Report on "Visions, requirements and needs for Future Research Environments: An Exploration Series with Researchers"

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1. Introduction

The European Open Science Cloud[1] (EOSC) initiative aims at supporting more than 1.7 million researchers and fostering interdisciplinary research in Europe. To understand better, what the research community needs, the EOSCSecretariat[2] partner TU Wien[3] is organizing workshops[4], interviews[5] and consultations[6]. As part of this initiative, the EOSCSecretariat invited high-profile researchers, such as members of the Marie Curie Alumni Association[7], ERC grantees[8] and Nobel Laureates to discuss their visions, requirements and needs for current and future research environments[9]. 17 researchers covering four research domains – Engineering and Technical Sciences, Medical and Health Sciences, Natural Sciences and Social Sciences and Humanities (see *Tab. 1: Number of Interviewees by Domain*) – accepted the invitation.

The objectives of these discussions were to

- explore the perspectives of excellent researchers who have a vision for and are interested in shaping the future of (European) research infrastructures for their domain
- identify current barriers and services considered essential for a well-functioning EOSC
- obtain a better understanding on how research is changing
- elaborate visions on how research will be conducted in 5 to 15 years and what the effect and impact on research infrastructures will be

[1] See https://ec.europa.eu/digital-single-market/en/european-open-science-cloud
[2] See https://www.eoscsecretariat.eu/
[3] See https://www.tuwien.at/en/
[4] See https://www.eoscsecretariat.eu/co-creating-eosc-workshops-researchers-and-university-networks for information on the workshops. Full reports on the workshops can be downloaded at https://zenodo.org/record/3693914#.XwhIhSgzaUk (workshop with university networks) and at https://zenodo.org/record/3701194#.XwhI0CgzaUk (workshop with researchers with a focus on technical and natural sciences). For Key-takeaway messages on these workshops and a discussion with funding bodies, please see https://zenodo.org/record/3701269#.XwhIyygzaUk.
[5] For a link collection of the interviews with researchers, please see https://www.eoscsecretariat.eu/eosc-liaison-platform/post/visions-needs-and-requirements-future-research-environments-exploration-0
[6] A Newsletter on the matter is available at https://www.eoscsecretariat.eu/news-opinion/online-session-visions-requirements-and-needs-future-research-environments-healthcare. Please, download the full report and key takeaway here: https://zenodo.org/record/4015121#.X1NdI8gzaUl (report), https://zenodo.org/record/4030301#.X2Mg7WgzaUk (key takeaway messages).
[7] See https://www.mariecuriealumni.eu/
[8] See https://erc.europa.eu/
[9] In September 2020, the Research and Innovation EC department published a study called "Towards a 2030 vision on the future of universities in the field of R&I in Europe". It did not only set out a stake-holder driven vision for 2030 for the future of European universities in the field of R&I in Europe, but also to see how to support on-going transformations on an EU Level. It introduces so-called transformation modules covering topics such as governance issues, maintaining trust and research integrity, the role of universities as research actors in research infrastructures, the need to strengthen human resources and working conditions at universities, knowledge transfer and digital changes such as the transition to open science through FAIR and open data, open access and open education. Some of these points were also discussed during the interviews, consultations and workshops in the context of the "Exploration Series on Visions, Needs and Requirements for (future) Research Environments". For more information on this study`s findings, please download it at https://ec.europa.eu/info/publications/towards-2030-vision-future-universities-field-ri-europe_en

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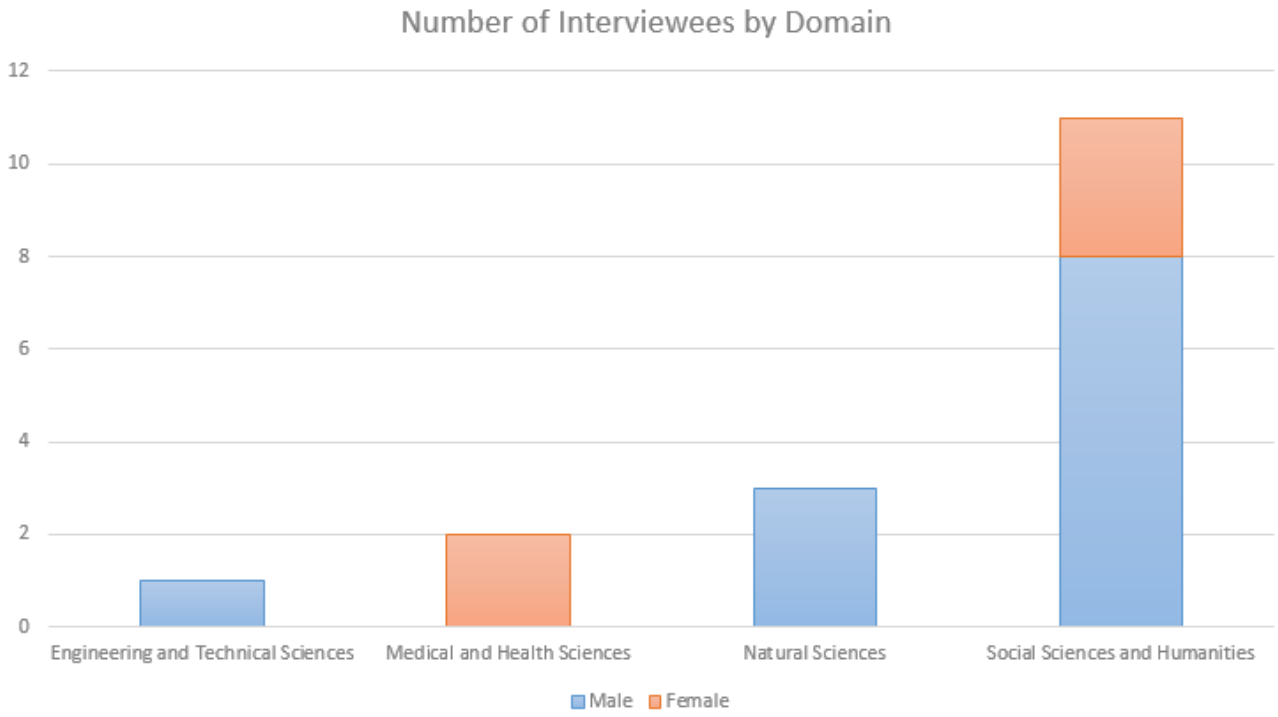
- provide these as seeds for public comments to involve a large stakeholder community, thus ensuring many voices are being heard and that findings are considered in EOSC implementation processes, so that the EOSC is serving the needs of researchers



Tab. 1. Number of Interviewees by Domain. 17 researchers - five of them female - from different fields were interviewed for the exploration series on visions, needs and requirements for future research environments. The fields covered are Engineering and Technical Sciences (1 man), Medical and Health Sciences (2 women), Natural Sciences (3 men), and Social Sciences and Humanities (3 women, 8 men).

All findings of the discussion are shared with potential stakeholders and feed directly into the work of the EOSC governance bodies [10] and the EOSC Working Groups [11] (WGs) providing input crucial for the development of the EOSC.

2. A "wish list": Identified Key Services

2.1 Re-assessing Research Environments

With research environments evolving from isolated and loosely connected islands to dense networks of researcher and institutional cooperation, scientific processes have already changed extraordinarily in the past half century. Still the world is changing at an increasing pace, societies face challenges that extend across national and geographical borders, and are flooded with (dis)information. To live in dynamic times, however, also comes with the opportunity to reassess the status quo of research environments, plan and see how science should be conducted on a local, national and global level and how research can contribute to and benefit society. Against this background, the EOSC as part of global future research environments needs to be aware of its stakeholders' needs. It is therefore crucial that further **developments of research**

[10] See https://www.eoscsecretariat.eu/eosc-governance
[11] See https://www.eoscsecretariat.eu/eosc-working-groups

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environments including the **provision of services** are accompanied by **ongoing dialogue** that **involves research communities**, and other stakeholders.

As (scientific) challenges extend across borders, science needs to be considered a global effort more than ever. At times, however, there seems to be a disconnect between the global – or at least – international profile of research and (administrative) cultures of institutions on a local level as international activities such as recruiting internationally mobile staff are not supported much. **Helpdesks** or ways of bringing together people to **share experiences and best practices** are first steps to improve local situations. Additionally, **the mobility of researchers and research staff should be encouraged and supported** on a broader scale by funding, e.g. via **mobility grants**.

2.1.1 Sustainable research environments

(In-)fighting for positions and too much emphasis on competition are fuelled by over-crowded research environments and reward mechanisms: Individuals are singled out based on their publications, citation counts, or grants. This is hindering research as a collaborative effort that is societally beneficial and that maximizes knowledge. To improve the current situation, **rewards could be given to specific communities, or teams that have created meaningful insights** instead of selecting individuals from such teams. That might also **enhance and enable team science**. However, too big a team might stop creativity and innovation as big research consortia require a lot of administrative work and coordination effort in order to finish research projects.

Eventually, it all comes down to financial issues. For all these points, **long-term plans for financing research should be developed** and a **fair distribution of resources at European level** should be made possible. This would encourage the thrust of research to be more global than national.

2.1.2 Publish or Perish

The current publishing system and how publications are tied to research and careers are criticized: First, the style of academic publication has not changed much within the past decades. Researchers write for free, reviewers aren't paid for their additional workload, but still publication fees have to be paid. Additionally, papers and articles published in specific journals are not open and, again, other researchers, their institutions, or the public have to pay to get access. In a way scientific publishers make profit out of situations that block Open Science (see chapter *2.2.3 Open Data*).

Second, even though the actual publication systems appear to be outdated, individual careers still seem to solemnly depend on the amount of papers and articles they get published in top journals as funding comes with great publication lists. This emphasis on publications brings up two main problems: For one thing, it sometimes hinders to work on long term projects. For another, it leads to the risks of researchers choosing mediocre research topics with little social benefit and good chances of getting published quickly over "unfashionable" research topics that do wield great social benefit but are not likely to be published soon, or at all. Additionally, it does not allow for failure within research processes, or for presenting science as a process.

There is more than one way in which this system could be softened, or undermined: A **lobby for legislation that curtails publishers of scientific journals in their profiteering** can help to foster Open Science. ERC grants already push into the direction of Open Science, as **research funded by public money has to be opened** at

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some point. Funders should take into consideration not only publication lists but also **give value to researchers' social outreach and science communication**.

2.1.3 (Research) Support Services

Changes in infrastructures, the automation of (trivial) tasks, the renewal of research technologies offered to research staff on the institutional level etc. should support researchers and help them save time to spend on research and increase their research capacities. Instead, they often do not match the actual needs of the researchers and force them into spending a lot of time on, for instance, misguided attempts at automation such as setting up or updating profiles, linking credentials of journals to other credentials, uploading manuscripts etc. Less automation would be desirable for such services. **Digital services related to public archiving, knowledge management systems, standardized lab record keeping, domain-specific search engines, and the integration of multiple existing platforms** would be very desirable.

In general, **knowledge management systems** could help to access different sorts of information in an easy and time-efficient manner. Such information may include instructions on funding procedures, policies and requirements to access specific data, contacts of experts and ongoing research projects, already existing (meta)data[12] etc. It could thereby bring together potential research partners to assemble multi-disciplinary projects.

2.2 Data

The EOSC will require services related to data and will have to take into consideration opportunities, as well as challenges that come with, e.g. big data (see *2.2.2 Big Data*), Open Data (see *2.2.3 Open Data*) and the application of FAIR principles (see 2.2.4 *FAIR Data*) to data.

2.2.1 Trustworthiness of Data

It should be noted here that the **trustworthiness of data has to be ensured** by all means – no matter the exact dataset. Thus, frameworks to understand data need to be transparent, although the framework would have to depend on data types. **Services to help with checking and verifying data quality** are just as essential. The following services were identified consequently[13]:

- Services to enable the automatic recording of provenance metadata for data, computation, and processes
- Services for data capturing
- Services to track provenance
- Services for secured and monitored data visiting
- Services for data quality validation processes

Descriptions of these services can be found in chapter *3. Table: Collection of Identified Services*.

