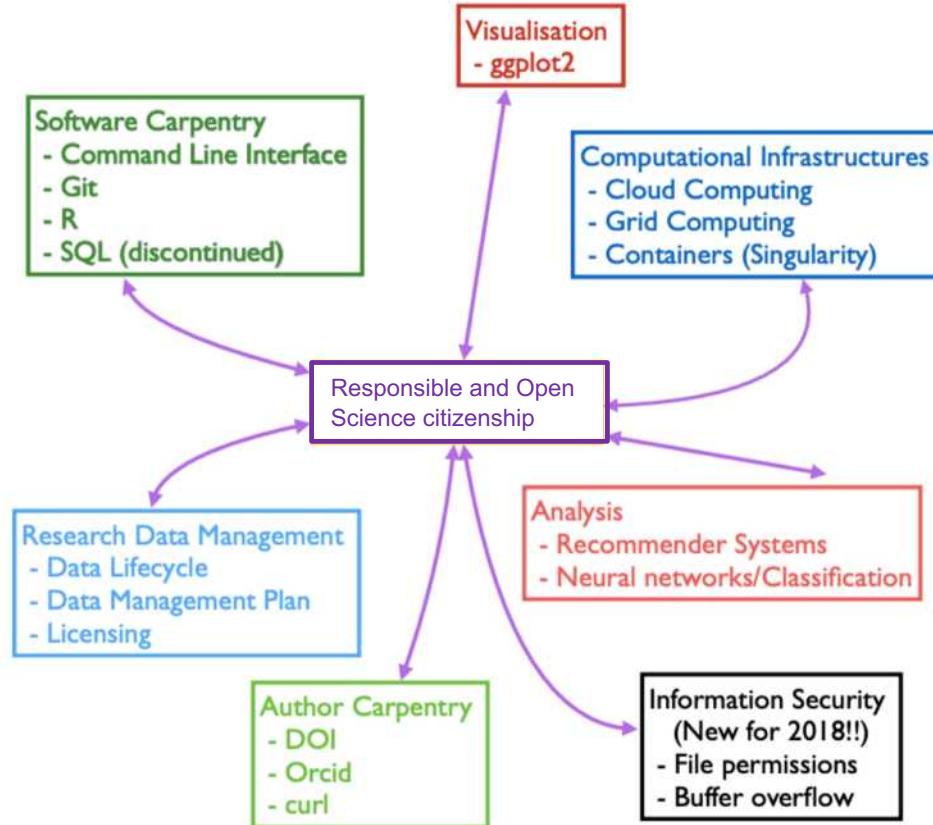# Responsibility, Openness and Science

Louise Bezuidenhout
University of Oxford

Our Curriculum

Plan for the Morning

1. Responsible conduct of research

2. Open science as a new way of being responsible

3. Being a responsible, open science citizen

Not just about learning data science … learning responsible data practices

Why Are We Focused on "Responsible Conduct of Research"?

- Create a small group:

  - Introduce yourself ☺ - where are you from, what discipline are you based in?

  - Discuss what you think Responsible Conduct of Research is – give some examples of the activities it involves?

  - Why do you think this is a key part of our summer school curriculum?

  - How you think RCR relates to the more practical subjects you'll be learning over the next two weeks (R, SQL, data vis, infrastructures etc)?
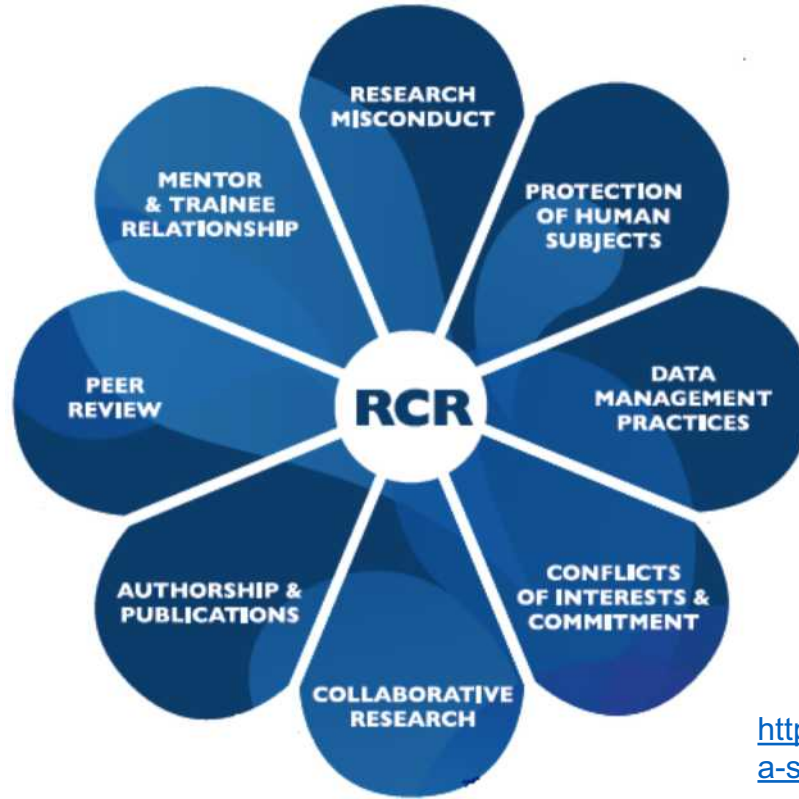
Responsible Conduct of Research

- Not just about being

  - "good at your work"

  - producing data

  - getting on with your colleagues

- As knowledge producers, educators and recipients of public funds we have additional responsibilities as researchers

Balancing Multiple Roles as a Researcher

- Data producer

- Data user and/or collaborator

- Author

- Employee

- Teacher/mentor

- Recipient of public funds

- Recipient of public trust

- Citizen/legally-obligated individual

Responsible Conduct of Research

RESEARCH MISCONDUCT

PROTECTION OF HUMAN SUBJECTS

MENTOR & TRAINEE RELATIONSHIP

PEER REVIEW

RCR

DATA MANAGEMENT PRACTICES

AUTHORSHIP & PUBLICATIONS

CONFLICTS OF INTERESTS & COMMITMENT

COLLABORATIVE RESEARCH

https://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in

Responsibility as a Product of Integrity

- Practice of scientific investigation with <u>integrity</u> (integridad)

integrity
/ɪnˈtɛɡrɪti/ ◀))

noun

1. the quality of being honest and having strong moral principles.
   "a gentleman of complete integrity"
   synonyms: honesty, uprightness, probity, rectitude, honour, honourableness, upstandingness, good character, principle(s), ethics, morals, righteousness, morality, nobility, high-mindedness, right-mindedness, noble-mindedness, virtue, decency, fairness, scrupulousness, sincerity, truthfulness, trustworthiness
   "I never doubted his integrity"

