USING SCIENCE DIPLOMACY
FOR ADDRESSING GLOBAL CHALLENGES

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 770342.

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Open Science Diplomacy

Dr. Katja Mayer

November 2019

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2015

What is Open Science?

Shifting from the standard practices of publishing research results in scientific publications towards sharing and using all available knowledge at an earlier stage in the research process

Original publication:
https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe
Perspectives:
https://op.europa.eu/en/publication-detail/-/publication/15e2ff8d-c525-11e8-9424-01aa75ed71a1

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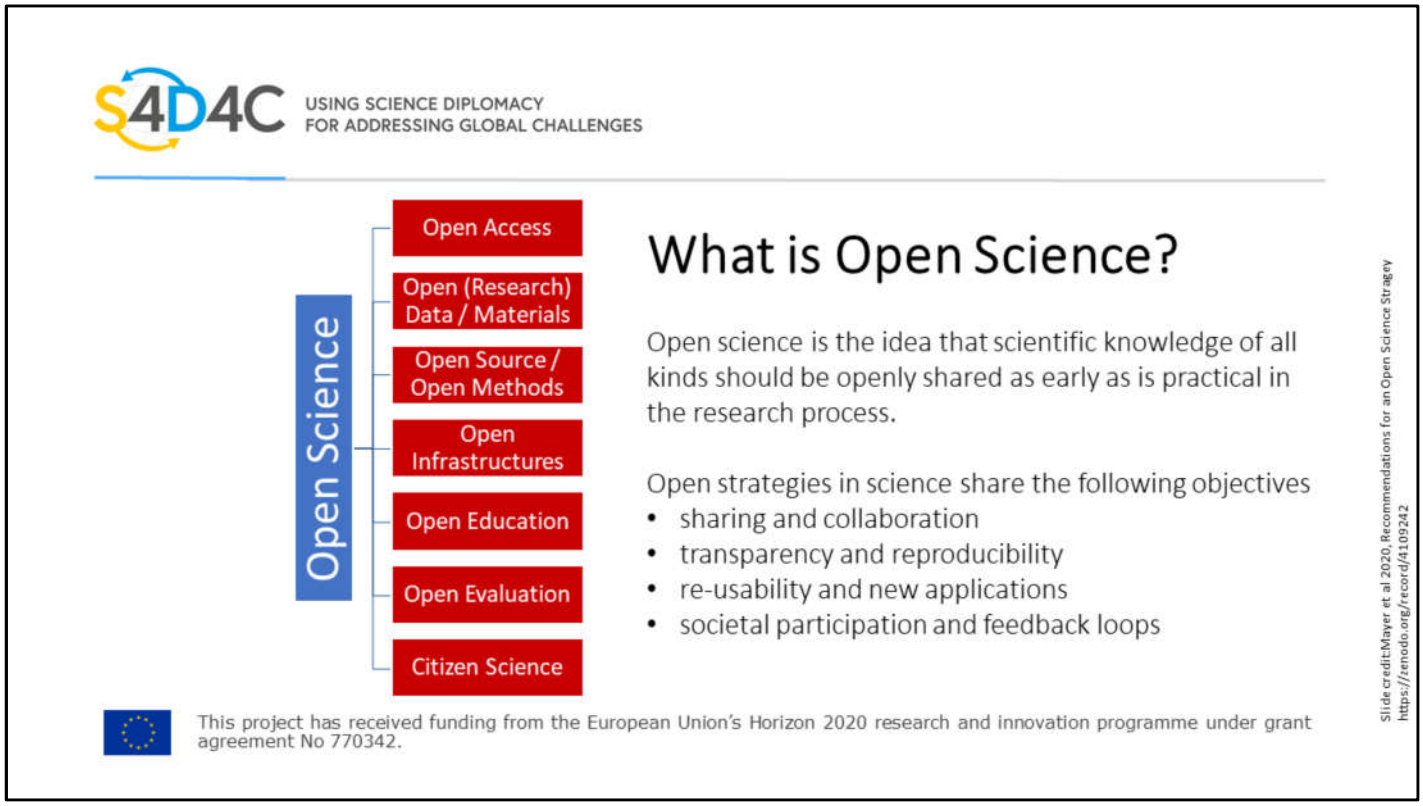
The way that science works is fundamentally changing and an equally important transformation is taking place in how companies and societies innovate.