2.2.2 Big Data

Data becomes increasingly more complex and bigger. In some cases, it already is too big to download and process locally. **Infrastructures that allow for massive scale processing** of the data would prove useful if

[12] *The National Research Data Infrastructure* (NFDI) in Germany may serve as an example for some sort of service that aims at systematically indexing, editing, interconnecting and making available data from science and research. It is currently under development: https://www.nfdi.de/en-gb

[13] These services were also identified at previous workshops and discussions. The full reports entailing more detailed explanations and descriptions can be downloaded at: https://zenodo.org/record/3701194#.X7gE5M1KiUl and https://zenodo.org/record/4015121#.X7gEmM1KiUm

offered on a European level by the EOSC: **Super computing capabilities** and **cloud platforms for sharing data** as well as for **enabling the cooperation of scientists** to analyse jointly data are therefore needed. Especially cross-border cooperation would prove crucial if huge datasets are to be maintained in good quality.

As data becomes ever more complex and bigger, **skills and competences in e.g. reading and evaluating data, or classifying information** become crucial. The need for new, **advanced data skills** and **data literacy** has already been recognized partially on levels of higher education such as universities. Educational programs and trainings are being established as part of Bachelor and Master programs[14], jobs such as data scientists or data librarians have become professions in their own right[15] and the idea of training data stewards and champions[16] to help manage data on institutional levels becomes increasingly successful. In order to boost data literacy further, it should be anchored in curricula at all levels of education as early as possible. Universities, however, are a good place to start.

2.2.3 Open Data

Open science facilitates access to scientific data for professionals and the larger public; it is a positive development as it helps to access resources anytime and anywhere, all while barriers for cooperation decrease. EOSC is a good model for fostering Open Science and needs **services to promote and enable Open Science**. Additionally, organizations play important roles when it comes to encouraging or enforcing Open Science including free dissemination of software, deposition of data, and dissemination of publications.

Open data, however, also comes with challenges: for example, authorship needs to be recognized. In addition, sensitive data cannot be open to everyone. Moreover, it would have to be discussed at what time research data should be opened: should data be opened as soon as it is generated? Should it be published as part of the submission of a paper, or as part of the peer-reviewing processes, or along with the final paper? What are likely benefits? What risks are involved when opening data? Thus, it can be noted that data should be as open as possible and as closed as necessary and that opening data is facing cultural challenges rather than technical ones.

Such cultural challenges include risks to individual careers due to an exaggerated emphasis on competition. Risks to individual careers relate to opening data too early and fears of others “stealing” datasets that were created with much effort. Against this background, open data may accelerate science, but not necessarily individual careers. This may increase worries of opening data as well as the reluctance to do so. Creating **work environments with safer working conditions** or putting **emphasis** not only on the number of publications in top-journals but also on **public outreach**, for instance, may improve that situation and help to focus on researchers as a community (of competitors) who want to drive curiosity-driven research forward (see chapters *2.1.1 Sustainable Research Environments* and *2.1.2 Publish or Perish*). Moreover, **top-level**

[14] For example, the Johannes Kepler University Linz (JKU) offers a Bachelor's programme on statistics and Data Science (https://www.jku.at/en/degree-programs/types-of-degree-programs/bachelors-and-diploma-degree-programs/ba-statistics-and-data-science/).

[15] See, for instance, master programs in (Social) Data Science at the University of Copenhagen (https://studies.ku.dk/masters/social-data-science/), or at TU Wien (https://informatics.tuwien.ac.at/master/data-science/). Data Librarian courses are offered by the University of Vienna (https://www.postgraduatecenter.at/en/programs/communication-media/data-librarian/). Another example is the *Data Scientist Training for Librarians* (DST4L) that was started by the Harvard Smithsonian Centre for Astrophysics John G. Wolbach library and the Harvard Library. That training consisted of experimental courses held in the 2010s. More information on these courses can be found here: http://www.aspbooks.org/publications/492/031.pdf

[16] At the University of Cambridge, for instance, data champions form a network across its different schools and departments. They are volunteers who advise members of the research community on proper handling of research data (https://www.data.cam.ac.uk/intro-data-champions). A paper on how the data champion program was set up can be downloaded at https://datascience.codata.org/articles/10.5334/dsj-2019-023/. TU Delft may serve as a second example as it employs data stewards, who provide disciplinary support for research data management at each TU delft faculty (https://www.tudelft.nl/en/library/current-topics/research-data-management/r/support/data-stewardship/).

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researchers have to act as role models, take a lead and start opening their data, so that early career researchers, who might be insecure or worry more about their careers due to the highly competitive environments they are working in, are encouraged to do so as well.

Another challenge for opening the research data is funding because preparing the data so that it suits an open data platform is cost intensive. Often worries occur whether it is necessary to use the limited research funds for that purpose. Another hurdle is that in order to make your data available in a common protocol there is a need to adhere to strict guidelines, which can be extremely time consuming. Thus, science data is frequently not prepared for that type of open access, which is a huge loss, both in terms of all the investments that went into research, but also in terms of the missed opportunity of building on the data. Additional funding for opening data and **services that help lower the effort required to open data**, would help meet these kinds of challenges.

The benefits of opening data, however, are manifold: Data becomes the more valuable the more people work with the same dataset, opening data enables their re-use, access to primary data allows to check research results and it leads to an increase of researchers' (data) citation indexes. Open data supports the mutual fertilization of ideas. Against this background, establishing **open data repositories** can speed up research processes and support quality in research. Such repositories need also be able to handle big data. In addition, it is crucial to promote benefits that come with the opening of data.

2.2.4 FAIR Data

Applying FAIR principles to data is central for making research (funding) more efficient and sustainable: redundancies can be avoided. FAIR data, services and software enable machine-to-machine actionability. Furthermore, FAIR is a concept usually accepted by researchers because it does not mean automatically that data needs to be open. It also helps to boost the visibility and citations of research. **Guidelines and trainings** to increase the number of researchers who understand the relevance of **making data FAIR** and who know what it takes to do FAIR Science and **how to annotate data**[17] properly, are essential to further optimize the reuse of data. In addition, **EOSC should offer services that help make data FAIR**[18] such as access protocols, ontologies, advanced search mechanisms, etc.

2.3 Interdisciplinary Research

Given the complexity of today's world and problems that cross borders, cultural divides and fields of knowledge, research becomes more interdisciplinary. Cross-fertilization is fundamental in all fields as it is essential to broaden and develop different perspectives on scientific and global challenges. In addition, interdisciplinarity allows research problems to be tackled from different perspectives. Thus, in order to develop ideas and find viable approaches, possibly solutions, to problems it is crucial that academics **have a**

[17] Adding metadata to datasets can enhance information discovery and the reuse of data. It was also mentioned, however, that adding and sharing metadata is often very tiresome and time-consuming as it has to be done manually in many cases. Services to enable the automatic recording of provenance metadata for data, computation, and processes as well as services to track (meta) data contribution automatically were identified at previous workshops and discussions. They are described in detail here: https://zenodo.org/record/3701194#.X2Mhr2gzaUk and https://zenodo.org/record/4015121#.X1NdI8gzaUl

[18] In 2018, the European Commission Expert Group on FAIR Data published a report and action plan called "Turning FAIR into reality" (https://ec.europa.eu/info/sites/info/files/turning_fair_into_reality_0.pdf) to help guide the development of the EOSC. This report addresses not only the concept of FAIR, but also the need of creating a Culture of FAIR data and technical ecosystems, skills and capacity building, measuring change and funding. In addition, the EOSC Fair Working Group (WGs) is working hard to provide recommendations on the implementation of open and FAIR practices within the EOSC. Its outputs can be found here: https://eoscsecretariat.eu/eosc-fair-wg-outputs

dialogue not only with colleagues, but also with governmental and non-governmental institutions and the public.

Crossing disciplinary boundaries, however, leads to problems due to communication and language barriers. As with open data, interdisciplinarity poses less of a data challenge than it poses a challenge to knowledge, networks, communication and language skills. For example, data sets, or scientific concepts cannot be taken out of context. In order to overcome such hurdles, on-going dialogues between disciplines, and experts who understand more than one field who can explain and instruct if need be are considered to be crucial. By providing advanced **translation services**[19] not only to translate from one language to another but also to translate scientific concepts of one discipline to other disciplines, to governments, to the public, or across different levels of expertise and career stages, **EOSC could help to get rid of such barriers**.

At this point, however, it should be mentioned that language translation services are maturing quickly and could provide a valuable service to communities not fluent in the dominant languages of the respective scientific fields. Services to translate between domains and levels of expertise are more challenging. They will take time to mature, but would promise significant improvements in scientific collaboration and communication.

Even though interdisciplinary research comes with benefits, there currently are limitations to what can be done. The focus on interdisciplinarity for the sake of interdisciplinarity does not support cutting-edge research. Interdisciplinary research tends to be good and successful whenever research topics and questions emerge that cannot be tackled by one discipline alone. “Classic” disciplines can then go about questions with their own strengths and specific preferences. **Services that identify and collect research questions and topics that are interdisciplinary in nature** might help to overcome such challenges.

[19] The need to address communication and language barriers within research has already been identified at the first workshop (https://www.eoscsecretariat.eu/events/what-do-our-researchers-want-workshop-%E2%80%9Ccollect%E2%80%9D-needs-requirements-and-visions-ideal-future) with researchers held by TU Wien in January 2020. A full report on this workshop giving more details on translation services is available at: https://zenodo.org/record/3701194#.X2Mhr2gzaUk

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3. Table: Collection of Identified Services

The following table listing specific services as well as a short description can be derived from the discussions covered before (see chapter *2. A "wish list": Identified Key Services*):

Service	Description
Initiatives to involve stakeholders in an on-going dialogue on the development of research environments	The world is constantly changing. Thus, the needs of researchers for research environments may change over time. Consequently, the EOSC as part of global (future) research environments needs to be constantly aware of its stakeholders' needs. Developments of research environments (including the provision of services) therefore have to be accompanied by ongoing dialogues that involve stakeholders, such as research communities to elicit new requirements and to ensure that the services offered remain cutting-edge.
Services and initiatives that help build bridges and connect researchers and their institutions across geographical borders on local/institutional level	Even though (scientific) challenges extend across borders, there seems to be a disconnect between the global/international profile of research and (administrative) cultures of institutions on a local level. Helpdesks or ways of bringing together people to share experiences and best practises are first steps to improve local situations. Additionally, the mobility of researchers and research staff should be encouraged and supported on a broader scale by embedding research visits as part of the EOSC culture of infrastructure use.
Initiatives to support research as collaborative effort and team science	(In-)fighting for positions due to too much emphasis on competition are fuelled by over-crowded research environments and reward mechanisms: Individuals are singled out based on their publications, citation counts, or grants. This is hindering research as a collaborative effort that is societally beneficial and that maximizes knowledge. To improve the current situation, rewards should be given to specific communities, or teams that have created meaningful insights instead of selecting individuals from such teams. That might also enhance and enable team science
Initiatives to change publication systems in order to increase benefits for society and the increase of knowledge	Softening the current publication system might increase knowledge as well as benefits for society. That could be achieved by a lobby for legislation that curtails publishers of scientific journals in their profiteering, enforce the opening of publicly funded research results along with data, or base funding not solemnly on publication lists but also on science communication and social outreach. Additionally, EOSC should offer publication services for papers, code and data to surpass traditional journals.
Micro services that support researcher's day-to-day routine	Such micro services include digital services related to public archiving, standardized lab record keeping, domain-specific search engines, and the integration of multiple existing platforms.
Knowledge Management Systems	Knowledge Management Systems have to be established in order to make better use of what is there already as well as in order to avoid redundancies. Knowledge Management Systems may include services search catalogues for experts, ongoing research projects and device inventories.
Services to help with checking and verifying data quality	The trustworthiness of data has to be ensured by all means. However, trust requires understanding where data comes from. Consequently, there needs to be a transparent framework to understand the data. In general, provenance and data quality, have to be checked or, at the very least, be checkable. EOSC shall offer services that allow for the documentation of how data is gathered. It should make (meta) data more searchable, findable and trackable and it should support many different formats. Examples are services to enable the automatic recording of provenance metadata for data, computation, and processes, services for data capturing (that can even include cryptographic verification of data like cryptographic signatures on the metadata on the data being processed), and services for trusted validation