2. the state of being whole and undivided.
   "upholding territorial integrity and national sovereignty"
   synonyms: unity, unification, wholeness, coherence, cohesion, undividedness, togetherness, solidarity, coalition
   "internal racial unrest threatened the integrity of the federation"

Key Ethical Norms

- Awareness and application of professional norms and ethical principles in all areas relating to scientific research

- Beneficence (do good) - beneficencia

- Non-maleficence (cause no harm) - no causar daño
- Accountability - responsabilidad

- Transparency - transparencia

- Care - cuidado

- Collegiality - colegialidad

Codes of Conduct

- Ethics are often outlined in disciplinary codes of conduct
- Can be helpful ways of summarizing areas of activity to think about wrt RCR

ACM Code of Ethics and Professional Conduct

1. GENERAL ETHICAL PRINCIPLES.

1.1 Contribute to society and to human well-being, acknowledging that all people are stakeholders in computing.

1.2 Avoid harm.

1.3 Be honest and trustworthy.

1.4 Be fair and take action not to discriminate.

1.5 Respect the work required to produce new ideas, inventions, creative works, and computing artifacts.

1.6 Respect privacy.

1.7 Honor confidentiality.

2. PROFESSIONAL RESPONSIBILITIES.

2.1 Strive to achieve high quality in both the processes and products of professional work.

2.2 Maintain high standards of professional competence, conduct, and ethical practice.

2.3 Know and respect existing rules pertaining to professional work.

2.4 Accept and provide appropriate professional review.

2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

2.6 Perform work only in areas of competence.

2.7 Foster public awareness and understanding of computing, related technologies, and their consequences.

2.8 Access computing and communication resources only when authorized or when compelled by the public good.

2.9 Design and implement systems that are robustly and usably secure.

3. PROFESSIONAL LEADERSHIP PRINCIPLES.

3.1 Ensure that the public good is the central concern during all professional computing work.

3.2 Articulate, encourage acceptance of, and evaluate fulfillment of social responsibilities by members of the organization or group.

3.3 Manage personnel and resources to enhance the quality of working life.

3.4 Articulate, apply, and support policies and processes that reflect the principles of the Code.

3.5 Create opportunities for members of the organization or group to grow as professionals.

3.6 Use care when modifying or retiring systems.

3.7 Recognize and take special care of systems that become integrated into the infrastructure of society.

4. COMPLIANCE WITH THE CODE.

4.1 Uphold, promote, and respect the principles of the Code.

4.2 Treat violations of the Code as

https://www.acm.org/code-of-ethics

RCR as a Collaborative Endeavour

Institutional Responsibilities

- Education

- Infrastructures that support responsible research

- Capacity for dealing with concerns/whistleblowing/misconduct

- Engagement and compliance with inter/national regulation

- *The roll-out of RCR is patchy. We will discuss this more on Friday*

RCR: Changing Practices and Environments

- Understanding of responsible research, researchers and research contexts is changing

- Individual responsibility – expect compliance with regulations, active engagement with RCR behaviours

- Institutions/National/International systems – expect investment in RCR-supporting infrastructures, develop systems of educating, monitoring and mediating

- International science community – expect monitoring, support and capacity building

RCR as an Extended Form of Research Ethics
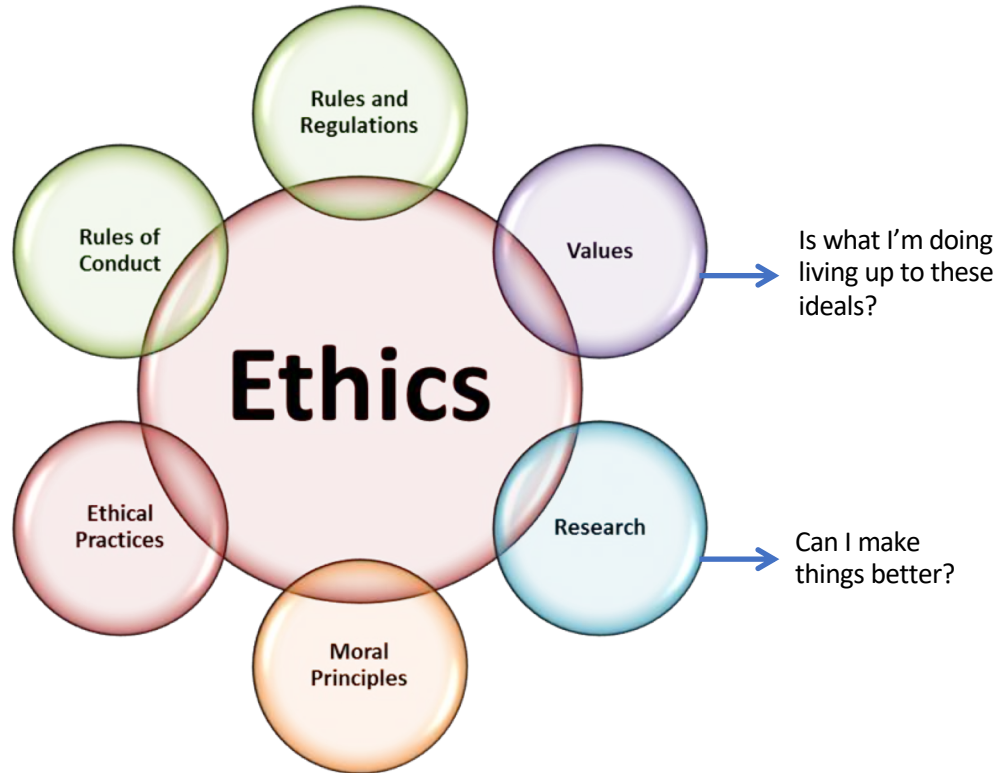
Extending the Reach of Ethics in Research

- Produce verifiable and re-usable data

- Protect scientists and societies from harm

- Enable collaboration

- Ensure investments (financial, trust, time etc) are recompensed

- Embeds science within cultural/social priorities

- Amount and types of data being produced

- Practices of science

- What constitutes "good research"

- How responsible conduct of research is understood

Translating RCR into a Digital Age

- Understandings of RCR in a digital age continue to evolve

- Extension of existing discussion, but also new areas for concern

  - Opportunity to share vs loss of control

  - Increase benefits of research for public vs possible harms

  - (Un)Intended marginalizations

  - Data recombination, re-use

New Questions for RCR

- How can the evolving power of digital technologies be harnessed to uphold the principles of responsible research?

- How can practices and structures of scientific research be adapted to ensure that research benefits the most number of people?

- How can the culture of science be adapted to support this evolution?

- What is the role of the individual scientist/institution/nation/infrastructure in this revolution?