The advent of digital technologies is making science and innovation more open, collaborative and global. In this light former EU Research Commissioner Carlos Moedas has set three goals for EU research and innovation policy:

- Open Innovation
- Open Science and
- Open to the World.



Open Science is not something that you can do afterwards, ex-post, it needs to be part of the planning, even the generation of the research interest or idea.

The basic idea of open science is to share as much knowledge (in all its forms) as possible before, during and after research.

Bottom up advocates of open science have long highlighted the transformative powers that open science has on research cultures and scientific efficiency and integrity.

Open strategies include:
- sharing and collaboration
- transparency and reproducibility
- re-usability and new applications
- societal participation and feedback loops

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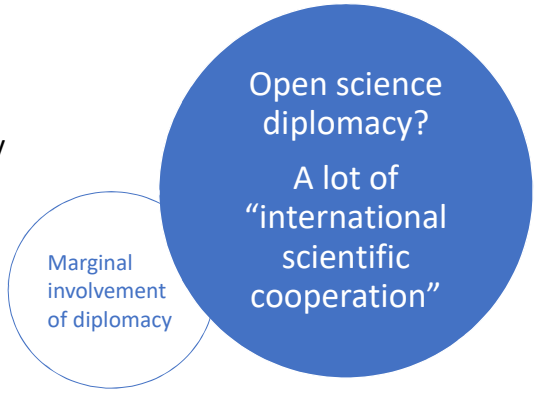
Results of the Case Study 2018-2019:

The international open science community is organizing itself mainly bottom-up, only recently there is more policy involvement, such as Plan S or the European Open Science Cloud, or several national open access strategies.

Professional diplomacy is rarely involved.



Slide credit: Mayer 2020: Open Science Diplomacy https://zenodo.org/record/4479514

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Open Science Diplomacy could be defined as international political cooperation for the advancement of the transition towards Open Science.

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OPEN SCIENCE DIPLOMACY – **Results of the Case Study**

- Even though taken up increasingly by international organisations at the interface of science and global health: open science and in particular, open data are not yet on the agenda of diplomacy.
- Advocates would welcome the involvement of foreign policy experts and diplomats in negotiations of – and push for pressing issues like the harmonisation of standards and legal frameworks for the exchange of data (data diplomacy).
- Opportunities for innovation (social, ecological, economic, technological, ….) based on open science and data sharing are still neglected by international policy actors.

Slide credit: Mayer 2020: Open Science Diplomacy https://zenodo.org/record/4479514

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Open scholarship as strategy, but not as goal

- Goals are equity, inclusivity, a better science that leaves no one behind.
- Open Science is a key enabling strategy, to create culture change on the ground.
- Openness is not only about access and re-use; it has a great anti-discriminatory and power-challenging potential to realise a sociotechnical environment that enables a more equitable knowledge exchange.
- Openness also has the power to mobilise engagement for sustainable development and collaboration.

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See for similar approach: www.oesdnet.org

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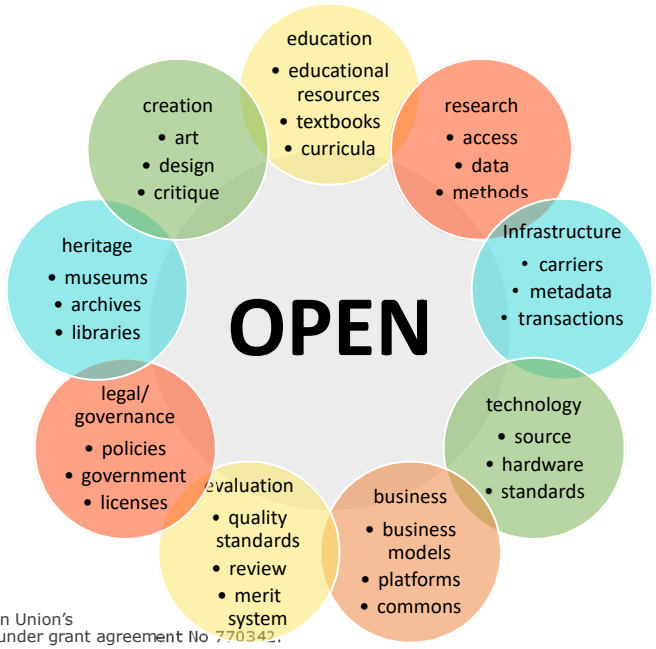
What is Open Science?