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	processes[20]. The latter is crucial because researchers will refrain from using datasets that they do not trust. Thus, EOSC must find ways to guarantee the quality of data.
Services for secured and monitored data visiting	Such services need to support the negotiation of access to data automatically. Trust analysis algorithms need to be established and leakage of information needs to be prevented.
Infrastructures that come with a low entrance barrier and ease the access to massive scale processing services and cloud-based compute platforms and libraries.	Such infrastructures would be very useful if offered on a European level by the EOSC. Included are e.g. super computing capabilities, cloud platforms for sharing data (to enable the cooperation of scientists).
Data Literacy	The bigger and more complex data gets, the more crucial it is that people have competences in reading data, evaluating data, classifying information correctly, or assessing whether data is suitable for addressing a specific task. Thus, data literacy basics should be anchored in curricula early on and form an integral part of EOSC training at all levels of education.
Services to promote and enable Open Science	Open Science facilitates access to scientific data for professionals and the larger public. It is a positive (democratizing) development as it helps access resources anytime and anywhere, all while barriers for cooperation decrease. EOSC is a good model for fostering Open Science. As such, it needs services to promote and enable Open Science as well as it needs services to lower the effort required to open data (in terms of money and time). Against this background, open data repositories might be of use here. Additionally, top-level researchers who open their research data can act as role models to foster Open Science further.
Services to assist in making data FAIR Guidelines and Trainings to increase the number of researchers who know how to make data FAIR and how to annotate data properly	Applying FAIR principles to data is central for making research (funding) more efficient and sustainable as redundancies can be avoided. Guidelines and trainings to increase the number of researchers who understand the relevance of making data FAIR and who know what it takes to do FAIR Science and how to annotate data[21] properly, are essential to further optimize the reuse of data. In addition, EOSC should offer services that help make data FAIR such as access protocols, ontologies, advanced search mechanisms, etc.
Translation Services	Translation services to communicate research outputs to policy makers, to the public and across disciplines, e.g. services for automatic metaphor translation. Services to translate scientific concepts and explanations for different levels of expertise within a discipline, e.g. services for math translation explaining some mathematical concepts for specific research questions.
Services that identify and collect research questions and topics that are interdisciplinary in nature	The focus on interdisciplinarity for the sake of interdisciplinarity does not support cutting-edge research. Interdisciplinary research tends to be good and successful whenever research topics and questions emerge that cannot be tackled by one discipline alone. Thus, services that identify and collect research questions and topics that are interdisciplinary in nature might help to overcome such challenges.

[20] A more detailed description of these services can be found here: https://zenodo.org/record/3701194#.Xu0fHWgzaUk

[21] Adding metadata to datasets can enhance information discovery and the reuse of data. It was also mentioned, however, that adding and sharing metadata is often very tiresome and time-consuming as it has to be done manually in many cases. Services to enable the automatic recording of provenance metadata for data, computation, and processes as well as services to track (meta) data contribution automatically were identified at previous workshops and discussions. They are described in detail here: https://zenodo.org/record/3701194#.X2Mhr2gzaUk and https://zenodo.org/record/4015121#.X1NdI8gzaUl

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Appendix I – (Link) Collection of Published Interviews[22]

The interviews published on the website and listed below are interview excerpts. For the report, however, the full interview transcripts were used.

1. Interview with ERC Grantee Toma Susi:

Toma Susi[23] is an assistant professor for Physics of Nanostructured Materials at the University of Vienna[24]. The interview was published on 23 Dec 2019 at the EOSCSecretariat website[25].

Interview by: Barbara Sanchéz and Katharina Flicker (TU Wien)
Interview Title: Data Sharing in the interest of reproducibility and re-usability

KF: What is your work currently focused on?

TS: My work focuses on material science and more specifically electron microscopy. What we do is we look at the atomic structure of different materials, and their defects and dynamics and things like that. In addition to the experimental work, we do quite a bit of modelling. We use methods based on quantum mechanics to model the properties of these materials and then try to understand what is going on by combining the experiments with the theory and correlating the two.

KF: Do you have data challenges that EOSC could help you with?

TS: Yes. We generate two types of data. We generate electron microscopy images, which are in principle normal image files except that they are 32 bit. If you open such a file on your normal computer without using a specific program, you won't see much because the contrast range in such images is much wider. And if there was a way to have an open data repository where we could just upload a bunch of images and the website would make preview images that you could just browse in your normal web browser. And you could of course also download the original data files. That would be very useful. The other challenge for making data available are the simulations we run to model the properties of materials. These generate files that are pretty big and are typically not shared at all between researchers. We generate such files to the tune of 1 to 2 TB per year. We keep them for the time until the publication is accepted. Maybe a little bit beyond that. Then we have to delete them, we normally cannot store long-term such big files.

KF: What would you need from the EOSC in order to resolve the challenges you face? Which services would help you most?

TS: I do not currently see us doing much of this work we do in the cloud. We can do the analysis locally and it probably is easier. For us it is about open science. That is where the cloud could be very useful. And of course, not just have static files sitting on a server, but something that you and other people could access and re-use in various ways.

KF: What is the main added value that you see in the EOSC?

TS: Having one place for all European research data that is openly available on the web. I think that is the valuable and worthwhile goal.

KF: Do you believe that the EOSC can boost interdisciplinary research in Europe?

TS: I don't think that interdisciplinary research really is a data problem. That is more of a knowledge and communication and networking problem and of people actually finding these collaborations. You cannot just take a dataset that you don't understand and do research with that. You have to understand the data and to do that you have to cross boundaries and need somebody from the other side helping you and instructing you. Even good metadata probably isn't enough. You can describe the data. But unless you understand the discipline specific meanings of those descriptions, it doesn't get you very far. In terms of helping within the discipline of nanoscience and physics – if more of the data that we generate or that people in the field generate was more openly available and easily accessible and perhaps even some analysis that we could run in the cloud, we would use that. I think it would at least improve

[22] In order of the date of the online publication at the EOSCSecretariat Website: https://www.eoscsecretariat.eu/node
[23] See https://ufind.univie.ac.at/en/person.html?id=53363 and https://www.mostlyphysics.net/
[24] See https://physnano.univie.ac.at/
[25] See https://www.eoscsecretariat.eu/news-opinion/researchers-eosc-interview-toma-susi

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our ability of verifying results. But the question is then at which point of the research cycle this is going to be incorporated in. Is it post-publication, or even part of the peer-review process? Or Is the data already part of the submission? Or even before the submission like in a pure open science approach?

KF: Do you have preferences when it comes to *when* to share the datasets?

TS: That also depends on how easy it is to share the data. Currently you have to do most of the work manually. If you could just drag one zipped file to a cloud and everything else is handled somehow automatically, it would be much easier to share the data in the beginning of the peer-review process. Sharing something before that is another story. There you do get into –I think legitimate – fears of being scooped, if you share your latest findings months before you have a manuscript ready or before you submitted something. I do think that we would be hesitant with that. Because we can collect very specific types of data, and just finding the right samples, making the appropriate measurements, getting a good dataset – that is a lot of work and if you just share it before you are ready to publish, perhaps then somebody will take the data and will do the analysis that you wanted to do. That accelerates science. But it doesn't accelerate our careers in any way. So I think that at submission we would be comfortable with sharing data.

KF: In your domain, which challenges can you or will you address with the EOSC, or with more open data available which would be impossible to tackle alone?

TS: It would be valuable to have a way of fulfilling open data mandates in a user-easy and painless way for putting our data out there, with our papers and having it potentially be cited and re-used. That for us is the biggest motivation for doing open data. Currently we do some data open, but it feels that you are just uploading stuff on the cloud or on a server and that is it. Nobody ever uses it. Nobody ever cites it. It is nice to be open, but if there is no tangible benefit of it to anybody, then it feels a little bit like a waste of effort.

KF: What is the meaning of open science and how does it increase the value of your work as a researcher?

TS: For me it has to do with reliability, verifiability, and the re-use of the research we do. Currently at least it is tied to publication. Every single part of the publication needs to be open. The paper itself needs to be open. The data needs to be open. Anybody should be able to reproduce the analysis and whatever steps are necessary to reach the conclusions that are in the paper. So they should have the data available, and all the analysis available and they should be able to reproduce this whole chain and reach the same conclusions. That will help to improve the reproducibility of research.

KF: How does the EOSC help to drive open science and facilitate open access?

TS: Making it very easy to view various types of different data in a way that is helpful and useful.

KF: What are you missing in the discussion? What do I need to tell everyone?

TS: There needs to be a very clear explanation of what the EOSC is. Why are we doing this? How is it going to work in practice? There needs to be a single page with the full story. Not tens of pages of interconnected explanations. One webpage where I can go to understand what is going on and why I should care. There needs to be a clear message about what it is and why we are doing this. In terms of adoption, it needs to be simple and painless. If we have to jump through hoops to fill in pages of metadata manually it is not going to be widely adopted.

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2. Interview with Wolfgang Wagner, Head of the Research Group Microwave Sensing at TU Wien

Wolfgang Wagner[26] is *Head of the Research Group Microwave Remote Sensing* at TU Wien[27] and Senior Scientist at the EODC Earth Observation Data Centre[28]. The interview was published on 14 Jan 2020 at the EOSCSecretariat website[29]. The interview had been published before at the TU Wien Website on 24 Sep 2019[30].

Interview by: Barbara Sanchéz and Katharina Flicker (TU Wien)
Interview Title: Data Sharing in the interest of reproducibility and re-usability

KF: Can you please describe your field of research?

WW: We work with Earth observation satellites data in order to understand global environmental processes. We try to understand how climate change affects the environment. Our main focus is on radar data and we look specifically at how hydrological variables like soil moisture or water bodies change over time.

KF: What is the main challenge you currently face?

WW: The main challenge is that our data are becoming more and more complex and the volume of our datasets become larger. For example, we work with the Sentinel-1 satellites which provide several terabytes of data every day. Accumulated over the lifetime of a satellite, this means we have hundreds of terabytes of raw data and, when we process the data, they become petabytes of data.

KF: Do you think the EOSC could help you solve some of these issues? Are there any services in particular that are useful for your research field?

WW: What we need in Europe is more cross-border cooperation, so that people from different countries can work on the same dataset. In this way, we can maintain huge scientific datasets like the one coming from Sentinel-1 and ensure that the quality is preserved. A useful service for us would be an infrastructure that allows us to do massive scale processing of the data. We need super computing capabilities and we need a cloud platform for sharing the data. These systems must enable the cooperation of scientists for jointly analysing data. For me, the main added value of the EOSC is that it will promote open science. This means that there are no barriers for cooperation amongst scientists and that there is a possibility that people can critically cross-examine the scientific research from others. The crucial point is: data become the more valuable, the more people work with one and the same dataset and the same applies for software.

KF: Do you believe the EOSC can boost interdisciplinary research in Europe and the world?

WW: Yes, I believe so. But foremost it would already be a big achievement if the EOSC can help to boost disciplinary cooperation across borders in Europe. I think that interdisciplinary cooperation will come later. For example, we also work very closely together with people from geosciences like hydrology, climate sciences or meteorology, who use the earth observation data for input into their models or for evaluating the models.

KF: Is there a service or tool that you or your community would bring to the EOSC?

WW: Yes, the TU Wien has founded together with some partners the Earth Observation Data Centre that aims to bring cloud computing and supercomputing together in order to process satellite data on a massive scale. From the beginning, it has been a cooperation amongst partners from the public and the private sectors and between Austrian and international organisations.