How do we ensure that we create presents and futures that uphold ethical principles and allow research with integrity?
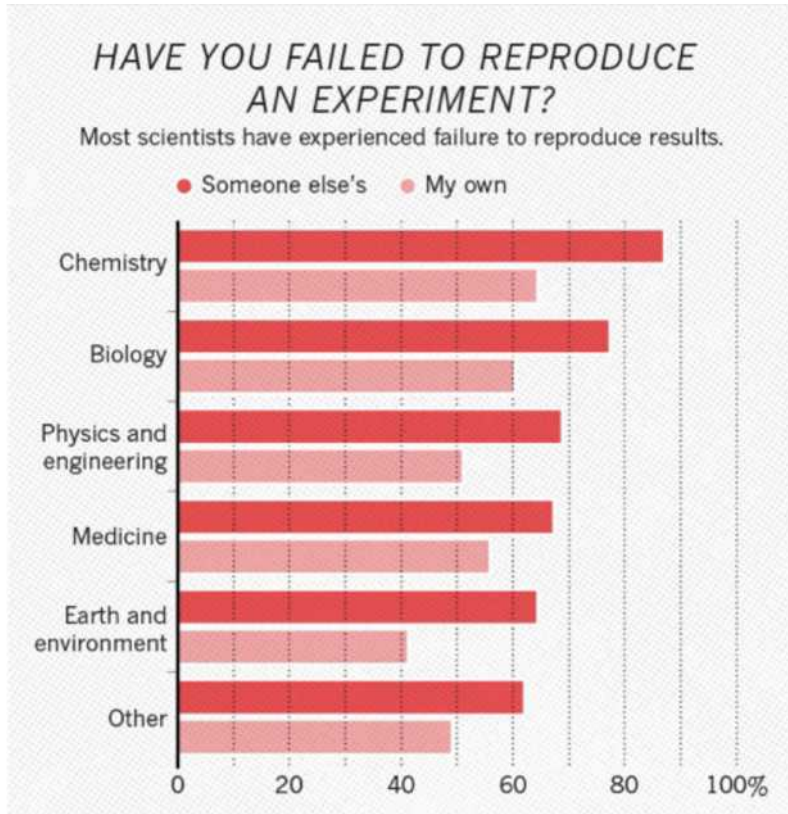
Who Has Heard of Open Science?

- Write down three things that spring to mind when you hear the term "Open Science"

  - If you've never heard the term before, that's ok too!
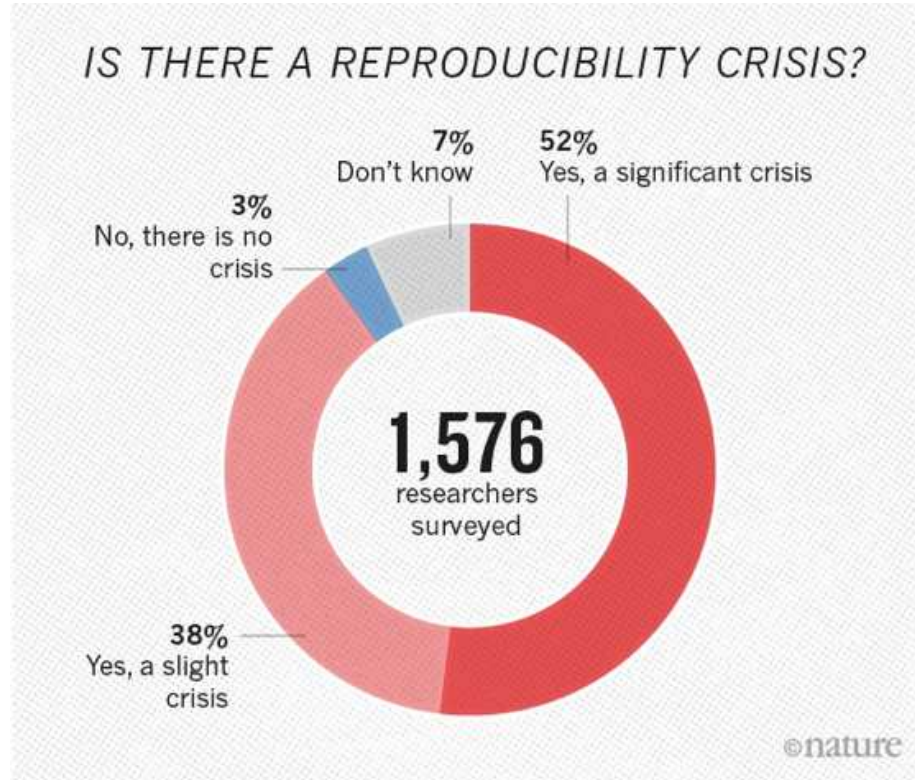
What Is Needed Is More Openness

- There is an historical precedence for this argument:
  - Openness is a core value of science/research
  - Merton 1942
    - Communalism
    - Universalism
    - Disinterestedness
    - Organized skepticism
- Long tradition of sharing resources and scrutinizing research
- Transparency of data and sharing of resources key to addressing issues of reproducibility, networking and public trust

A Reproducibility Crisis?

HAVE YOU FAILED TO REPRODUCE AN EXPERIMENT?
Most scientists have experienced failure to reproduce results.

Same Data, Different Conclusions
Twenty-nine research teams were given the same set of soccer data and asked to determine if referees are more likely to give red cards to dark-skinned players. Each team used a different statistical method, and each found a different relationship between skin color and red cards.

- Nature survey of 1,576 researchers (Baker et al 2016)
- https://psyarxiv.com/qkwst/

A General Consensus?

IS THERE A REPRODUCIBILITY CRISIS?

7% Don't know

52% Yes, a significant crisis

3% No, there is no crisis

1,576 researchers surveyed

38% Yes, a slight crisis

©nature

- Variability in analysis and methodology
- Incentives aligned towards publication not reproducibility
- Lack of transparency and access to data

Nature survey of 1,576 researchers

(Baker et al 2016)