- Methods and tools for opening the research cycle
- Scientific / epistemic culture
- International bottom-up movement (since 30 years active, open source since 1970s) – part of open cultures
- Set of policies / set of principles



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Open Science is tackling the following issues of the science system on a global scale

- Reproducibility / replication crisis
- High competition (embargos, positivity bias → unproductivity)
- Massification and high degree of specialization / fragmentation, despite globalization
- Inter- and transdisciplinarity
- Monopolised and expensive publication markets and biased indicators for evaluation
- Privatization of infrastructures and problems of knowledge ownership / knowledge access
- Knowledge transfer: neglect of importance of knowledge commons for global innovation systems and sustainability outside of specialist communities
- Brain drain

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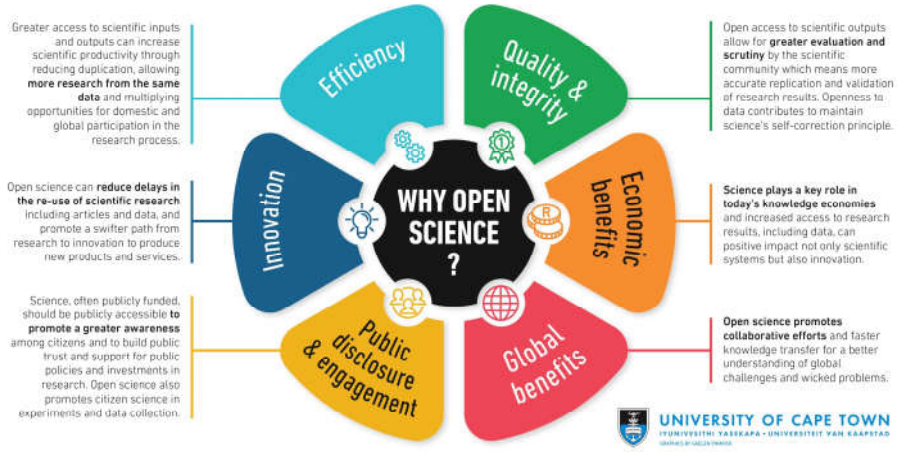

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Slide credit: Gaelen Pinnock, University of Cape Town 2019
https://commons.wikimedia.org/wiki/File:UCT_RDM_Why-Open-Science.png

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OPEN SCIENCE TRANSITION STAKEHOLDERS

Slide credit: Mayer 2020: Open Science Diplomacy https://zenodo.org/record/4479514

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Open Science is not only FOR science, it is also ABOUT science.

1) WHAT CAN IT DO FOR SCIENCE (what can you do for science?) in the making?
2) What can it do for science in society?

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OPEN ACCESS

- OA is a broad international **movement** advocating **unlimited access to results of publicly funded research.**
- OA means free and open online access to research information, such as publications and data. When anyone can read, download, copy, distribute, print, search for and search within the information, or use for education or another way within the legal agreements, the publication is called 'open access', as there are no financial, legal or technical barriers.
- OA is a **new business model** for academic publishing that makes research information available **to readers at no cost**. It contrasts with the subscription model, in which readers have access to scholarly information, usually via a library, by paying a subscription.
- OA increases the visibility, uptake and (re)use of research results.

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KNOWLEDGE MARKETS - PRICE OF ACCESS

The amount paid in Europe for accessing scholarly publications is impressive: more than **one billion euros per year** for all types of resources (journals, e-books and publication databases), and more than **720 million euros for periodicals alone**.