[26] See https://www.geo.tuwien.ac.at/staff/1034/wagner-wolfgang
[27] See https://www.geo.tuwien.ac.at/
[28] See https://eodc.eu/
[29] See https://www.eoscsecretariat.eu/news-opinion/researchers-eosc-interview-wolfgang-wagner
[30] See https://www.tuwien.at/forschung/fti-support/forschungsdaten/news/news/was-denken-unsere-forschenden-ueber-die-eosc/ (German) and https://www.tuwien.at/en/research/rti-support/research-data/news/news/what-do-our-researchers-think-about-the-eosc/ (English)

KF: What will research look like in 10 years' time and what will be the effect and its impact on research environments like infrastructures, services and policies?

WW: I believe in Earth observation the future is already here in a sense that in the past people downloaded satellite data to a local PC and processed it there, but nowadays the data volume is already so large that this is not possible any more. So people have already started using cloud services for processing satellite data, which are provided by various cloud services.

KF: How can the EOSC manage the balancing act between easy to use and free services on the one hand and rules of participation and governance on the other hand?

WW: In my view EOSC services do not necessarily have to be free in all the cases. Of course, it is important that we provide some base services for free, like data repositories or access to software and some community services. On the other hand, I think that it is important that scientists also pay for certain services on a pay-per-use basis, because this will allow us to understand which services are important for the users, which are needed and – thanks to the additional income – these services can be developed much faster than without this additional financing.

3. Interview with Marie Curie Fellow Ottavio Quirico:

Ottavio Quirico[31] is an Associate Professor at the University of New England[32] (UNE). His expertise includes international relations, international law, EU law and politics as well as comparative law and politics. The interview was published on 1 Apr 2020 at the EOSCSecretariat website[33].

Interview by: Katharina Flicker (TU Wien)
Interview Title: Facilitating open access and the circulation of ideas (interdisciplinarity)

KF: What does your work currently focus on?

OQ: International law and international relations, EU law and politics. I develop a systemic analysis of international relations, for instance, concerning the regulation of climate change, aiming to identify inconsistencies and improve the system. This research is mostly based on documentary sources (documents of relevant institutions and scholarly work) and fundamentally aims to provide policy advice.

KF: What routines do you repeatedly do, that could be automated?

OQ: Library catalogues automatically retrieve relevant sources and this works well. Maybe, an engine indicating institutions with research affinities can support collaboration.

KF: What (data) challenges are you facing in your research?

OQ: Not all resources that I need are open access. Sometimes, only specialized institutions have access to specific resources. In addition, I occasionally need to travel to access printed books. However, these are increasingly available online, although mostly not in open access.

KF: What is the meaning of open access and open science and how does it increase the value of your work as a researcher?

OQ: Open science facilitates access to scientific data for professionals and the larger public; it is a positive development as it helps to access resources anytime and anywhere. Open data is more problematic, it is important to recognize authorship and to clarify whether specific data, for instance, data embedded in graphs, are open data. However, in order to encourage researchers coming from my field to open our science, ideas need to circulate and dialogue is essential for developing collaboration and finding solutions to problems.

[31] See https://www.une.edu.au/staff-profiles/law/oquirico
[32] See https://www.une.edu.au/
[33] See https://www.eoscsecretariat.eu/news-opinion/researchers-eosc-interview-ottavio-quirico

KF: Why do you think it is important to start a dialogue and develop collaboration?

OQ: It is important to discuss with colleagues from the same disciplines and other disciplines, and to have access to interdisciplinary resources, to develop ideas and find viable approaches, possibly solutions, to problems. It is fundamental that academics have a dialogue with colleagues from governmental and non-governmental institutions. Thus, if EOSC allows retrieving contacts that are active in a specific area of research, it facilitates collaboration and advances research.

KF: You mention that access to interdisciplinary resources is important. Please, may you also give an example here? How does your research benefit from interdisciplinarity?

OQ: In social sciences, at least political scientists, economists and lawyers need to talk to each other. For instance, it is only by discussing with economists and political scientists the problem of rolling back incentive schemes for investment in renewable energy that a lawyer can develop a correct perception of institutional problems and develop tailored answers for investment governance. Cross-fertilization is fundamental in all fields. Think, for instance, that Karl Jenkins took inspiration from the work of Renaissance architect Andrea Palladio to compose the string concert 'Palladio'.

KF: How will research look like in 5-25 years? What will be the effect and impact on research environments like infrastructures, services and policies?

OQ: Digital sources accelerate and facilitate access to resources and circulation of ideas. This is likely to increase in the next 5-25 years. Furthermore, facilitating access to resources and exchange of ideas improves interdisciplinarity, which is essential to broadening and developing different perspectives on problems.

KF: How could EOSC help you face these challenges and make your vision for future research environments come true?

OQ: Open access to resources and availability of digital versions of books would be highly beneficial. It would also be helpful to speed up publication processes. Currently, publishing in peer-reviewed journals takes time. However, publishing via online platforms might preclude publication in peer-reviewed journals. It would be helpful to find a solution, because the world evolves rapidly. In addition, it is important to facilitate collaboration on an interdisciplinary basis.

4. Interview with Marie Curie Fellow Isabel Krug:

Isabel Krug[34] is Senior Lecturer in Clinical Psychology at the University of Melbourne[35]. The interview was published on 23 Apr 2020 at the EOSCSecretariat website[36].

Interview by: Katharina Flicker (TU Wien)
Interview Title: Facilitating global collaborations as well as collaborations of inter and multi-disciplinary teams

KF: What does your work currently focus on?

IK: My research is in clinical psychology and focuses on eating disorder populations, but I am also looking at disordered eating and body dissatisfaction amongst normal populations. My research covers the severity spectrum from normal eating / body image to clinical disordered eating behaviours / body dissatisfaction.

KF: Why are you doing the work that you are doing?

IK: I am interested in eating disorders because I feel that it is something that everyone encounters. Everyone is confronted with eating all the time. It is not like other problems that you can say I am just taking a break from it. We do have to eat to survive. And I am intrigued by the fact of why people have abnormal eating behaviours. I also think that the eating disorder area is a lot less researched than other mental health problems. Anorexia has the highest suicide rate of all mental illnesses. If you look at abnormal eating patterns within the community, prevalence can vary enormously. Being dissatisfied with one's body has become a norm that

[34] See https://findanexpert.unimelb.edu.au/profile/516673-isabel-krug
[35] See https://www.unimelb.edu.au/
[36] See https://www.eoscsecretariat.eu/news-opinion/researchers-eosc-interview-isabel-krug

people don't question anymore. I am intrigued to find out why people develop eating disorders and how we can improve prevention and treatment for those people affected by this illness that robs the life of so many people.

KF: What data are you working with and how do you collect it to answer your research questions?

IK: I work with different data sets and they vary a lot. For instance, when I was doing my PhD and my postdoc in Spain, I worked at an eating disorder unit and had access to clinical data. Each patient who was coming to the unit was asked to fill in a survey to be part of a standardized assessment. Throughout the years, the unit has been able to establish a large database of clinical eating disorder cases, which we have used to answer questions about the best classification of eating disorders, risk and protective factors for eating disorders as well as treatment outcome studies. In the last couple of years in Melbourne, it has been a little bit harder for me to access clinical data. This is mainly because I am now based at a university setting and not a clinical hospital anymore. We now do a lot of community-based surveys to assess women at risk for eating disorders and body dissatisfaction. For various of our studies, we use ecological momentary assessment, which entails data collection through a smartphone app on certain eating disorder behaviours and cognitions various times a day for approximately a week.

KF: Are there any (data) challenges that you are facing?

IK: A lot of things in the research I do could be automated! I do spend a lot of time on bureaucracy. For instance, ethics is very time consuming. This is especially the case when I want to access a clinical eating disorder population at a local hospital. It is also very challenging to establish research relationships with clinical units, because the clinical staff is often overburdened and doesn't want to take on any extra work related to the research we would like to do. Hence, it is very difficult to establish a research-practice integration momentum. However, I feel fortunate that I still have ongoing collaborations with my work colleagues in Europe, who have large clinical datasets, which I am allowed to use.

KF: In an ideal (future) research environment, what kind of services would you want? What would you want to be able to do?

IK: I would be delighted to be able to combine clinical datasets on eating disorders from different countries. A lot of times researchers use similar measures, which would allow to harmonize datasets to answer exciting research questions using advanced statistical techniques (e.g. network analyses, machine learning). Furthermore, large datasets would also allow to assess differences across a range of eating disorder subtypes (e.g. Anorexia, Bulimia, Binge Eating Disorder, Otherwise Specified Feeding and Eating Disorders (OSFED[37])). I'm particularly intrigued by OSFED, which is the main category of eating disorders that does not fall into the established eating disorders of anorexia and bulimia. We currently know very little about this eating disorder category, mainly due to its heterogeneity.

I would also like to see more integration of different biological, psychological and environmental risk factors, in order to be able to develop and test a multi-factorial risk factor model for eating disorders. Until the present moment, most risk factor studies have been assessed mainly in isolation. Genome-wide association studies (GWAS) on Anorexia, have a range of biological, psychological and environmental data available to assess, but until the current moment, these collaborations have mainly focused on the genetic risk factors for Anorexia Nervosa. The datasets shared in initiatives such as GWAS[38], do allow however to combine other psychological (e.g. comorbidity, eating disorder and general psychopathology) as well as personality risk factors that are available to analyse. It would be interesting to combine all these different risk factors into the same analyses to see which factors have the highest predictive power for eating disorders as well as the different subtypes of eating disorders.

KF: You mentioned the need of combining biological, environmental, social and clinical data before. How does your field benefit from interdisciplinary research?

IK: In my area an inter- and multidisciplinary approach is very important. For instance, for the machine learning methods that are currently used to predict risk you need statistical and engineering knowledge. For the genetic analyses, you need the biological know-how and for the GWAS you need to be very good at processing very large datasets, which is only manageable with extensive

[37] See https://centerfordiscovery.com/conditions/osfed/
[38] See https://www.genome.gov/about-genomics/fact-sheets/Genome-Wide-Association-Studies-Fact-Sheet

bioinformatics expertise. However, it is of course essential to always be able to relate these findings back into a clinical context. I guess that's where my clinical skill sets are being asked for. It is impossible to acquire all these skill sets as one individual person. It is therefore essential to collaborate with people who are experts in these different fields to be able to move the eating disorder research field forward, with the hope of improving prevention / treatment programs for those affected by the illness.

KF: Now, getting back to all the things you said concerning the challenges that you are facing in research and interdisciplinary research. What would you need the EOSC to be or to offer to support your research endeavours?

IK: As a European living in Australia, I would really like to maintain and start new collaborations in Europe. I mainly know people working in the eating disorder field, but research on cross-disorders and other disciplines is becoming more and more important. Hence, facilitating collaborations from an inter and multi-disciplinary team, would certainly allow us to address exciting and timely research questions that won't be able to be answered in silo. Finding ways to automate administrative burdens to facilitate collaborations amongst different countries, especially within a clinical setting, would also be vital to progress research. Finally, being far away, I would also like to find out more about funding opportunities that are targeting research exchanges between Europe and other parts of the world, e.g. Australasian countries.

KF: Thank you.

5. Interview with Nobel Laureate Joachim Frank:

Joachim Frank[39] is Professor at the Department of Biochemistry and Molecular Biophysics as well as at the Department of Biological Sciences[40] at Columbia University[41]. The interview was published on 13 May 2020 at the EOSCSecretariat website[42].

Interview by: Katharina Flicker (TU Wien)
Interview Title: "Us against them" mentality might defeat existing international cooperation

KF: What does your work currently focus on?

JF: I focus on taking advantage of single-particle cryo-EM technology (for which I was awarded a Nobel Prize in Chemistry) as applied in structure biology research. Several collaborations are focusing on diverse molecules (receptors, ion channels, ribosome) implicated in disease processes.