Returns on Public Investment

UK Gross expenditure on R&D over time
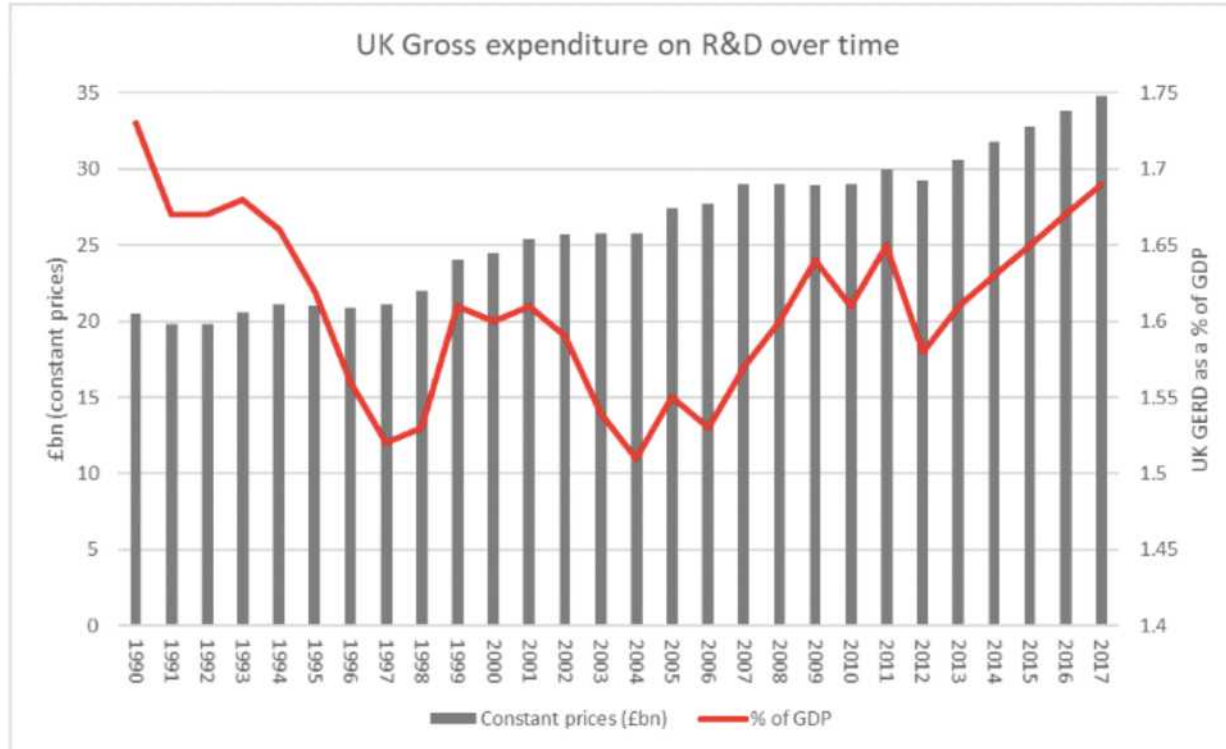
New Forms/Places of Knowledge Production

- Big Data

- AI

- Social data

- Citizen science

- Blurred boundaries between academia, commerce and government

Time For A New Approach?

Increase trust in science, don't waste public resources

Get constructive feedback

Be international and inclusive

Increase the speed of discovery

Pictures from freepik.com by @brgfx, @makyzz; flaticon.com by Icon Pond, Dimitry Miroliubov

Open Science

- **The products of scientific research should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control**

- Open Science includes activities that:

  - facilitate resource sharing

  - improve awareness of sharing

  - create linkages between resources

  - advocate for removal of financial barriers

Open Science

- The movement to make scientific research, data and dissemination accessible to all levels of an inquiring society

    https://www.fosteropenscience.eu/taxonomy/term/7]

- Scope:

    - Transparency in experimental methodology, observation, and collection of data

    - Public availability and reusability of scientific data

    - Public accessibility and transparency of scientific communication

    - Using web-based tools to facilitate scientific collaboration

        http://www.openscience.org/blog/?p=269]

Free Speech … Not Free Beer

- *Gratis* versus *Libre*

  - "**Free**" means there is no cost, where **libre** means "at liberty", referring to the freedom to modify source code. **Libre** doesn't mean **gratis**. **Libre** can mean available. **Libre** can mean without restriction

Think 'free speech,' not 'free beer.'

Richard Stallman
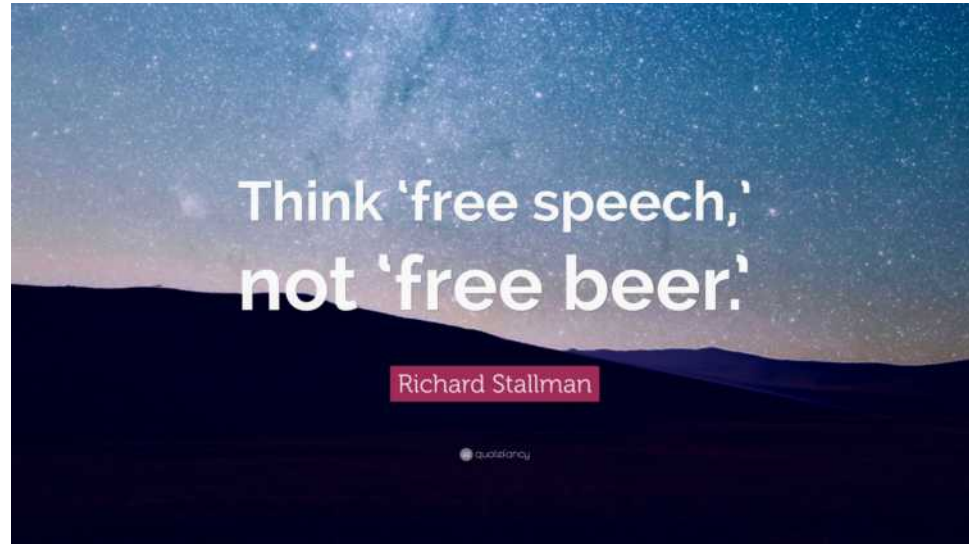
As Open As Possible, As Closed As Necessary

Open Science: an Umbrella of Many Activities
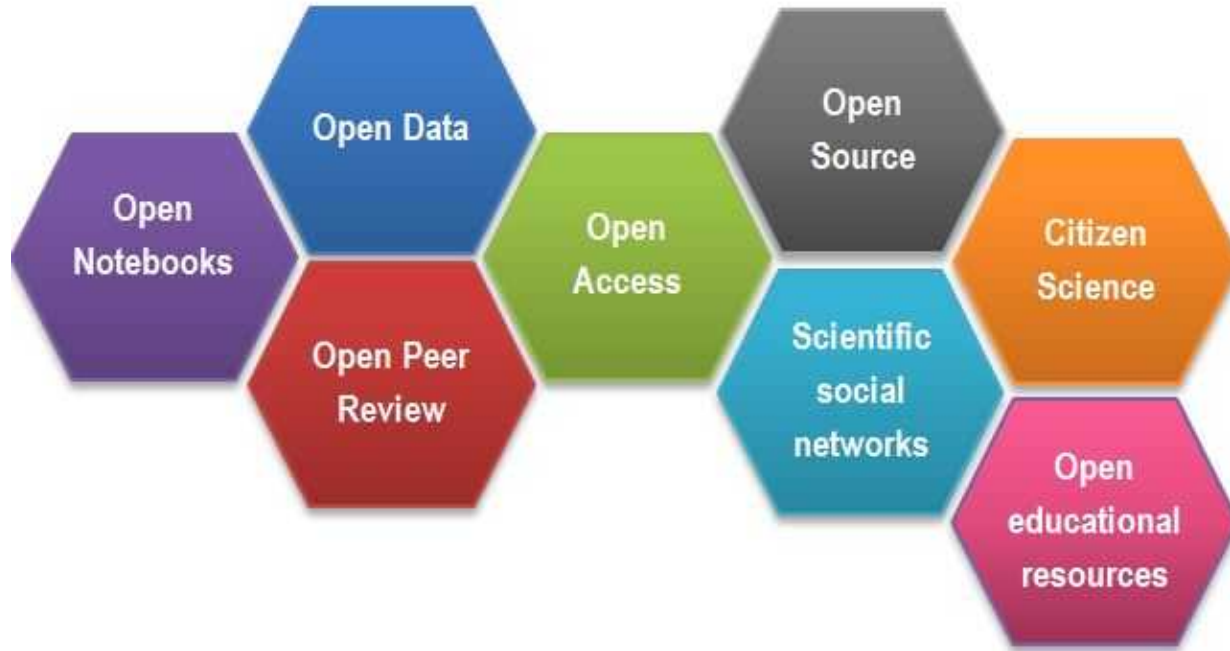
Open Science Throughout The Research Lifecycle

