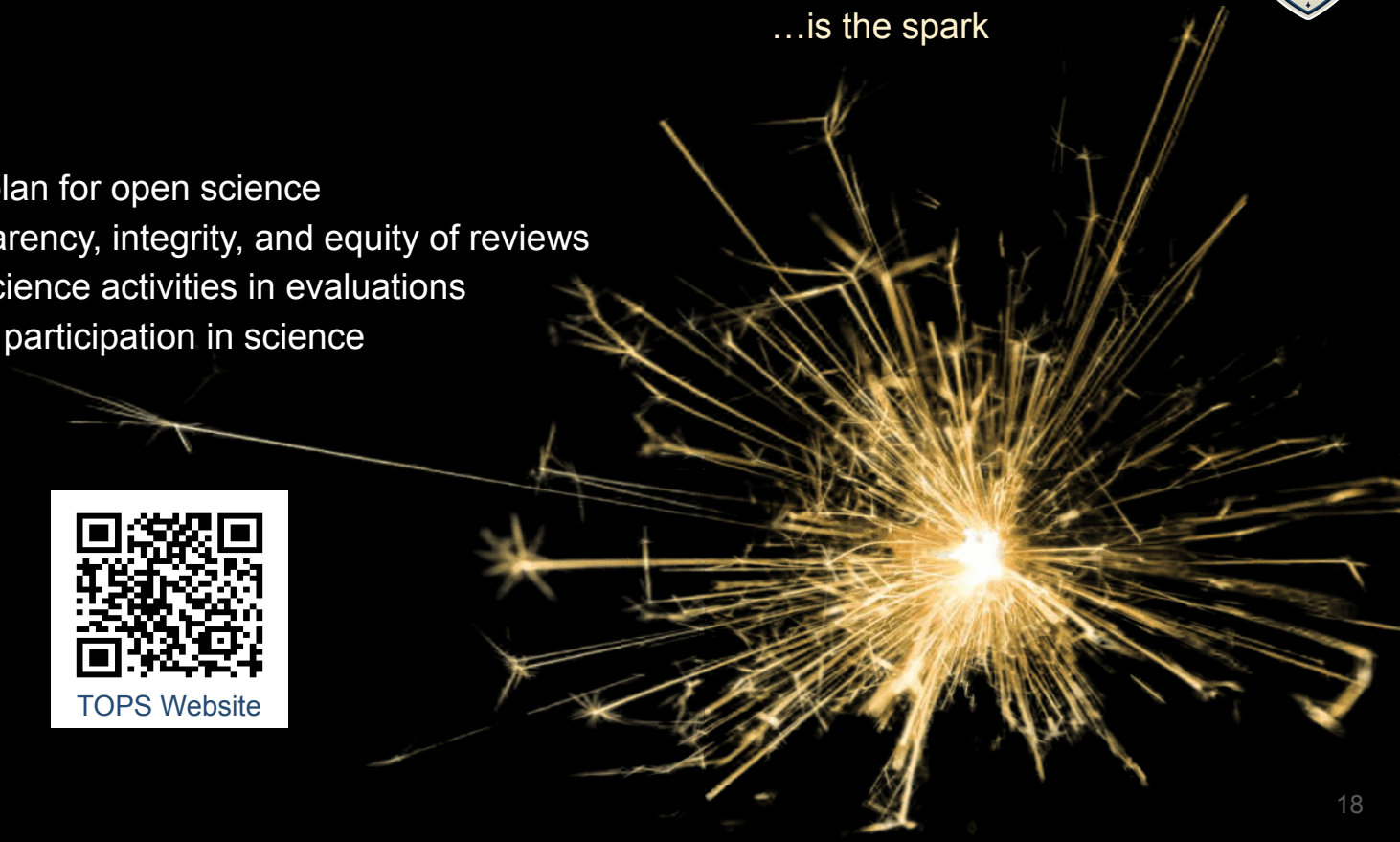
Awards, promotions, evaluations consider Open Science activities and teams as well as individuals

NASA's 2023 Year of Open Science

…is the spark

Goals:

- Create a strategic plan for open science
- Improve the transparency, integrity, and equity of reviews
- Account for open science activities in evaluations
- Remove barriers to participation in science



TOPS Email List

TOPS Website

OpenCore: NASA's Open Science Curriculum

What is open science, why should I be open?

