Tooling Open Science With Web3 & The Blockchain

Open Science

Science Ouverte

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- Co-Founder, FrontierDAO
- Small Business Owner - IoT Logistics, LLC
- Subcontractor to NASA - STEM Inclusion
- Builder/ Creator - Frontier Registry

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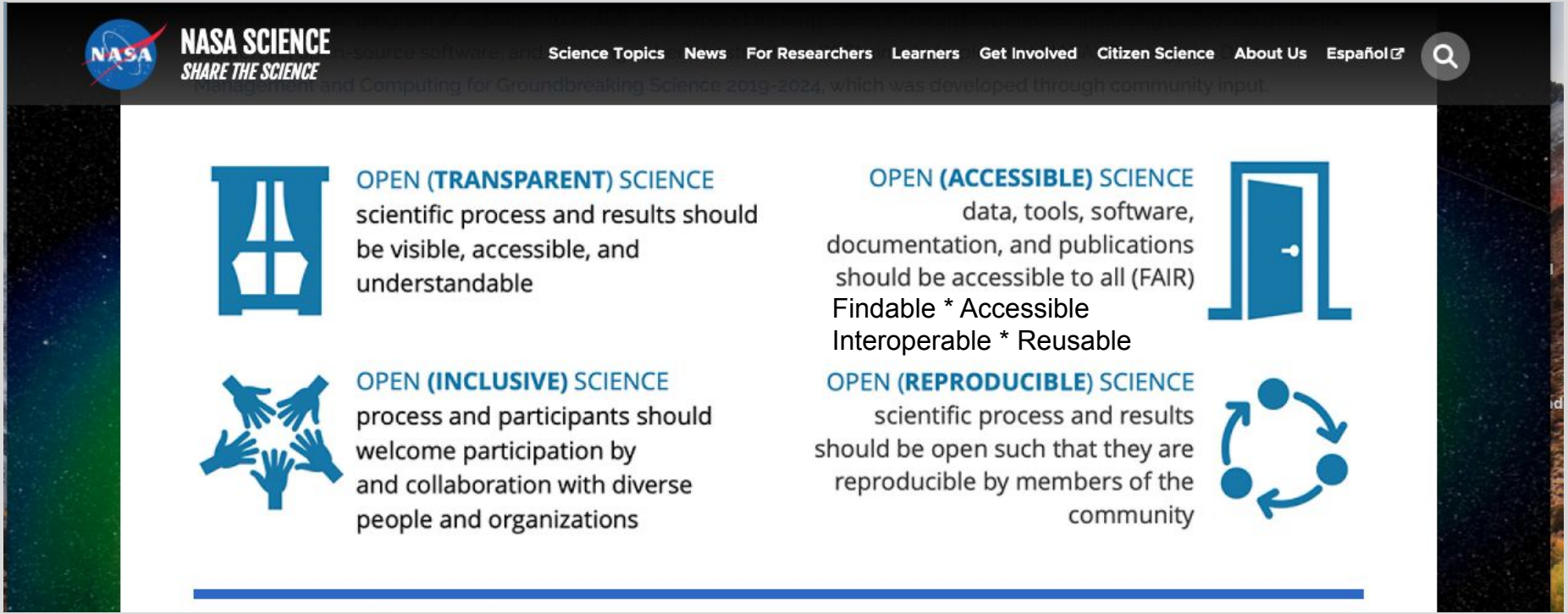


Open Science is:

- TRANSPARENT
- ACCESSIBLE
- INCLUSIVE
- REPRODUCIBLE

NASA TOPS - Transform to Open Science

NASA'S 5-Year Plan to accelerate Open Science practices.

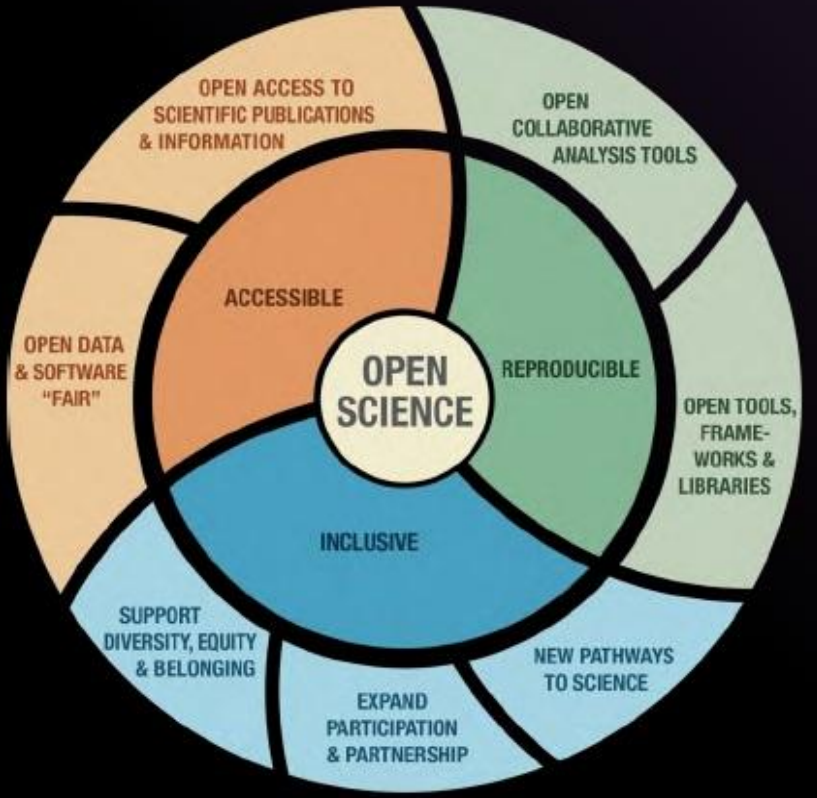
Roadmap:

- ❏ Enable 5 major scientific discoveries through open science principles
- ❏ Broaden participation of historically excluded communities - Double the participation of these groups across NASA Science
- ❏ Increase understanding and adoption of open science principles and techniques
- ❏ Support 20K researchers to earn NASA's Open Science badge
- ❏ Accelerate major scientific discoveries

TOPS Website

We need more WE science, rather than ME science. Openly sharing data, software and results.- Yale

Open Science is Accessible, Reproducible & Inclusive



Creates research that is:

- Cited more
- Has a bigger impact
- Increases transparency
- More inclusive

Inclusive science means more:

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

*slide credit: Chelle Gentemann, TOPS Program Scientist

We need more people - more hands, more eyes, more brains.

‘More people with diverse experiences to participate so that we ask the best questions and find the best solutions.’

POLICY

Outreach

2023 Is The Year Of Open Science - Open.Science.gov

The U.S. White House declared 2023

The Year of Open Science

In May & June of 2023 they held a series of Listening Sessions, open to the public and accessible online, where diverse stakeholders offered their insights into the implementation process and goals of Open Science.

- **Early Career Researchers**
- **Academics**
- **Entrepreneurs**
- **Publishers**
- **R&D**
- **Government Agencies**

UNESCO Tool Kit for Open Science

The UNESCO Open Science Toolkit: designed to support implementation of the UNESCO Recommendation on Open Science, the first international standard-setting instrument on open science. This Recommendation was adopted by 193 countries in November 2021 at the 41st session of the UNESCO General Conference.

From CNRS: Centre National Recherche Scientifique

National Plan For Open Science

Open science…involves a new way of practicing science by opening up processes, codes, methods and protocols.

Open access makes the movement towards disseminating scientific production on the internet possible.

It removes barriers to access *while maintaining the levels of protection offered by copyright.*

As open as possible and as closed as necessary

- European Commission report 2016

https://www.science-ouverte.cnrs.fr/en/national-context-for-open-science/

NASA & CERN Joint Open Science Summit July 2023

On April 30, 1993 CERN released the World Wide Web to the public. Tim Berners-Lee proposed this to allow scientists and researchers working all over the globe to share information quickly and accurately.

Today 5 Billion+ people, more than ⅔ of the world's population rely on the internet for research, commerce, entertainment and communications.

Additional Resources

Open Source Science White Paper

Jupyter Notebooks / Lab

2i2c

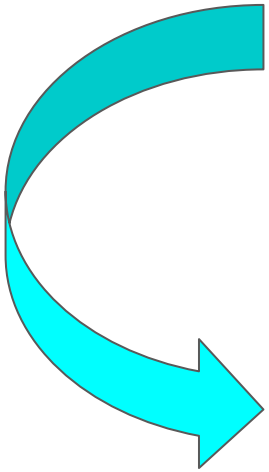
NumFocus + IBM

Jupyter.org

Science & Technology

‘We aspire to convene these two great community efforts of the modern era, by bringing together scientists and technology developers to drive a new open era of progress.’ - Alexy Khrabrov

OSSCI - Open Source Science



blockchain

= tools for Open Science

Open Science Is A Nice Idea – But How Do We Implement It?

Tools facilitated by the blockchain offer some key solutions.

- **IP NFTs**
- **Transaction Hashes that can be used as Persistent Identifiers (PiDs)**
- **Decentralized Data Storage (such as on IPFS, Arweave or Storj)**
- **On-chain Publishing**
- **Traceability of researchers' contributions**

Frontier Registry - Explainer Video

Open Science + Blockchain

DeSci

Or 'Decentralized Science'

The term DeSci is still being defined by the ecosystem.

But it often implies use of DeFi tools such as tokenized data. It is a very young movement, gaining traction since Spring 2022.

Blockchain for Science

Blockchain tooling for Open Science Implementation

More broadly interprets uses of the blockchain for scientific research and sharing.

Such as for FAIR (Data)

Findable

Interoperable

Accessible

Reusable

Activité : Open Science Café

1. Join together in Groups of 4 to 5 people

2. Choose an urgent Scientific Need (ex: cure cancer)

Solve For:

- Accessibility
- Transparency
- Reproducibility
- Inclusivity

Apply Open Science + Blockchain Tooling

(Suggestions - infrastructure, outreach, funding)

A. Data Sharing
B. Collaborate on Intellectual Property
C. Deliver Aid rapidly and with traceability to Disaster Victims
D. Climate Relief/ Energy Justice
E. Re-plant wildfire devastated lands
F. Share Knowledge but protect IP rights of researchers/ institutions
G. Anonymous Peer Review but with authenticated decentralized identity

FrontierDAO

Use Case

blockchain for Open Science

Accelerating scientific research and collaboration through open science tools enabled by blockchain & AI.

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