Heidi Seibold
tinyurl.com/opendatascience
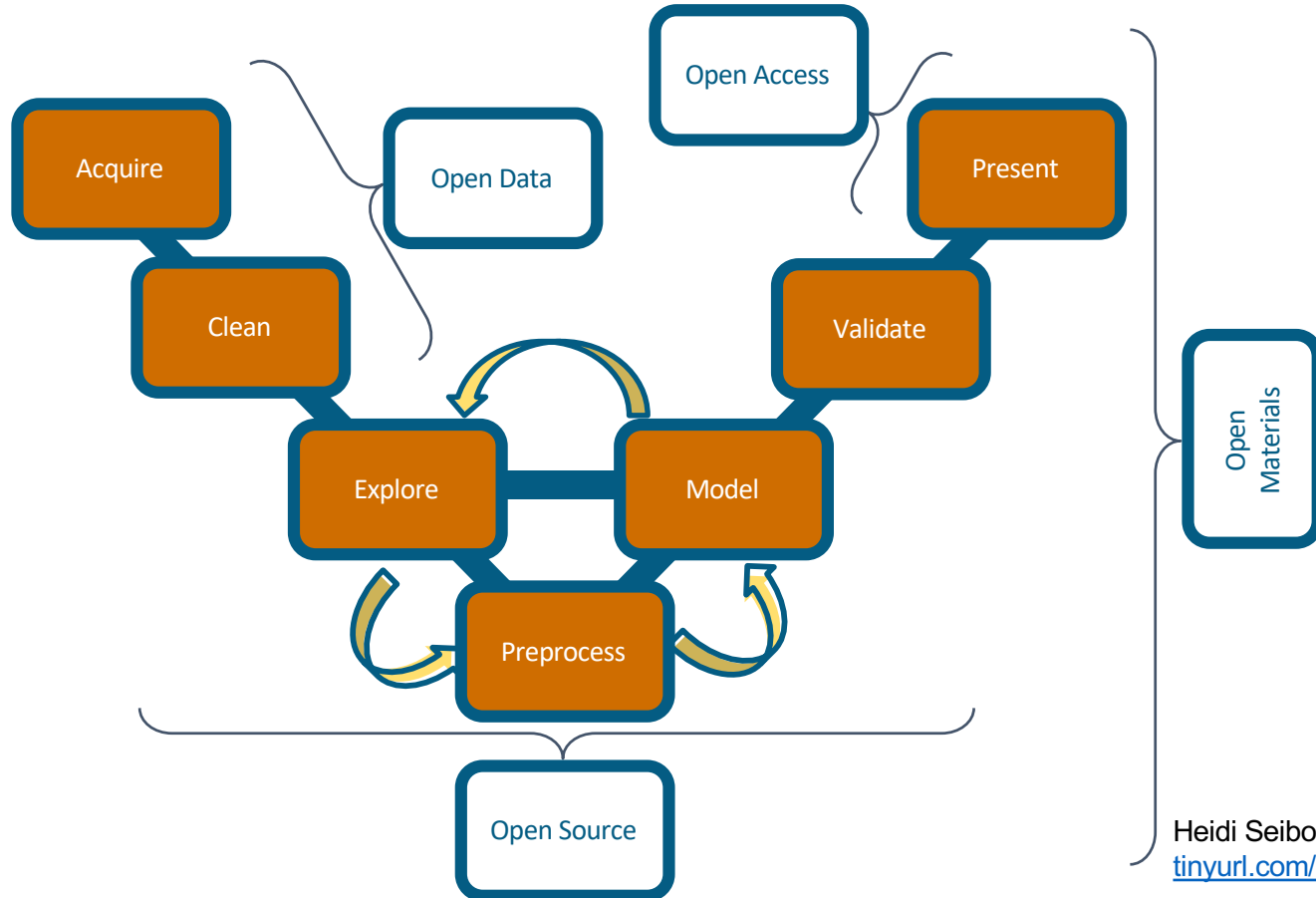
A Way of Thinking And Doing

- An ideology as well as a set of practical actions
- Changing the way we think about responsible research
- Requires buy-in and commitment

Open Science as … a Set of Practices

- The practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods

- Practice-based ethics

Different Motivations, Same Response
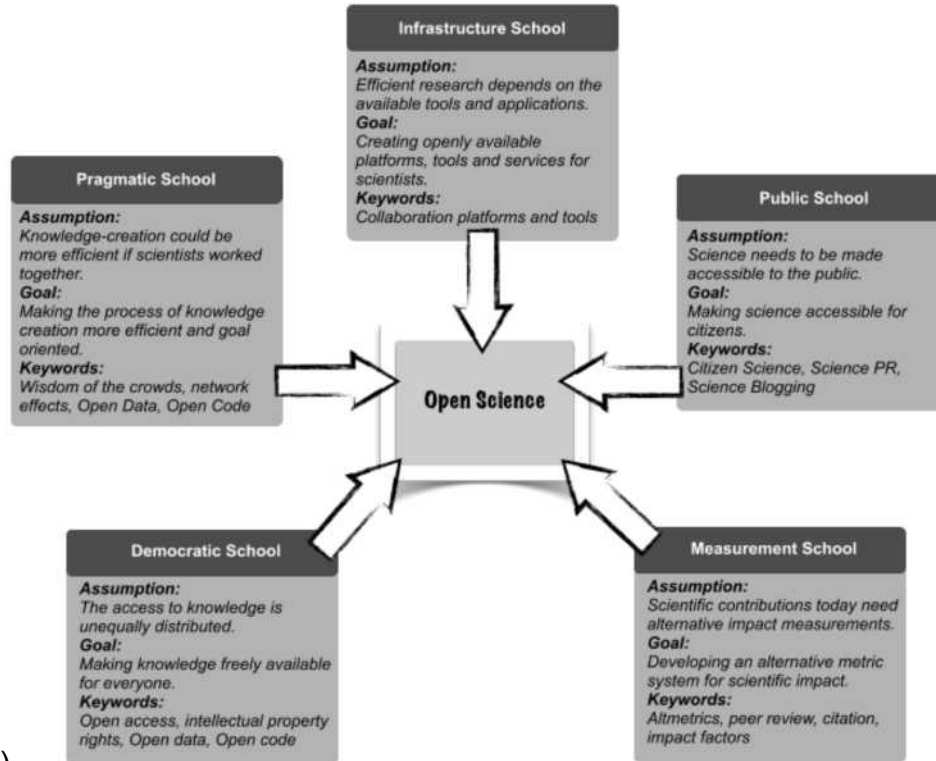
Open Science as ... a Cultural Change