How to use popular open science tools

How to use, make, & share software

How to use, make, & share open data

Best practices for sharing all results and analysis, as well as peer reviewing

ETHOS OF OPEN SCIENCE

OPEN TOOLS & RESOURCES

OPEN SOFTWARE

OPEN DATA

OPEN RESULTS

Open Science

Open Tools

Open Software

Open Data

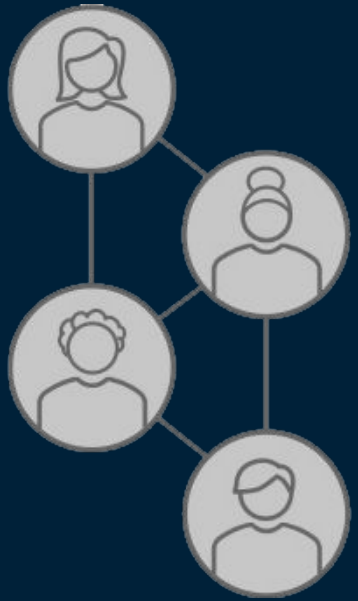
Open Results

Earn Badges at Each Level

Complete All 5 & earn TOPS Open Science Badge & Certification

OpenCore Curriculum

*A **community developed** introduction to open science*



Designed to provide researchers with **core open science skills:**

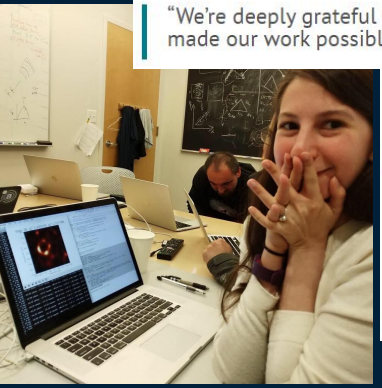
- Create the digital tools to perform open science (e.g., Github account and ORCID)
- Become aware of data management and software management plan best practices and resources
- Grow connections across a community of open science practitioners

Area of Action: Incentives

Open Science Awards

- Award Purpose: To reward significant leadership and progress toward open science and showcase the benefits of open science
- Societies establish and sustain TOPS Open Science Prizes and Awards programs
- TOPS will work with societies to evaluate and update their existing awards and recognitions to:
  - Include open science activities as review criteria
  - Where possible allow for team nominations

Open Science Results Speak for Themselves….



First image of black hole

> "We're deeply grateful to all the open source contributors who made our work possible." –Dr. Katie Bouman

> "The open source community is very important for scientists; imagine if we had to do everything from scratch every single time." –Dr. Chi-Kwan Chan

> We "greatly improve[d] our own work by adopting well-tested community packages that contain the collected wisdom of many other projects." –Dr. Lindy Blackburn

> "with the open source projects in NumFOCUS, we were able to iterate our algorithms so fast that they enabled us to finish our work in two years"

Lucas Sterzinger
@lucassterzinger

Replying to @ChelleGentemann and @theNASEM

Probably the most common answer, but using @xarray_dev, @dask_dev, @ProjectJupyter, and @matplotlib has been the backbone of my research since day 1. Working with these tools also motivates me to make the data and code for my plots open source, making my science more reproducible

7:41 AM · Mar 11, 2022 · Twitter Web App

Dr. Julia Stewart Lowndes
@juliesquid

Replying to @ChelleGentemann and @theNASEM

Congrats Chelle!
The welcoming, inclusive, collaborate-and-reuse culture of the #rstats community is something that changed my science-life and my life-life. Hard to distill but here are a few attempts:
openscapes.org/blog/2020/02/2...
openscapes.org/blog/2019/02/1...
openscapes.org/blog/2019/08/2...