KF: What routines do you repeatedly do that could be automated?

JF: I spend a lot of time on unreasonable, absolutely trivial tasks like setting up or updating profiles, linking credentials of journals to other credentials, chasing lost passwords, uploading manuscripts, dealing with 1-800 phone lines with automated voices in numerous service contexts. These are results of completely misguided attempts at automation. The extent of these pervasive changes in infrastructure, compared with the settings I was used to, is such that I frequently fly in a rage.

KF: Where are the challenges in the current digital services you use? What kind of support is needed to face those challenges?

JF: For the subset of digital services I singled out above, less automation would be much preferable. For digital services related to public archiving, knowledge base networks, bioinformatics, standardized lab record keeping, domain-specific search engines, the integration of multiple existing platforms would be very desirable.

KF: What will research look like in 5-25 years? What will be the effect and impact on research environments like infrastructures, services and policies?

JF: The state of the world in all aspects after the current pandemic is unpredictable. I don't think it is worthwhile thinking of a status quo ante and strategizing for it. "Us against them" mentality might defeat existing international cooperation. Also, depending on the politics of individual countries or alliances, a good deal of science funding might go into the study of pandemic-prone pathogens and

[39] See https://www.biology.columbia.edu/people/frank
[40] See https://franklab.cpmc.columbia.edu/franklab/
[41] See https://www.columbia.edu/
[42] See https://www.eoscsecretariat.eu/news-opinion/interview-nobel-laureate-joachim-frank-science

how to combat them. The USA has proven extremely vulnerable to economic disruption, and if the waves of the pandemic continue under the current models, science funding and the pursuit of science as we know it might be in jeopardy.

KF: What are the biggest barriers to opening up code, data...?

JF: In my area there is a controversy about patent claims relating to data processing methodology that demonstrably slows down progress in the field.

KF: What does it take to encourage you and researchers coming from your field to open your science?

JF: The general trend in recent years to deposit preprints in the life sciences is a good sign and my prediction is that it will become an accepted mode of fast communication, pending the blessing of authoritative review. In the USA NIH has been very effective in encouraging or enforcing open science including free dissemination of software, deposition of data, and dissemination of publications. Still I favour immediate unrestricted access to publications worldwide.

KF: How could the EOSC help to drive open science and facilitate open access?

JF: Lobby for legislation that curtails publishers of scientific journals in their profiteering, one of the main reasons for the current barriers.

KF: Please describe in one short sentence what is the main added value that you see in the EOSC.

JF: It's a good model for fostering open science.

KF: Thank you.

6. Interview with ERC grantee Monika Wolkers

Monika Wolkers[43] is a medical biologist and Research Group Leader at Sanquin[44] in the Netherlands. The interview was published on 3 Jun 2020 at the EOSCSecretariat website[45].

Interview by: Katharina Flicker (TU Wien)
Interview Title: Move science forward by getting rid of excessive data protectionism

KF: What does your work currently focus on?

MW: I am primarily interested in how the immune system works and how it responds to infections and cancer cells. I work primarily on T cells and study how T cells respond to tumours and infections, as well as how these responses are maintained and how we can exploit immune responses for treatments.

KF: What data sets are you working with?

MW: We use different types of data sets. We work with different RNA-Seq data types and with mass spectronomy data, which we also combine to determine the protein output from a given mRNA. We also work a lot with flow cytometry data, which is pretty much like mass data as well. Imaging is not in our portfolio yet, but we are planning to use it in the near future. Overall, we generate our own data but we also re-use published datasets from other scientists.

KF: Is it easy to access other people's data in your field?

MW: It works, but it could be better. It is good that funding agencies and journals now require access to raw data. However, not all data are reusable, for instance because the data acquisition is not well described or because they are not well annotated.

KF: How could you improve that?

[43] See https://www.sanquin.org/research/group-leader-overview/group-member/name/monika-wolkers#
[44] See https://www.sanquin.org/
[45] See https://www.eoscsecretariat.eu/news-opinion/monika-wolkers-interview-perspectives-european-researchers

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MW: It is crucial to raise awareness of how data should be annotated so that they are reusable for other researchers. Researchers need to be aware of the necessity to do so. In addition, a culture change would help a lot. We should get rid of excessive data protectionism. Is it not fantastic when other people make use of our data, and that they can answer questions that you have not even thought of? Besides that, we scientists are all in the same boat and we want to move science forward. I think we would achieve much more if we saw ourselves as a community rather than as competitors. Don't get me wrong. Some competition is important, because it keeps us moving, but the emphasis on it is too strong.

KF: Ok. So what would ideal (future) research environments look like?

MW: I am working in two different fields of research. The RNA biology field is definitely competitive, but it is primarily knowledge- and curiosity-driven. The immunology field is much closer to the clinics and to patient treatment, so other interests are at stake. And that attracts different types of people. Collaborations with pharmaceutical companies are common. There is nothing wrong with it. But we also need our independence in doing our research. Dependence on money can kill free thought and open discussion. I think if research funding was more independent from industry and more driven by governmental funding, it would already help a lot. In addition, all scientists should embrace the FAIR[46] (Findable, Accessible, Interoperable, Reusable) principles.

KF: Are there any other challenges that you are facing in your current research environments?

MW: Communication between researchers and experts that are setting up infrastructures and / or services is sometimes suboptimal. You may get services that you do not need or cannot work with because no one bothered asking about the pipelines you are using. Then again, we scientists may not even be aware of what is possible in terms of infrastructures and services. Therefore, good communication between researchers and experts is key to get the appropriate infrastructure.

In my institute we are still working on the infrastructure for big data. We are not there yet, but people are working hard on it, which I really appreciate. Moreover, having better access to robotics, for instance screening of genetic modifications, would be great.

KF: So having said all that, what would you want the EOSC to be, or to offer you so that it would really be helpful to you as a researcher?

MW: Perhaps getting good guidelines would help quite a bit. Ensuring that people know what type of data are out there that they can actually use. Also to emphasize what it takes to do open or FAIR science, and emphasize its value to the scientific community and the society. Perhaps EOSC could also play a role in highlighting research results that come from interdisciplinary approaches. This could inspire and encourage scientists to take new paths in their research and to strike out in new directions.

KF: Thank you.

7. Interview with ERC grantee Saket Saurabh

Saket Saurabh[47] is a theoretical computer scientist, mathematician and professor at the University of Bergen[48] in Norway. The interview was published on 19 Jun 2020 at the EOSCSecretariat website[49].

Interview by: Katharina Flicker and Bernd Saurugger (TU Wien)
Interview Title: EOSC: By joining efforts we might achieve more than as individuals

BS: What is your work currently focused on?

SS: We focus on hard optimization problems – in a technical language, these are called np-hard problems. In practice such problems are very hard to solve, and hence these problems can be solved exactly for only small problem sizes. That is why we draw on e.g. finding approximate solutions or some subclasses of inputs to solve practical problems.

[46] See https://www.go-fair.org/fair-principles/ and https://www.force11.org/group/fairgroup/fairprinciples
[47] See https://www.imsc.res.in/saket_saurabh and https://www.uib.no/en/persons/Saket.Saurabh
[48] See https://www.uib.no/en
[49] See https://www.eoscsecretariat.eu/news-opinion/saket-saurabh-european-researchers-interview-erc-grantee-bergen

BS: What are the things that drive your work? And why?

SS: Let me give you an example: Imagine that you would like to travel to several cities and you would like to travel in an efficient way. Thus, you are given the distances between each pair of cities in order to find the shortest possible route that visits each city and returns to the origin city eventually. This is called the Travelling Salesman problem. It is an np-hard problem and it is one of the most well studied problems in optimization. And these kind of np-hard problems appear everywhere. So you would like to design an algorithm for that. We are both driven by curiosity to solve these hard problems in different algorithmic paradigms as well as its need in various day to day applications.

BS: What datasets are you working with? And how do you analyse the datasets?

SS: I am a theoretician. Thus, we do not need many datasets because we do not do any experiments at all. However, lately we started working with problems related to big data. So you have a big amount of data that is trying to communicate something to you. Now what I'd like to do is to find small data sets which essentially have the same kind of features as the big data sets. So in essence, the small data, which you are storing, is representative of the original data. I need both data sets to check the algorithms we need. Theoretically, I can say that "look! If you give me data that satisfy this property, then the small set which I am going to compute algorithmically represents the data very well. Theoretically that is ok, because it would prove theorems. But I would like the data to really run these algorithms and see that it really does what I intend to do. Not only in theory, but also in practice.

Unfortunately, it is very hard to get these datasets. For this, you would need to collaborate with very different kinds of people to get these datasets. Of course, we can generate artificial datasets and be happy that our algorithm works on these artificial datasets. However, it is not very satisfactory. So in my opinion, it would be great if datasets were freely accessible.

BS: Thank you. What would it take to encourage you, or the researchers (coming from your field) to make your data open, or at least accessible?

SS: I thought about that quite a bit. I would say that competition is the biggest hindrance. So for example, putting together a good dataset takes a lot of effort and time. Thus, it is very natural that one wants to exploit every little aspect of it, before you share it so that no one else can use it before you do. So I think the way we think about research has to change. We have to start opening data for everyone. The more data that gets available for me to use, the more I will be able to contribute. But someone has to start at some point in time and say "I don't care. I open my data and I open my research". Once one or two big fish in the field do it, others will be encouraged to do the same.

BS: So what are your suggestions exactly?

SS: I think you will need the most established people. They will have to take a lead on this, because they are the trendsetters. As a young researcher, I was always a little bit worried about how things would go. However, established people will be less insecure. Thus, they need to take the lead as others will definitely follow. The ERC Advanced grantees are a very good example. Generally, they are people who are on top in their fields. If they share and open data, it is very natural for their working groups to do the same. Thus, a culture of data sharing and opening data is being adapted.

BS: In general, what will research look like over the next 5, 15, or 25 years? And what will be the effect and impact on research environments like infrastructures, services or policies?

SS: So if there is one thing I learned due to the Covid-19 pandemic, it is that in theoretical research distances will matter less. Before that I didn't think that online-seminars, teaching, meetings and conferences could actually work. Given the situation, we all had to try and do our best and I was satisfied with what we were able to get. That would also help reduce costs. Take the culture of having to attend conferences as an example. You go there to disseminate your ideas after your paper was accepted. To go there physically, however, is expensive: you'll pay registration fees and you'll be paying for transport and accommodation in order to have a very small audience listening to you. The audience becomes bigger if you do it online. In addition, you save money that can be spent on e.g. administrative staff / scientific administrators. I guess this will also affect policies and funding. And I really believe that as you go ahead, distance will have less meaning. Of course physical meetings will definitely be helpful and everything, but I think we have just found alternatives.

EOSCsecretariat.eu has received funding from the European Union's Horizon Programme call H2020-INFRAEOSC-2018-4, grant Agreement number 831644

BS: Having said all this, what would you need the EOSC to be to support you and your research?

SS: Help getting data, find people to collaborate with and identify people with similar goals. Then we could come together and come up with a better output and better dataset. For example, ERC is funding so many projects. When you take a closer look, you see that some are similar in nature. Therefore, if they could talk to each other, not only would they succeed in doing what they are doing, but in a joint effort, we might achieve more than as individuals or in small teams.

BS: Thank you.

8. Interview with ERC grantee Elise Muir

Elise Muir[50] is professor and *Head of the Institute for European Law* of KU Leuven[51] in Belgium. The interview was published on 23 Jul 2020 at the EOSCSecretariat website[52].

Interview by: Katharina Flicker (TU Wien)
Interview Title: EOSC may help to build bridges and encourage research on an international and global level

KF: What does your research currently focus on?

EM: Currently, my main research agenda is defined in relation to a project called "Reshuffle". That is the project for which I received funding from the European Research Council (ERC). The intention behind "Reshuffle" is to rethink the institutional framework within which fundamental rights are shaped at European level. For many years, the institutional setting in which fundamental rights were shaped at European level is the Council of Europe and its European Convention for Human Rights. It is still there, but I believe that for the past two decades another set of institutions engaged with fundamental rights at European level, and these institutions are those of the European Union. Thus, another institutional setting is now interacting very powerfully with the Council of Europe. What I want to do with "Reshuffle" is to explore these actions in the next five years.