- The products of scientific research should be freely available to everyone to use and republish as they wish, without restrictions from copyright, patents or other mechanisms of control

- Justice, responsibility, egalitarianism

Open Science is Many Things

- Open Science includes activities that:

    - facilitate resource sharing

    - improve awareness of sharing

    - create linkages between resources

    - advocate for removal of financial barriers

    - advocate for just distribution of resources

Open Science: an Extension of RCR Values

- Openness can be thought of as an extension of RCR

- Allows researchers to uphold *integrity* and core *ethical values* underpinning RCR

- Allows researchers to engage in practical activities relating to RCR
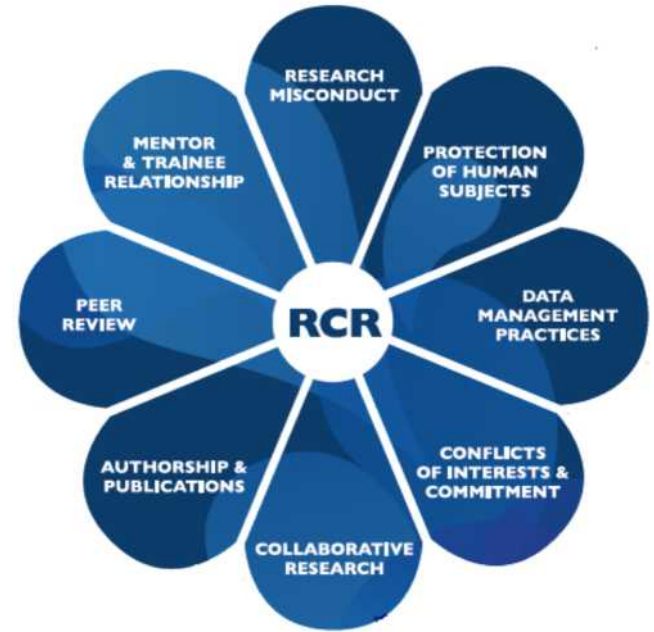
Openness as an Extension of RCR

- A just distribution of resources (public funds and research products)

- A way of maximizing the benefits of research

- A safeguard against possible harms arising from research

- As a means of improving accountability and transparency

- An enactment of collegiality

Openness in RCR

Open Lab Books: Transparency in research practices
Sharing and openness: enhance transmission of values

Open Peer Review: Transparency in peer review leads to better dialogue and collegial behaviour

Open Access: Improves availability of research outputs
*Open publishing:* leads to improved citations, credit and collaboration
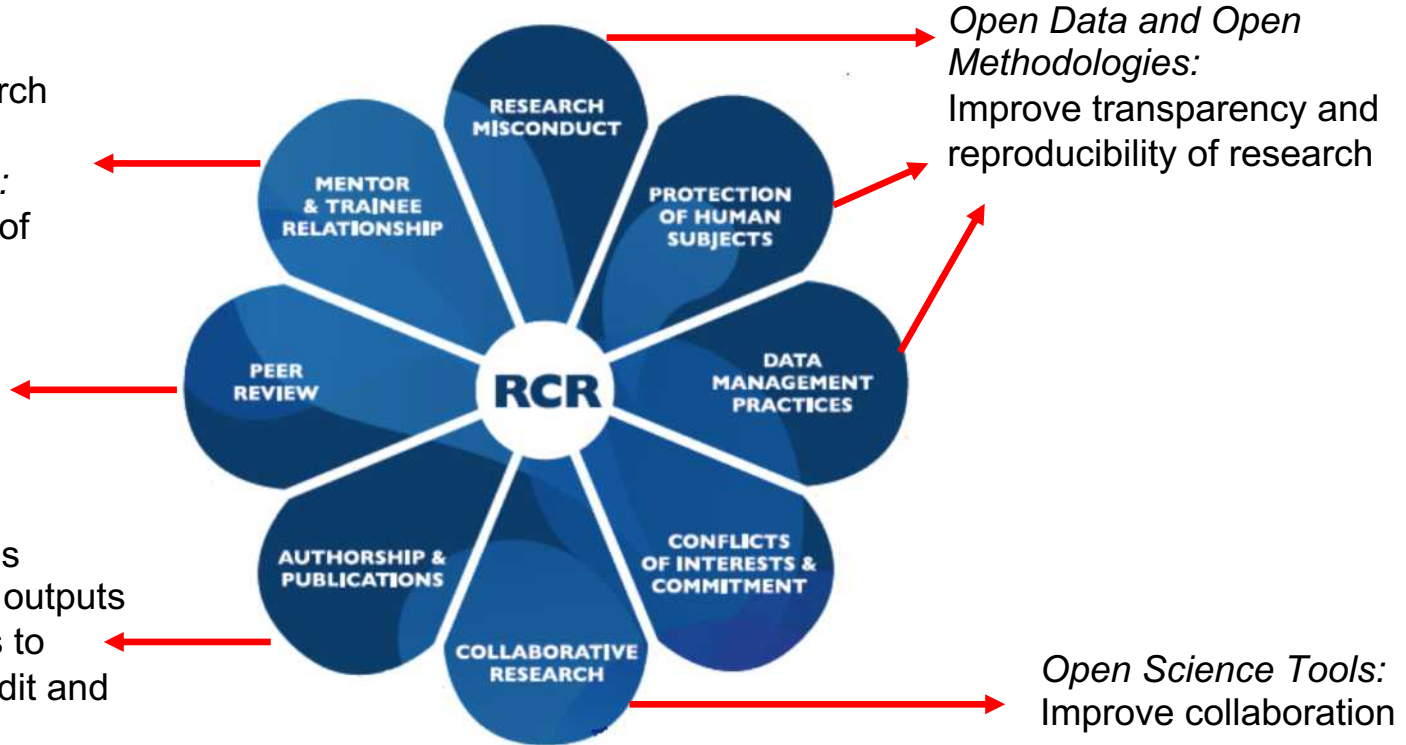
Open Data and Open Methodologies: Improve transparency and reproducibility of research