3:15 PM · Mar 11, 2022 · Twitter Web App

Pierre de Buyl
@pdebuyl

Replying to @ChelleGentemann and @theNASEM

In remote sensing: using @PyTrollOrg satpy as a comparison point for reading geostationary satellite data, @scitools_iris and panoply from @NASA for plotting said data.

12:15 PM · Mar 11, 2022 · Twitter Web App

Sam Ehrenstein
@elasticsnake

Replying to @ChelleGentemann and @theNASEM

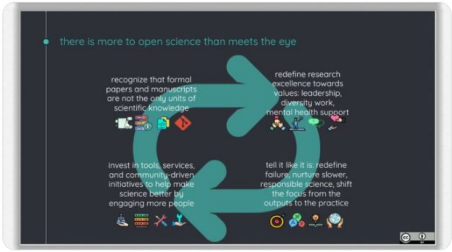
In computer science, research moves very fast. It would not be possible to keep up with the latest work if not for the arXiv and open-access conferences.

1:47 PM · Mar 14, 2022 · Twitter W

Paola Masuzzo
@pcmasuzzo

Replying to @ChelleGentemann and @theNASEM

An aspect we should talk more about, open research practices as a driver to a real reform in the research endeavour. I try to depict it in this image :)

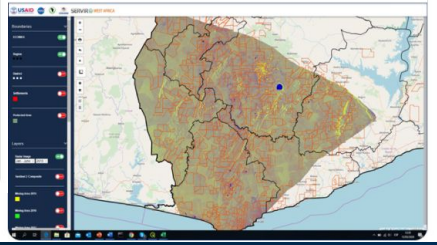


Belize GEO @BzGEO · Mar 11

Replying to @ChelleGentemann and @theNASEM

Our friends @SERVIRGlobal have many examples of how algorithms + code from one region have been customized for use in another. An example is gold mining monitoring, where Amazonia + W. Africa have collaborated in an #OpenScience context, leveraging #GEE.

> **simonestaiger** @simonestaiger · Apr 8, 2020
> Reducing illegal gold mining in the tropical forests of Ghana and Peru: A forthcoming collaboration across the Atlantic #SERVIRamazonia servir.ciat.cgiar.org/illegal-gold-m... @USAIDPeru @SERVIRGlobal @CERSGIS_GH @NovoaSidney @amazonacca @sig_gis @BiovIntCIAT_eng



Scott Collis (He/Him)
@Cyclogenesis_au

Replying to @ChelleGentemann @openscience and @theNASEM

Being an open scientist has:
1) accelerated my career. It has allowed me to choose projects which benefit more people.
2) Has created long lasting collaborations and friendships. When you are open you are… open!
3) Made me a better scientist. "Show your working!"

6:36 AM · Mar 12, 2022 · Twitter Web App

Ricardo Barros Lourenço
@rblourenco

Replying to @ChelleGentemann and @theNASEM

I've briefly returned to the public-private sector (between 2019-21) and the nicest thing about working with OSS during all my career was the ability to show new methods to be applied in that company, which was of clear understanding, helping auditing efforts.

7:56 AM · Mar 12, 2022 · Twitter Web App

Max Grover @mgroverwx · Mar 11

Replying to @ChelleGentemann and @theNASEM

Here's a great use-case of @Py_ART , which is funded by @doescience @armnewsteam ! Over 200 citations so far, with many including awesome code like this paper which enables #OpenScience !

> **Milind Sharma** @Gewitter_Blitz · Mar 11
> The power of open source software! The authors (@jehcssou and @deeplycloudy) also provide a clean code to encourage reproducible science. I could apply their technique to my dataset within a few hours. Neat! Yes to #OpenScience

Quotes from https://numfocus.org/case-studies/first-photograph-black-hole

How YOU can Get Involved:

To implement a cultural shift, we need community engagement from the broad spectrum across the scientific community!

We are looking for community partners to co-develop YOOS activities

- Develop open science action plans
- Share your data, software, publications
- Nominate science teams for summer schools
- Organize events
- Join TOPS email list!

Learn more and collaborate with us - we're working on GitHub!

TOPS Email List

TOPS Website


Q&A
Learn more and collaborate with us!
TOPS Email List
TOPS Website