KF: What data do you need to answer your research questions?

EM: The data that I need to answer these research questions is a combination of academic writing and legal data, which means looking at traditional legal texts. For example, the original European Union treaties, the Council of Europe, the European Convention for Human Rights but also legal texts produced at European level, such as EU legislation, directives, regulations, decisions. They must be analysed in comparison with case law. I want to look at how courts understand and articulate these various legal sources. I also need to know how academics – pure academics, but also legal practitioners who may voice themselves through legal or academic writing – understand these sources and the interaction between these sources. In the context of "Reshuffle", I also want to bring in the input of a number of other disciplines. In particular, philosophy, legal theory, political science or sociology. Here the data is taken from scholarship, but we will also have surveys and interviews.

KF: Is it easy for you to gather the data that you need?

EM: Insofar as there are legal sources at the highest level in Europe are concerned, I think it is reasonably easy as there has been a lot of progress in the past few years making legal sources available in English and all other official languages in the EU on the internet. However, it is a bit more difficult to find national case law and national legal materials, because of the linguistic barriers and because some systems are a bit behind in terms of providing electronic resources, for certain types of judgements, or certain legal acts. For example, not all the judgements are translated in English, translations do come late, or the meaning of the translation is not as accurate as it needs to be because uses of language differ between lawyers of different nationalities and translators. This is a problem, which I usually make up for by double-checking sources, reading the original sources and asking for input from my research staff who I trust on their understanding of texts.

KF: What would the EOSC have to offer in terms of services that could support you, or help you with these kind of linguistic challenges?

[50] See https://www.coleurope.eu/whoswho/person/elise.muir and https://www.kuleuven.be/wieiswie/en/person/00111456
[51] See https://www.kuleuven.be/english/
[52] See https://www.eoscsecretariat.eu/news-opinion/perspectives-european-researchers-elise-muir-interview-erc-grantee-ku-leuven

EM: I guess, by offering support to either contact national organs who hold information in a national language and/or offer their support to these organisations for translation. However, the quality of translations is usually hard to trust, because translation services are usually embedded in very specific (national) translation cultures. That leads to – I said it before – meanings getting lost in the translation process, because, for example, the jargon that EU lawyers use differs from that of Italian, or Austrian, etc. lawyers. I am not certain about what to do about this. Maybe micro-grants allowing scientists to recruit highly qualified and specialised lawyers / linguists would be the best way to address the problem.

KF: So you named translation services and the need to ensure that research environments support international research. Is there anything else you could think of that might increase your research capacity?

EM: Indeed. Very often e.g. grants come with a lot of administrative extra-work and reporting. I do understand the need for being accountable to the public on how we use the funding as well as the need to think about data management plans or ethics. However, the design of these rules – perhaps because they must be the same for every researcher – end up being ill-suited for certain types of research. From my perspective as a lawyer, some rules seem unnecessarily burdensome. Thus, I wonder if and how they could be simplified.

KF: Having discussed your needs and requirements for future research environments, what could be the main benefit that you see in the EOSC?

EM: EOSC could help to build bridges, encourage research on an international and global level, and rethink the conditions and rules that research funding is tied to.

KF: Thank you so much for your time.

9. Interview with ERC grantee Emanuele Campiglio

At the time of the interview Emanuele Campiglio[53] was assigned researcher at the Vienna University of Economics and Business[54]. He is now based as an Associate Professor at the Department of Economics at the University of Bologna[55]. His research focuses on economics, climate change and sustainability. The interview was published on 14 Aug 2020 at the EOSCSecretariat website[56].

Interview by: Katharina Flicker (TU Wien)
Interview Title: Research should be a collaborative effort that is beneficial to society

KF: What does your research currently focus on?

EC: My research is about climate, economics and the impact of climate change on socio-economic systems as well as the impact of a transition of a low-card economy on socio-economic systems with a focus on the macro-financial side.

KF: What do you do to answer your research questions?

EC: Basically, I use existing datasets to run some analysis on the data, or I use the data to calibrate a model that I want to build. In order to do that, I need access to databases. The crucial ones are the databases provided by international organizations such as the International Monetary Fund[57] (IMF), or by national statistical agencies. Every now and then, I need access to financial databases like Bloomberg[58]. There, money can get an issue. Often, I can access the data without having to pay for it. Financial databases, however, are usually not free. In my case, I plan for these costs when I apply for funding, or I get access via my university's subscription. The Austrian academic system is generous on average. However, not all systems are like that. When I worked in other environments, I simply did not access the data at times. Still I am quite lucky, because my research is not that data-intensive compared to other research, meaning that I can afford not always having access.

[53] See https://sites.google.com/site/ecampiglio/
[54] See https://www.wu.ac.at/en/
[55] See https://dse.unibo.it/en/index.html
[56] See https://www.eoscsecretariat.eu/news-opinion/getting-perspectives-european-researchers-interview-erc-grantee-emanuele-campiglio
[57] See https://www.imf.org/external/index.htm
[58] See https://www.bloomberg.com/europe

KF: Then what do you need in your line of research in terms of data, services, tools etc. in order to increase your research capacity?

EC: Project-related work and research requires a lot of administrative work that is highly time-consuming. At this university, there is a project manager, who helps us out a lot. It really is good to have people with specific expertise to contact. Of course, when you are responsible for your research project you want to be aware of everything, but still knowing whom to consult and being able to do so is a time-saver. It would be also great, if it were easier to quickly find and contact experts, for instance, on how to anonymize data, or with a specific background that I need for my research team.

KF: In that case, I would like to discuss two ideas that came up during other interviews and at workshops. The first idea was to have some kind of catalogue or services that enable EOSC stakeholders to find experts not only in research domains but also on skills needed for a day-to-day research routine. The second was to establish support teams for scientific experts on e.g. programming, statistics, data stewardship etc... Depending on which expertise is needed, researchers could contact these support teams to speed up scientific processes.

EC: I would love that. I mean, it would be amazing.

KF: Okay. Let's talk about future research environments. What components does your preferred future research environment consist of?

EC: I have a long list of dreams, but I would like to stay pragmatic. First, the reproducibility of research matters. I am often not comfortable, for instance, with requests of reviewing papers that present a model or an analysis without the underlying code. Even though I can relate to the authors' reluctance to share, I just feel this is something that has to happen. If I want people to believe that my results are indeed correct and meaningful, then they need to be able to replicate my analysis. However, I feel that things are moving in that direction more and well they should.

Second, I feel that research should be a collaborative effort that is beneficial to society, not only to individual careers. However, given that actual system it is very hard to push people into that direction. Science is very competitive. You fight with super-strong people for jobs at top-level institutions; you need to deal with being allocated a lot; you need to know the right people; you need to publish in the right paper. That really concerns me because the actual system supports research that is mainly of interest to scientific communities and individual researchers, not so much to society.

Third, I think that interdisciplinary research is very likely to become more important. Why? Because we face global challenges such as climate change, or pandemics and this is way too complex to deal with from only one perspective. We need joint efforts to find scientific solutions to threats to humanity on global scale.

KF: What has to change to get there?

EC: Especially when research is funded publicly, we should be motivated into sharing results as well as data, code, etc... Otherwise, research is not reproducible. In addition, I feel that maybe some sort of social change has to come about. My attitude, my favouring open access so much, was primarily shaped by the people that I worked and work with. Thus, it would help to support and push environments, where people find it natural to share things. Interdisciplinary research is being pushed already by e.g. funding that applies only for interdisciplinary research.

KF: Having said all this, what would you need the EOSC to be or to offer you to actually make a change and to support research?

EC: I could state the obvious, of course: we need access to data, results, code, papers, etc... However, I would appreciate it if this initiative could lead to re-thinking some of the topics mentioned above and add to an on-going dialogue about needs, requirements and research environments.

KF: Thank you!

10. Interview with ERC grantee Nicolas Schuck

Nicolas Schuck[59] is the *Leader of the Max Planck Research Group NeuroCode – Neural and Computational Basis of Learning, Memory and Decision Making*[60] in Germany. The interview was published on 29 Aug 2020 at the EOSCSecretariat website[61].

Interview by: Katharina Flicker and Bernd Saurugger (TU Wien)
Interview Title: Establishing an on-going dialogue on the research system and researchers' needs

KF: What does your research currently focus on?

NS: My work focuses on the neural basis of decision-making and memory. One particular process that we are investigating right now is called "replay". During this process the hippocampus – a brain area located deep inside the temporal lobe – rapidly reactivated memories. Research has shown that the sequential reactivation looks like the brain is recapitulating, or replaying, past experience. That is why it has been called replay. It is not entirely clear what role this process has in decision-making, and one particular challenge has been to investigate the process in humans, where we can measure brain activity only very indirectly. So part of our work is not only to understand what replay is good for but also finding tools that will allow us to measure it in humans, rather than animals.

KF: What data sets are you working with to answer your research questions?

NS: We mostly use functional magnetic resonance imaging (fMRI) and computational models, and we often analyse the human brain imaging data using "custom made" statistical tools. One particular interest of mine is to combine more traditional research methods with insights from machine learning.

KF: What would you need to increase your research capacity?

NS: Generally, I appreciate and enjoy the excellent computational imaging facilities at the Max Planck Institute. What could make my team/lab more efficient is more "technical" exchange between researchers? For instance, we often find solutions to different aspects of data acquisition or statistical analysis, such as how we can get the most signal in a particular brain area. I think there could be a more streamlined process, which would make it easier to access solutions that other researchers worldwide have already found. Sharing these insights, which are often technical rather than scientific issues would be great.

KF: What else would you need for your preferred future research environment or your preferred actual research environment?

NS: I would like to dedicate more time to deep theoretical work and that would require me to focus on a single project for a longer time. I have many responsibilities, such as running the lab, which often results in chasing from one task to the next. Additionally, there is publication pressure and very frequent career changes. These responsibilities and pressures sometimes hinder working on long-term projects.

KF: Ok. So what needs to happen to change that?

NS: I think that careers in science are very focused on the achievements of individuals, and these achievements have to be evaluated in relatively short time frames. This has led to a structure in which we often try to create projects that can be spearheaded by a single person. That can reduce the complexity of the projects that we work on. These kinds of projects need to be finished within a certain amount of time because we know in so and so many years this one person will have to be evaluated. And people will be looking for one piece of finished work where it is very clear that the responsibility and the credit for this work are assigned to this one person. I think that finding different ways of assigning credits in science could be very helpful and that would allow us to work in larger teams and increase the time frames in which we are evaluated. Giving us more time would also be helpful because science is often a process that is filled with failures. Failures cost time, but they have a very useful function and we learn a lot from them. In other words, we need time to get stuff wrong. Of course, there needs to be accountability and people need to make sure from the outside that

[59] See https://www.mpib-berlin.mpg.de/staff/nicolas-schuck and https://schucklab.gitlab.io/
[60] See https://www.mpib-berlin.mpg.de/research/research-groups/mprg-neurocode
[61] See https://www.eoscsecretariat.eu/news-opinion/getting-perspectives-european-researchers-interview-erc-grantee-nicolas-schuck

experiments are not doomed from the start. Right now, however, you often cannot afford to do really cutting-edge research, because you have to show frequent success.

KF: So these needs are needs that actually concern the immediate future. On a more macro level, where do you think science is heading?

NS: I hope that in the long-term science is going to be as thriving and international as it is today. Right now, I am afraid that the rise of nationalism will make it a lot harder for us to keep that international exchange within science going. As I mentioned before, I really hope that the future will bring more team science, in which you can work in larger teams to solve problems in a more thorough manner, with more time. It would be important to prevent teams from getting too big. It would not be helpful if we had huge centralized institutions with thousands of researchers working on the same topic, because then diversity of ideas and creativity would be lost. However, for the purpose of publishing papers, I would like to see groups going beyond the typical team size, which is now between two and five people. I do hope to see slightly larger teams in the future.