The second EUA Big Deals Survey Report contains inputs from 31 negotiating consortia, providing unique and important figures from Europe. It informs the debate within the scientific community, as well as among laboratory heads, rectors and policy makers.

https://eua.eu/resources/publications/829:2019-big-deals-survey-report.html

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Opening the markets of scholarly knowledge

A transition to Open Access requires

- A big change in scientific culture
- Robust and sustainable open infrastructures
- Incentives and rewards
- New diversified and inclusive evaluation systems
- Elaborated monitoring systems and access to national and international research information
- Legal frameworks to support text and data mining and reuse of publicly funded knowledge
- Backing by policy makers and funders on global scale

https://paywallthemovie.com/

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Learning from Open Science Champions

20 countries
Population: 626.721.000
Language.: Spanish/Portuguese
Map source: Wikipedia
Scientific output (main countries): Brazil, México, Argentina, Colombia, Chile

- **Research+dissemination: mainly government-funded + int. cooperation**
- **Scholarly publishing not outsourced to commercial publishers**
- **Scholarly-led OA publishing with no APC/BPC**

from individual journals to regional portals for transition to Open Access

SciELO Scientific Electronic Library Online

- Started 1997
- Today **1.249 journals** (Iberoamerican countries)
- 573.525 articles
- Bibliometric indicators
- Scielo Citation Index WoS

UAEM redalyc.org

- Started 2003
- Today **1137 journals** (Iberoamerican countries)
- 481.962 full-text articles
- Indicators of scientific output (institutions, countries, subjects)

Improved **quality, visibility, open access and impact** of scholarly journals
Development of **Open Access indicators**
Collaborative **research on Open Access** outreach and impact in Latin America

Regional journals harvester: **Portal de Portales Latindex www.latindex.ppl.unam.mx/**

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Plan S is an initiative for open access publishing that was launched in September 2018 by a consortium of major national research agencies and funders from twelve European countries and with support of international funders, such as the Gates Foundation and Welcome Trust.

Plan S requires that, from 2021, scientific publications that result from research funded by public grants must be published in compliant open access journals or platforms.

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https://www.coalition-s.org/

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OPEN RESEARCH DATA

is data that can be

- freely accessed,
- reused,
- remixed and
- redistributed

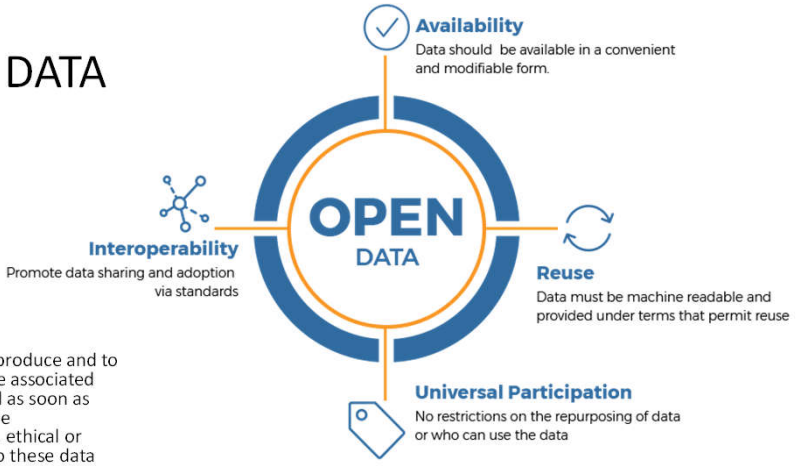

Image Source: https://pbs.twimg.com/media/D1XV_6SXcAAhCDQ.jpg

Research data are all data necessary to reproduce and to verify the results of research, including the associated metadata. These data should be published as soon as possible, but at the latest together with the corresponding research publication. Legal, ethical or other reasons, that prevent open access to these data should be explained.

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European Commission Expert Group, Turning FAIR into Reality (2018)

FAIR DATA

- **Findable:** have sufficiently rich metadata and a unique and persistent identifier, to enable discovery.
- **Accessible:** retrievable by humans and machines through a standard protocol; authentication and authorisation where necessary.
  Allows programmatic access for analysis.
- **Interoperable:** metadata use a 'formal, accessible, shared, and broadly applicable language for knowledge representation'.
  The descriptions of variables etc follow a shared specification and are commensurable.
- **Reusable:** metadata provide rich and accurate information; clear usage license; detailed provenance.
  Both humans and their analytical tools know what can be done with the data (license) and can assess its provenance.