Open Science Tools: Improve collaboration

Extending the Reach of RCR

- Creating new visions for the future

- *Policy:* guiding research priorities and practices

- *Open Education, Open Hardware:* getting marginalized communities into research
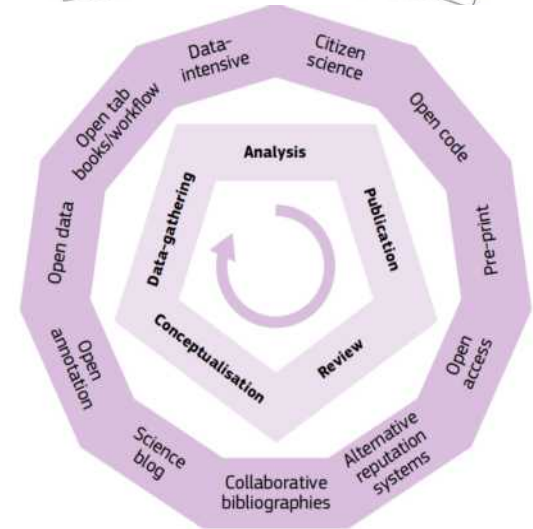
Extending the Reach of RCR

- Changing the way research is done

- Changing the tools in research

- Linking up areas, disciplines and communities
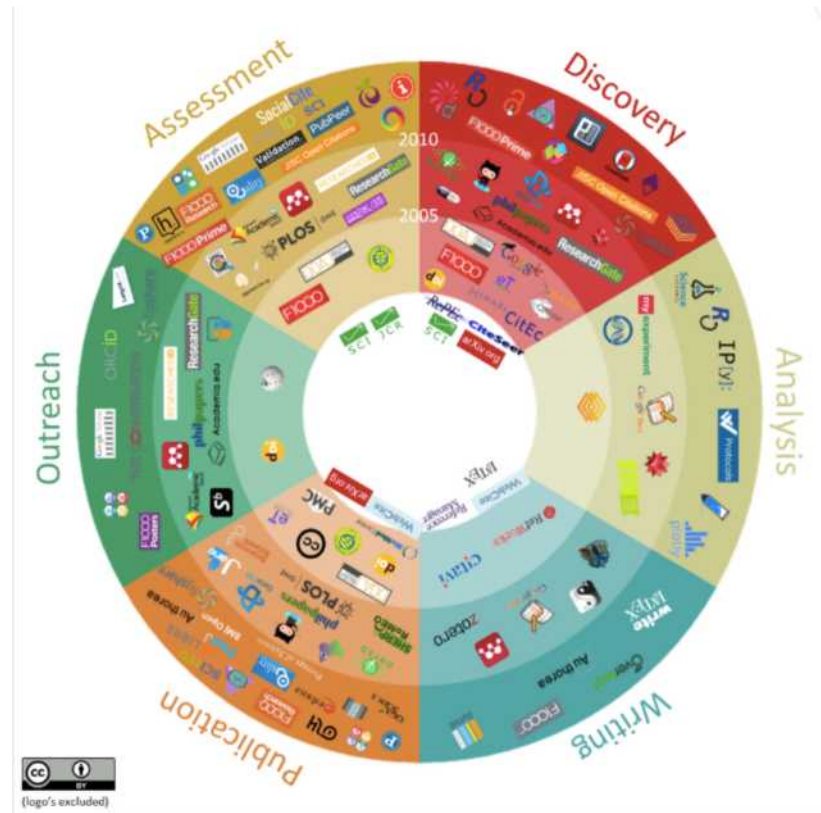
Big Picture/Little Picture

- Open Science is a cultural movement as well as a set of practices

- Individual researchers can show support for Open Science through the way they do their research

- Can make changes to daily research practices to be more open in all aspects of research

- *There is no "hard and fast" rule – openness must work for you within your specific work context and with your daily challenges*

"My" Open Science
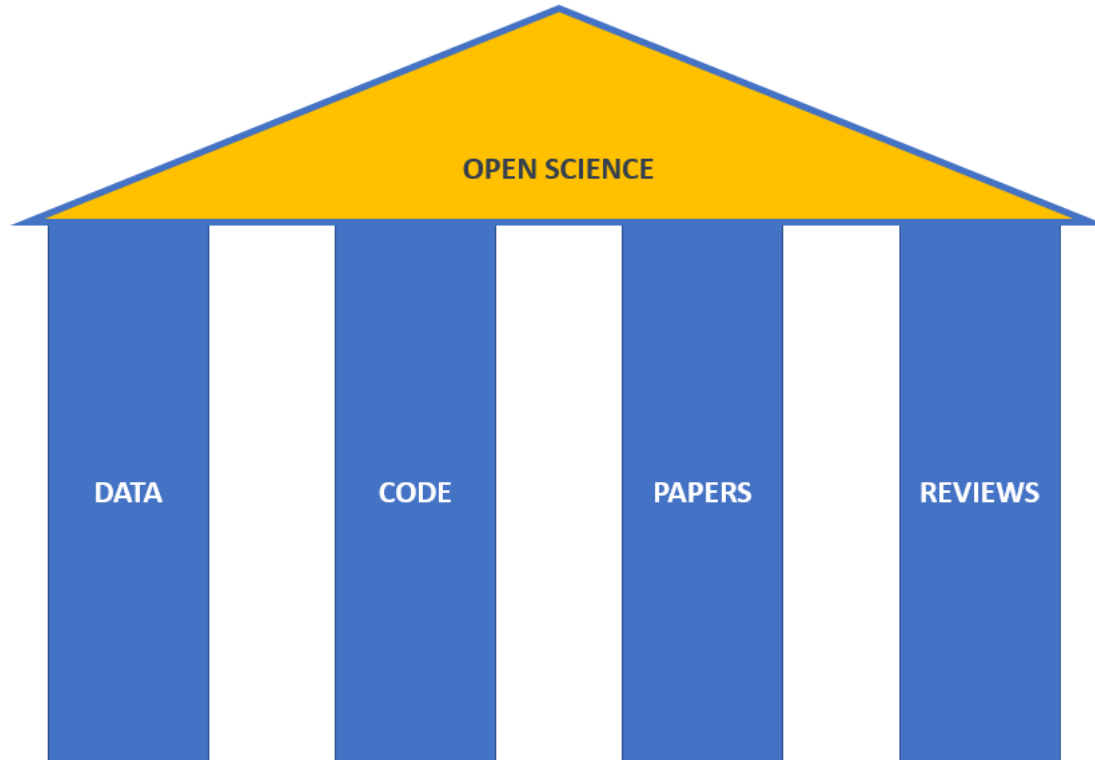
Different Actions at Different Stages
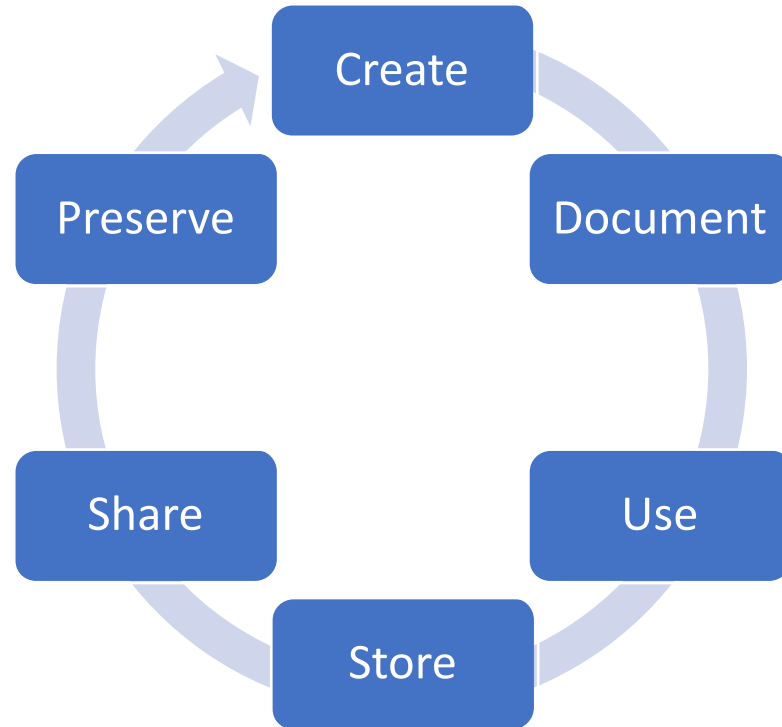
Individual Openness: More Than Open Access