KF: What is your personal worst-case scenario for future research environments?

NS: I do not want to see an ever-increasing need to publish papers at a faster rate. Publishing good papers should be a priority. I also think that we are sending more and more people into the scientific system, without really thinking about what will become of these people. Right now, I think that the university system is not sustainable, because we keep opening graduate schools and have very talented young people that become early-career scientists. However, all of these scientists eventually want to have postdoc positions, then they want to have PI positions, and then they want to have tenured professorships. Rightfully so. But unfortunately, these positions do not exist. This increases the pressure on young graduates, which is not only harmful to people but harmful to science because people focus on maximizing the reward system that is focused on individual papers and citation counts. That cannot be the best way forward.

KF: Having said all this, what do you want from the European Open Science Cloud?

NS: It is a great idea to connect researchers on a European level and listen to what is on their minds. It would be good to establish an on-going dialogue on their needs and the system. It is a very competitive system, which causes many researchers' continuous worry about their careers. I think that listening to that reality and trying to think about how we can make the system overall functional would be useful. I would like to see a focus on both maximizing scientific outcomes and on the way the system works for the researchers.

KF: Thank you for your time.

11. Interview with ERC grantee Stephan Schiffels

Stephan Schiffels[62] is the *Group Leader for population genetics at the Department for Archaeogenetics* of the Max Planck Institute for the Science of Human History in Jena[63]. The interview was published on 9 Sep 2020 at the EOSCSecretariat website[64].

Interview by: Katharina Flicker (TU Wien) and Bernd Saurugger (TU Wien)
Interview Title: Of middle tier researchers, publishing systems, and social outreach in research

KF: What does your research currently focus on?

SS: I am a population geneticist working in the field of archaeogenetics. We are trying to investigate the human past by looking at genomes from long dead people found in excavations and in archaeological contexts. My specific role is to develop methods and to analyse these genomes in ways that can elucidate past movements of people, mixtures or social processes, such as sex biased

[62] See https://www.stephanschiffels.de/ and https://www.shh.mpg.de/person/44297/2375
[63] See https://www.shh.mpg.de/en
[64] See https://www.eoscsecretariat.eu/news-opinion/visions-needs-and-requirements-future-research-environments-exploration-erc-grantee-1

admixture, or kinship in prehistoric cemeteries. We want to know, for example, how people were related to each other and what these relationships can tell us about their population structure.

KF: What data are you working with to answer your research questions?

SS: I am working mainly with genetic data but also with archaeological and sometimes anthropological data. The genetic data is the biggest part. Thus, we work with next generation sequencing data from living people today and from ancient genomes. Typically, we analyse this data in comparative ways, meaning that we are looking at differences between people's genomes and focus on positions that are different between people and groups. We then try to understand how they stratify across geography, time, ethnic groups, and archaeological cultures. This kind of data is also rather big data: an individual genome is represented by millions of positions that are informative about ancestry and that can be used for genetic comparative analysis.

KF: In your field of research, what kind of opportunities come with big data? What challenges do you face?

SS: There are huge opportunities currently in ancient genomics. In archaeo- or paleo-genetics we have moved towards population scale sequencing. In a single project, we can now analyse hundreds, sometimes thousands of samples that we then use to understand population structure through time. Before that, we analysed only a few samples to full depth. Ramping up the number of individuals and samples used when we do population scale sequencing comes with an entirely different set of questions. However, many genetic metadata and archaeological data are often not available in machine-readable formats. I am talking about FAIR[65] principles here. Findable. Accessible. Interoperable. Reusable. This is crucial, but certainly not currently fulfilled for many such data.

The change is not only in quantity, but also in quality, because we are able to analyse hundreds of genomes instead of only two, we can look into questions of (social) group belonging and procreation or of how ancestry stratifies with wealth and status, as assessed for example using grave goods. In addition, we are now raising questions relating to rather recent history. This also means a shift to engaging more with different scientific communities, such as historians, and also different types of data.

KF: Can you think of any services that might help you face these kinds of challenges?

SS: In Germany, there is an initiative called *Nationale Forschungsdaten Infrastruktur*[66] (NFDI). It involves both humanities and natural sciences. What are we aiming at? Imagine a specific research object you want to analyse and you want to know what kind of analysis has been done on it already. This kind of knowledge management system does not exist yet, but we want it. This is exactly what we are working on with the NFDI4Objects Initiative[67]. The NFDI, however, is a national initiative, but co-coordinating something like that in Europe – or across the world even – would be fantastic.

In terms of other services, I would say, we should aim at normalizing and standardizing datasets that enable us to link the worlds of natural sciences to that of humanities and support multidisciplinary approaches, when it comes to the studies of the human past. One would have to think about how to enable researchers from one discipline to make sense of data from another scientific community, or how to translate scientific concepts from one discipline to another. Not a trivial task!

KF: What would you want the EOSC to be or to offer in terms of services?

SS: I think we need services that allow researchers to put in arbitrary data in a computable format and with good documentation. We would need access to scripts, tools, primary data etc. to make research reproducible and to put results under scrutiny. And I think I would like to see something like *eduroam:* everyone uses it and it just works. All I need is to log in.

KF: Finally, considering research environments more generally, what do you need, or want to support your research endeavours?

SS: In Germany, at least, I would say, the situation is quite nice. We typically have access to public funding, for example through the DFG. There are the Max Planck Institutes, and there are great universities. In comparison to other countries there seem to be many jobs in academia. However, there are three issues that I do feel passionate about and that should be addressed: the system of having

[65] See https://www.go-fair.org/fair-principles/ and https://www.force11.org/group/fairgroup/fairprinciples
[66] See https://www.nfdi.de/en-gb
[67] See https://www.nfdi4objects.net/

fixed-term contract middle tier researchers, the peer-review and publishing systems and crediting social and public outreach in hiring committees.

Middle tier researchers are researchers below the professor or director level, but above PhDs, such as postdocs and group leaders. They are given fixed term contracts with no long-term job security. This kind of policy does not allow for e.g. family planning, which increases gender biases even further. After all, it is still women who are more affected by getting children. This social issue won't be fixed without permanent jobs being available at this level.

The publishing system really has been an issue for a while as well. The traditional system of academic publishing has not changed much during the last 50 years, despite the media landscape having undergone massive changes, with Social Media, blog, online magazines, etc. But for hiring committees, we still are mainly judged by our peer-review publications, and nothing else. On top of that, the peer review process itself is somewhat bizarre. Scientists all over the world peer-review papers for free, all while the authors of papers have to pay huge fees to get their paper published in a journal. Often, that paper is then not even published open access, and readers have to pay a second time to read the paper.

So I would love to see more credits and value given to other forms of publishing, also to public outreach, when it comes to evaluating scientists for grants and jobs. After all, more and more researchers try to increase their public outreach and explain what they do to the public. They are on Twitter, Facebook, or Instagram. They write blogs, run web pages that explain stuff, or give public talks. Credit or reward systems should take that kind of work into account, so that not only publication records matter but also social media and public outreach.

KF: Thank you very much!

12. Interview with ERC grantee Valeria Pulignano

Valeria Pulignano[68] is professor at the Centre for Sociological Research at Ku Leuven[69] in Belgium. The interview was published on 21 Sep 2020 at the EOSCSecretariat website[70].

Interview by: Bernd Saurugger (TU Wien)
Interview Title: Helping research and researchers growing in a world without boundaries of any kind

BS: What does your work currently focus on?

VP: My work focuses on examining the challenges individuals and their families encounter as a result of transformations occurring in society. Recently I have been awarded an ERC Advanced Grant which looks at precarity across the paid/unpaid dimension of work. Socio-political and economic drivers of changes have and are continuously shaping the world within which people live and work. They have transformed the conditions under which employment systems and labour markets function and evolve. As change is a fact of life, wellbeing as well as the quality of work and life need to be carefully preserved under the occurrence of these changes in order to create inclusive and sustainable societies.

So, in my work I have been concerned to study individuals and workers who spend part of their lives under certain recognizable socio-economic conditions. As a sociologist interested in work, employment and their societal contexts such as labour markets I examine the problems, or problems related to the work people undertake, in all its forms and manifestations in order to provide sound analysis of these problems and engage in policy responses for society. Why do I talk about problems related to work? Because workers are men and women who work under conditions that they do not determine at the first instance. But they can potently influence these conditions through 'voice', for example. So empowering workers while safeguarding their rights is something I care about a lot.

BS: What datasets are you working with and how do you analyse these datasets? What tools and services do you use for that and what would help you to be more efficient?

[68] See https://soc.kuleuven.be/ceso/wo/erlm/team/valeria-pulignano
[69] See https://soc.kuleuven.be/ceso
[70] See https://www.eoscsecretariat.eu/news-opinion/visions-needs-and-requirements-future-research-environments-exploration-erc-grantee-2

VP: I use ethnography, narrative (biographical) qualitative methods for interviewing which aims at contextualizing subjective experiences in their working and living circumstances, including different regulatory and organizational settings as well as multiple case design in comparative research. NVivo software is used to analyse these data. I usually use EU-level databases such as EWCS[71], ECS, EU-LFS[72], EU-SILC[73], Eurostat data[74] to define a statistical overview of a structural context in order to interpret qualitative data. I do also use these datasets to draw analysis on specific topics. Regarding the question about how to make these datasets more efficient one thing I would surely point to is facilitating access to these data. There is scope for improving technicalities to make it "use-friendly" and avoid troublesome when transferring data and files. Specifically, from a quantitative perspective, I see the need to increase the scope for panel data particularly at the EU level. In order to encourage researchers to give access to their data, data disclosure agreements while guaranteeing privacy and anonymity are essential and need to be respected.

BS: Which tools and services are you already equipped with to allow you to perform cutting-edge research and what would help you to be even more efficient?

VP: Good support infrastructures at the local level and simplification of administrative burden for the researcher are essential to dedicate time to perform cutting-edge research. Networking with peers and good communication tools are also desirable. We cannot forget that ground-breaking or blue-sky research, particularly in humanities, requires substantial exchanges and inter-changes among top scholars in the field. All this requires time and resources which are often scarce. Finding ways to maximize and optimize these resources would be desirable.

BS: What does it take to foster interdisciplinary research in Europe and beyond?

VP: Interdisciplinary approaches that set up bridges between different faculties are not deprived of the risk for them to explore uncharted territories. Still, if resources are invested in order to establish the connections with scientific partners in advance, particularly when the research subject at stake suits for a cross-disciplinary approach, the gains can far outnumber the risks.

Big structures that enrich and support interdisciplinarity are needed. However, 'small' structures such as clarity of meaning, motivation of staff, misalignment of old structures, time and workload, and loss of identity can work against interdisciplinarity. Setting up interdisciplinary workshops and curricula, increase funding and prepare people to inter-disciplinary research, establish collaborations with industry and other bodies which can stimulate interdisciplinarity, stay clear on focus and above all remember that "one size does not fit all" may help moving the interdisciplinary project forward.

BS: What kind of research are you currently unable to do, because you lack the knowledge, time, or technology, which administrative burdens are put on your shoulders and how can that be avoided?

VP: As probably many other colleagues I spend a lot of time updating profiles, improving visibility on-line, undertaking tasks which are not directly linked to what I am supposed to do such as 'research' like for example looking for a new password. Technology sometimes is not helping but rather increasing workload. It is not technology per se but the use (and who does it) which may create distortions. Sometimes I found myself having to make choices about which research tools I want to use and why. It is clear we have too much out there and we are often entrapped in all this which has clear commercial scopes. Our time is precious and we cannot afford to waste it.