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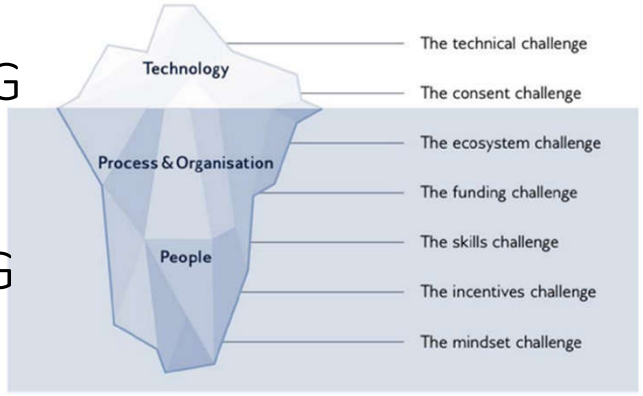
OPENING DATA FOR SHARING



Source: Deetjen U., E.T. Meyer and R. Schroeder (2015), *Big Data for Advancing Dementia Research*, OECD Publishing, Paris, forthcoming.

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https://doi.org/10.1787/5jsj4sbddf7jk-en

Dementia is increasing in prevalence, and to date has no cure or treatment. One element in improving this situation is using and sharing data more widely to increase the power of research.

Above the surface is the technical challenge in relation to mechanisms for sharing data securely and the need for common standards to pool data more easily. Consent needs to be set up in a way that it is understood by individuals and protects them against data misuses with effective enforcement mechanisms, but without unduly hampering the potential of research and routine data from a variety of sources and the ability for scientists to collaborate beyond borders and across time.

Below the surface are challenges of process and organisation, including the need to ensure a favourable ecosystem for research with stable and beneficial legal frameworks, and links to pharmaceutical companies and other private organisations for exchange of data and expertise. Similarly important is sustainable funding for data infrastructures, while funders at the same time can also have considerable influence on how research data, in particular, are made available. The most fundamental level relates to the people involved in dementia research: the scientists, but also the policymakers, regulators, private partners, patients and research participants. We need more people with appropriate skills to manage big data. These people must be trained, be connected across disciplines, and be given

incentives. Finally, everyone involved must shift their thinking to adopt a mindset towards responsible data sharing, collaborative effort, and long-term commitment to building the two-way connections between basic science, clinical care and the increasingly fluid boundaries of healthcare.
Source: https://www.oecd-ilibrary.org/docserver/5js4sbddf7jk-en.pdf?expires=1594644278&id=id&accname=guest&checksum=D577750193463404FC3E930C7EECB7F8

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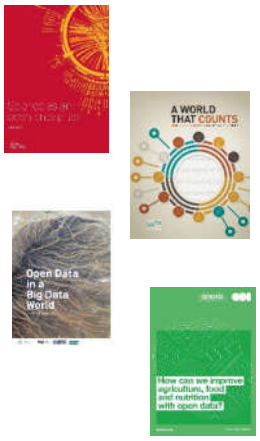
OPEN DATA – GLOBAL INITIATIVES

- Bits of Power: Issues in Global Access to Scientific Data 1997
- The three Bs (Budapest, Berlin and Bethesda) and Open Access, 2002-2003
- OECD Principles and Guidelines on Access to Research Data, 2004, 2007
- UK Funder Data Policies, from 2001, but accelerates from 2009
- NSF Data Management Plan Requirements, 2010
- Royal Society Report 'Science as an Open Enterprise', 2012
- OSTP Memo 'Increasing Access to the Results of Federally Funded Scientific Research', Feb 2013
- G8 Science Ministers Statement, June 2013
- G8 Open Data Charter and Technical Appendix, June 2013
- EC H2020 Open Data Policy Pilot, 2014; Adoption of FAIR Data Principles, 2017
- Science International Accord on Open Data in a Big Data World, Dec 2015
- China State Council Law on Management of Research Data, March 2018
- Open, Public, Electronic and Necessary (OPEN) Government Data Act USA 2019
- EU Directive on Open Data and Public Sector Information 2019
- UN Conference Towards Global Open Science: Core Enabler of the UN 2030 Agenda 2019