Share your data - the research data that underpins publications should also be accessible to support validation and facilitate reuse. In cases where data sensitivities won't allow open access, be sure to provide details on how someone could request authorised access.

Share your code - many researchers now develop bespoke bits of code to help them analyse and/or visualise the data they have collected. Having access to this code is essential for supporting the validation of your findings and to help others to build upon your work.

Share your workflows - without knowing what steps were taken to capture, process and analyse the data - and in what order - it can be virtually impossible to validate published findings. This has led to what some are calling the Reproducibility Crisis. Nature's special issue on Challenges in Irreproducible Research gives you a better sense of the scale of this problem.

www.fosteropenscience.eu

Pragmatic Openness

- Openness in research is new … And can be scary

  - It's ok to have concerns

  - It's ok to realise that not all the open practices will work for you

  - There can be legal, regulatory, ethical reasons not to share

- However, you benefit from the increasingly open research landscape (papers, data, software)

- So, how can one avoid "freeloading"?

Responsible and Open Research as Citizenship

- Citizenship:
  - ethical obligations arising out of social living
  - being part of a community requires the acceptance of civic responsibilities and contribution to the overall public good

- As a citizen you have duties and expected ways of acting
  - Follow rules
  - Participate in community activities
  - Protect the community and its resources from misuse
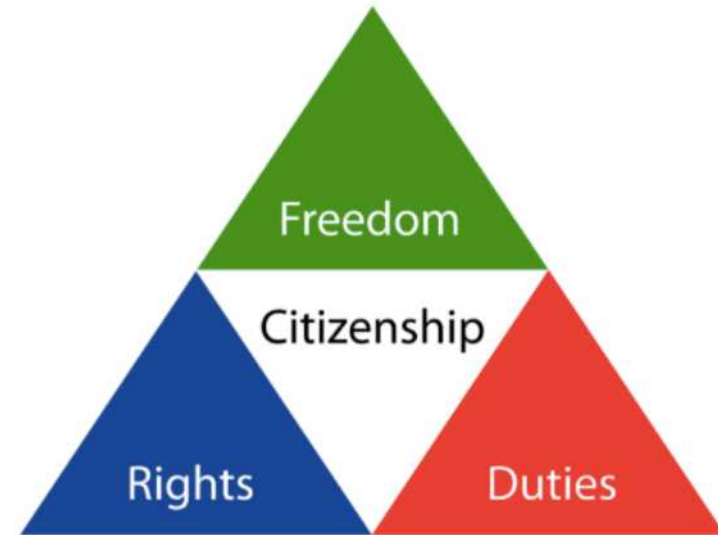
Responsible and Open (Data) Science Citizenship

- Research is a community endeavour

  - involves social actions such as resource sharing and communal practice

  - responsible researchers are "citizens" of the research community

- Citizenship is a give and take

  - Benefits to facilitate freedom of research

  - Structures to safeguard rights as researcher

  - Responsibilities to assume to protect culture

- Support and grow culture instead of just living in it

Responsible and Open (Data) Science Citizenship

- RCR and Open Science form the blueprint for a form of "science citizenship"

- Research relies on the use of "community resources"

    - data, papers and so forth

- As a "citizen" of the research community you therefore have responsibilities for these resources

    - follow community determined rules (such as citation, licensing and so forth)

    - Contribute to communal resources (data sharing)

    - Maximise good for the community by participating in civic service (reviewing, curating etc)

Open and Responsible Data Science Citizenship in a Digital Age?

In your groups discuss:

- Why is Open Science an important part of modern research? How does it enhance responsible research?

- What areas of RCR in particular are influenced by Open Science, and how?

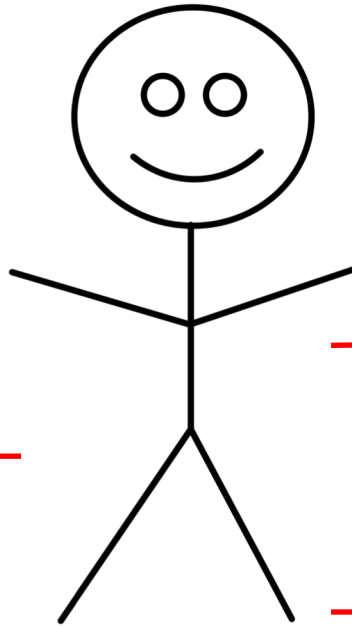- How can data scientists be open and responsible science citizens?

Tools for Responsible, Open (Data) Science Citizenship

Data science
- Practical skills
- Norms and values
- Infraethics

Data management
- Norms and values (FAIR)
- Practical tools - RDM

Authorship
- ORCID
- Journals and licensing

Data use
- Finding and using data
- Data re-use and attribution

Ethics and responsibility
- Areas for activity

Openness, sharing, justice, beneficence