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Slide adapted from Simon Hodson, CODATA

- Bits of Power: Issues in Global Access to Scientific Data 1997: https://www.nap.edu/catalog/5504/bits-of-power-issues-in-global-access-to-scientific-data
- The three Bs (Budapest, Berlin and Bethesda) and Open Access, 2002-2003: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1525322/
- OECD Principles and Guidelines on Access to Research Data, 2004, 2007: https://www.oecd.org/sti/inno/38500813.pdf
- NSF Data Management Plan Requirements, 2010 : https://www.nsf.gov/news/news_summ.jsp?cntn_id=116928
- Royal Society Report 'Science as an Open Enterprise', 2012: https://royalsociety.org/topics-policy/projects/science-public-enterprise/report/
- OSTP Memo 'Increasing Access to the Results of Federally Funded Scientific Research', Feb 2013: https://obamawhitehouse.archives.gov/blog/2016/02/22/increasing-access-results-federally-funded-science
- G8 Science Ministers Statement, June 2013: https://www.gov.uk/government/publications/g8-science-ministers-statement-london-12-june-2013
- G8 Open Data Charter and Technical Appendix, June 2013: https://www.gov.uk/government/publications/open-data-charter/g8-open-data-charter-and-technical-annex
- EC H2020 Open Data Policy Pilot, 2014: https://www.openaire.eu/what-is-the-open-research-data-pilot; Adoption of FAIR Data Principles, 2017: https://www.exlibrisgroup.com/de/blog/complying-with-fair-principles/
- Science International Accord on Open Data in a Big Data World, Dec 2015: https://council.science/current/news/open-data-in-a-big-data-world-accord-passes-120-

endorsements/

- Open, Public, Electronic and Necessary (OPEN) Government Data Act USA 2019: https://www.datacoalition.org/policy-issues/open-data/open-government-data-act/
- EU Directive on Open Data and Public Sector Information 2019: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.172.01.0056.01.ENG
- UN Conference Towards Global Open Science: Core Enabler of the UN 2030 Agenda 2019: https://research.un.org/c.php?g=961229&p=6989510

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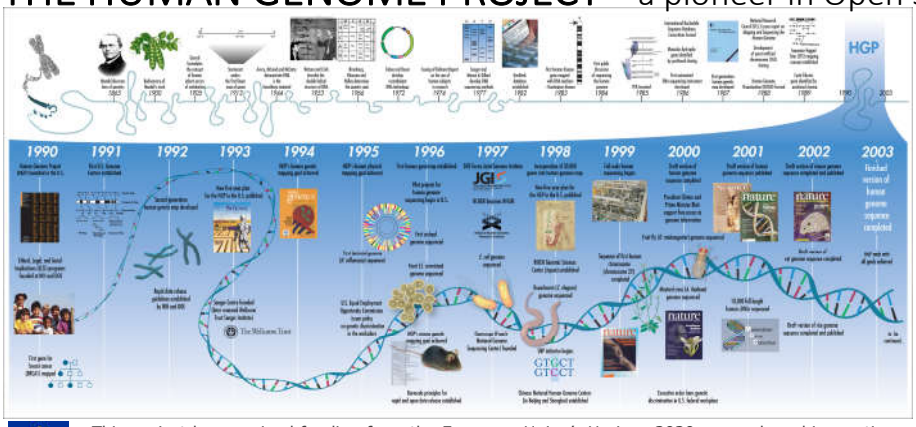
THE HUMAN GENOME PROJECT – a pioneer in Open Science



The Human Genome Project Timeline contains major milestones in genomics from 1865 to 2003. More: www.genome.gov/11007569. Credit: Darryl Leja, NHGRI.

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The Human Genome Project (HGP) was the international, collaborative research program whose goal was the complete mapping and understanding of all the genes of human beings. All our genes together are known as our "genome."

The International Human Genome Sequencing Consortium published the first draft of the human genome in the journal *Nature* in February 2001 with the sequence of the entire genome's three billion base pairs some 90 percent complete. More than 2,800 researchers who took part in the consortium shared authorship.

See timeline description at https://www.genome.gov/human-genome-project/Timeline-of-Events.

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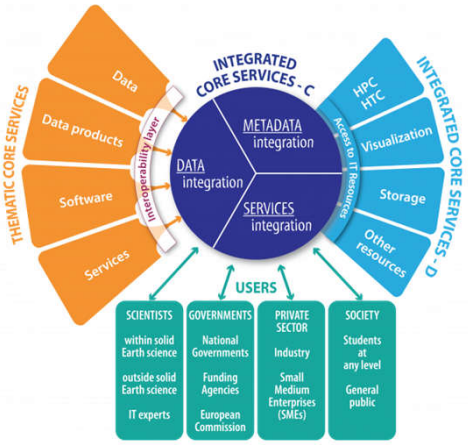
EUROPEAN OPEN SCIENCE CLOUD

The European Open Science Cloud (EOSC) is a European Commission initiative aiming at developing an infrastructure providing its users with services promoting open science practices. The EOSC officially launched in November 2018, starting to provide access to services via their EOSC Portal.



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https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnership-open-science-cloud-eosc.pdf

The EOSC partnership proposal is now published (June 2020): https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-cloud

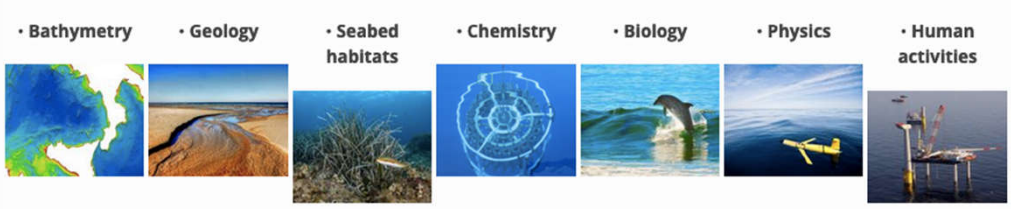
EOSC strategy is available here: https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/ec_rtd_he-partnership-open-science-cloud-eosc.pdf

The European Marine Observation and Data network

EMODnet

- Data from the marine environment are valuable assets. **Rapid access to reliable and accurate information** is vital in addressing threats to the marine environment, in the **development of policies and legislation** to protect vulnerable areas of our coasts and oceans, in **understanding trends and in forecasting future changes**. Likewise, better quality and more easily accessible marine data is a prerequisite for further **sustainable economic development**, so-called 'blue growth'.
- The European Marine Observation and Data Network (EMODnet) is a network of more than 150 organisations supported by the **EU's integrated maritime policy.** These organisations work together to observe the sea, process the data according to international standards and **make that information freely available as interoperable data layers and data products**.
- This "collect once and use many times" philosophy benefits all marine data users, including **policy makers**, **scientists**, **private industry** and the **public**. It has been estimated that such an integrated marine data policy will save at least one billion Euros per year, as well as opening up new opportunities for innovation and growth.

EMODnet provides access to European marine data across seven discipline-based themes:



http://www.emodnet.eu/what-emodnet

EMODnet is a long term marine data initiative. It has been developed through a step-wise approach and is currently in its third and final development phase. Available data are used to create and make available multi-resolution maps of all Europe's seas and oceans, spanning all seven disciplinary themes. More than 120 partner organisations are currently involved in the EMODnet programme.

For each of these themes, EMODnet has created a gateway to a range of data archives managed by local, national, regional and international organisations. Through these gateways, users have access to standardized observations, data quality indicators and processed data products, such as basin-scale maps. These data products are free to access and use.

Source: https://www.emodnet.eu/what-emodnet

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Conclusions 2

Future science diplomacy efforts with and for Open Science should therefore include planning and harmonization of the following actions:

1. Understanding and mediating the benefits (and challenges) of Openness
2. Bringing together and managing multi-level, multi-national, multi-format stakeholder negotiations

Slide credit: Mayer 2020: Open Science Diplomacy https://zenodo.org/record/4479514

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