Being a scholar within humanities also regularly confronts me with the duties of keeping ethics in place. I personally consider a 'must' for every social scientist to protect respondents and research participants. However, the tricky part may be "how to do it in such a way that it does not create burden for the respondent" and it helps the researcher to retain that respondent as a necessary condition to develop research. Finding the right and suitable technicalities which would help respondents while fulfilling ethical requirements may prove difficult sometimes, unfortunately. I often find myself spending more time trying to be creative enough to find the most suitable pragmatic technical solution respondents would also like and feel comfortable with, than doing effective research.

[71] See https://www.eurofound.europa.eu/surveys/european-working-conditions-surveys-ewcs
[72] See https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey
[73] See https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions
[74] See https://ec.europa.eu/eurostat/data/database

BS: Having said all that, what would you need the EOSC to be to support you in your research endeavors?

VP: Liaising with universities and other interest bodies for opening alternative routes for the assessment of research outputs. For example, as we all know, citations may be critical. We also need to ensure more open access for publications of journal articles and books and finding ways to speed up the process of publications, which can take a long time. Providing and supporting visibility to research and researchers is also desirable.

BS: Thank you very much!

13. Interview with ERC grantee Kristian Bernt Karlson

Kristian Bernt Karlson [75] is Associate Professor at the University of Copenhagen [76] in Denmark. His research interests include educational stratification, social mobility, quantitative methods and social science methodology. The interview was published on 15 Oct 2020 at the EOSCSecretariat website[77].

Interview by: Katharina Flicker (TU Wien)
Interview Title: However complex the structure behind the EOSC, it should never be a problem for the end user

KF: What does your research currently focus on?

KBK: My main research areas include educational stratification, social mobility, quantitative methods and social science methodology. These four areas, however, can actually be assigned to two categories. One of them is about intergenerational social mobility. For example, I look into social inequalities and how life courses are shaped by families, the state and educational as well as social policies. The other main theme is about developing different tools for measuring and quantifying mobility research in specific, but – more broadly – also methodologies in other scientific disciplines both inside and outside the Social Sciences. In short, I deal with social mobility and methodologies.

KF: What datasets are you working with?

KBK: Currently, I work with a range of datasets from national surveys to international surveys, including data from big collaborative programs such as the European Social Survey. These days I also use data from the Danish administrative registers. These population wide databases have extensive information on each Danish citizen and are updated annually. We sometimes try to link the aforementioned surveys with such registers to derive new insights from that. Within the Social Sciences, I would say, I am using almost all types of data you can imagine.

KF: OK. Are there any challenges you face with regard to that?

KBK: Procuring data access. This might be a widespread challenge – especially after the GDPR[78] came into play. I must say, however, that nothing changed dramatically in Denmark because the rules concerning data used to be very similar to the GDPR anyways. The GDPR brought about a change in terms of new definitions of the different roles of data in data management processes though.

Back to data access: In my experience, it often takes a very long time to procure access to data. Especially when you need access to data from different public institutions. Communication can be very time-consuming too and slows down the whole research process. In one instance, I had to wait one and a half years. It would be great, if there was a way of speeding up these procedures – at least after you have identified the data you need. Overarching-structures or setting up some sort of institution, or some sort of agency that coordinates all register based research to support researchers, or offices with go-to persons and experts. Such experts would have to know what is needed in terms of gaining access to specific data at specific public and private institutions that hold different sorts of data. Some sort of an online-tool, or knowledge management system, where you can find and access such information easily would also save quite some time. Having said this, I also need to stress that this works already well for some institutions, such as the

[75] See https://www.sociology.ku.dk/staff/researchers/?pure=en/persons/266163
[76] See https://www.ku.dk/english/
[77] See https://www.eoscsecretariat.eu/news-opinion/visions-needs-and-requirements-future-research-environments-exploration-erc-grantee-3
[78] See https://gdpr-info.eu/

administrative register at the Denmark National Statistics Office[79]. In addition, there are digital infrastructure initiatives in Denmark who are looking into such issues.

KF: So this need concerns your current research environment. Considering the future, where do you think science is heading?

KBK: I think Open Science and interdisciplinary research are gaining relevance. The latter is getting more important in relation to big data in whatever form because analysing and understanding big data naturally foster interdisciplinary approaches. Thus, I dare-say that in five to 25 years, big data will play a much bigger role in the Social Sciences than it does today. Furthermore, boundaries between different disciplines are likely to be more blurred. The latter comes with a risk of letting go of the benefits of specific disciplines. Much can be learned from immersing oneself in a specific discipline – be it sociology, economics, or whatever you are interested in – because they are highly focused on specific problem areas. With some of the interdisciplinary "big data"-research I have seen so far, neither the analysis, nor the results are novel except for the use of big data. What research really needs is to kind of move beyond doing relatively rudimentary analysis. Instead, research needs to begin analysing and understanding social phenomena by using big data and by drawing on different disciplines. However, that's where things are moving anyways.

KF: So what kind of change do we need to get there?

KBK: My point is that we need to learn and draw even more from the insights of core disciplines such as Sociology, Anthropology, Economics, Psychology, Business studies... After all, we do not want to reinvent the wheel just because big data comes with new opportunities. Living up to basic scientific principles – such as reliability, validity and accuracy – is absolutely essential. For that, we need to trust data quality. At times, I feel, we have to remember that getting access to big amounts of data does not necessarily mean that they are good quality or should be trusted. It also does not mean that big data always enables us to contribute to science in terms of novel findings or societal benefits. Thus, without putting scientific core concepts first, bigger is certainly not better.

KF: What do you think we need to deal with that?

KBK: I think we need a new set of skills in e.g. reading data, evaluating data, or classifying information correctly. In connection with that, things are already changing. At least, I get the impression that educational programs in the Social Sciences are responding to these new trends. At my faculty, for example, we have a centre for social data science. A new master program was anchored there. In addition, we hire new staff with the required expertise to teach within this program. In addition, we are restructuring our bachelor program to have more of this. So, you know, this is coming.

KF: What about Open Science?

KBK: I think Open Science is a democratic tool because when someone tries to make a point, someone also should be able to back it up. Others have to be able to see e.g. the data and code that led to certain findings and be able to replicate the results. This too is becoming more and more common, even though there are limits to Open Science such as the sharing of sensitive data. That is just not possible. We can, however, share our code, how we got the data, etc.

KF: Having said all this, how could the EOSC be beneficial to you?

KBK: As said right in the beginning, I spend a lot of time just figuring out what I need exactly to access certain data. Thus, in my case, the biggest relief would be to have some sort of European framework, infrastructures, or knowledge management systems that speed up such procedures. On a micro-level, however, it is important to think about the end user, the researcher. However complex the structure behind the EOSC, it should never be a problem for the end user.

KF: Thank you for the interview.

[79] See https://www.dst.dk/en

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14. Interview with ERC grantee Elena Esposito

Elena Esposito[80] is professor at the Department of Political and Social Sciences at University of Bologna[81] in Italy as well as at the Universität Bielefeld[82] in Germany. The interview was published on 28 Oct 2020 at the EOSCSecretariat website[83].

Interview by: Bernd Saurugger (TU Wien)
Interview Title: EOSC helping to find projects that are keen to each other

BS: So, what does your work currently focus on?

EE: I am a sociologist. I want to look at the social consequences of algorithmic prediction in three specific fields, which are insurance, medicine and policing. The idea is to look at how digital forms of prediction affect our society that still relies on probabilistic kinds of forecasts. The basis of my work is theoretical and as a sociologist I try to find topics that are socially relevant and at the same time sociologically interesting.

BS: What datasets are you working with?

EE: Our ERC project is divided in three parts and we work with different datasets for each of them. The one already started is on precision medicine, where we work with datasets of already published articles and grant proposals in the US and in Europe. Our project is divided in Germany and Italy with the host institution being in Germany. Mostly we work within German facilities and enjoy a very good collaboration with the university library. We use mostly the databases available to the library, plus we have contacts with Columbia University and with other institutions. For the project on insurance we will work on different kinds of data, for example data about user behaviour.

BS: Would there be something helpful for you to be even more efficient in your research?

EE: Well, I have to say something which holds for all other questions: My situation is very different in Germany and in Italy. I have much better support in Germany. That is why we work mostly there. There is still a big difference in library services and availability of resources. So I have to give a different answer according to the two situations. In general, it would be very useful to have better information about research projects that are similar or comparable or keen to mine. You discover after a while that there are really exciting research projects, partly even in your same university, that are looking at the same issues and can be extremely useful, but in some cases to find them you rely basically on randomness. You happen to get to talk with people who say: You know this person has this similar project and so on. Having a kind of knowledge management system that allows you to find out which researcher can be a resource for you or can be useful to be in contact with, I think that would save us time and help produce better results.

BS: You mentioned now that there is a difference between Italy and Germany. Do you have any idea where this difference comes from?

EE: The university and the academic system in Italy work differently than in Germany. I think that the main problem in Italy is – I will put it in a little exaggerated way – that in some contexts interest for research is perceived more as an annoyance than as an asset. What other colleagues and in some cases also the direction of the university can observe is that you do your teaching (which of course I love doing) and that administrative work is needed (everybody has to do its part) but research is in some cases considered like a whimsical personal attitude. The kind of support for research that I have in Germany and can observe in other countries in Italy is not always widespread and this can be a problem. Italian academic culture relies still more than in other countries on personal relationships rather than on international research outcomes.

BS: What does it take to foster interdisciplinary research in Europe and beyond?

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[80] See https://www.elena-esposito.com/, https://ekvv.uni-bielefeld.de/pers_publ/publ/PersonDetail.jsp?personId=52928627 and https://www.unibo.it/sitoweb/elena.esposito9/en
[81] See https://www.unibo.it/en/
[82] See https://www.uni-bielefeld.de/
[83] See https://www.eoscsecretariat.eu/news-opinion/visions-needs-and-requirements-future-research-environments-exploration-erc-advanced

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EE: In my experience I have the impression that success in interdisciplinary research requires a strong orientation to problems rather than to the background. In some cases the idea is that we meet with a different discipline and we experience each other. What is our approach? What drives us? And then we find a common ground and start researching. I have the impression that in many cases what you can share are relatively basic general issues and not the real interesting topics. If you are working on a focused problem, a real research problem, instead, you don't have to explain all the background and you just see what everybody can offer to solve that problem. In general, I think that this is the best way to foster productive interdisciplinarity. Of course, you don't always understand what the other researchers from other disciplines have in mind and what is their background, but if you refer to a problem it is not always needed.

BS: What would you need the EOSC to be to support your research?

EE: In general, I have an impression about European research structures. In the last years I have been working often with people from the United States and there is a clear difference between the European approach and the US approach. This refers to the fact that in Europe the general grant organization and research support tends to foster big consortia of many different institutions working on the same problem, which requires much administrative work and a lot of coordination effort (the projects are somehow connected, but in many aspects also very different). I am wondering if this is really productive. In the United States and in some specific programs in Europe (also the ERC goes in this direction) the financing goes directly to a single project with a single goal that has to be accomplished by itself, which is of course much easier and lighter to deal with. I understand that there can be a reason for big research consortia. You want to foster communication between researchers working in different ways. I see the logic but I think that the balance between the work required and the results is not always the most convenient one.

BS: An issue that often came up in previous interviews is the reward system. What is your opinion on that?

EE: Well, what I expect is that in the coming years the system of accreditation and rating of research will change. I observe that the review system in journals is not updated anymore. Especially young people are talking about open access and its role for research. Influential research is often not reviewed or not reviewed in the same way, according to our established review system. The system of peer review in principle can be very useful and in many cases I got really useful clues from reviewers – but the trend is towards a system requiring the reviewers mostly to criticize and not to coach the projects. This risks becoming a system that tends to punish real creative innovative research, because if you have a mediocre project with huge literature covering all the fields, you often get a revise or resubmit, while real inventive risky projects are more likely to get rejected. The system sometimes promotes mediocrity and I don't think it is productive. On the other hand, I already see trends that go in a different direction. I expect our publication landscape and also the reward system to change in the coming years and I think that it would be very productive if institutions get prepared for that and try to find ways to bypass the rigidity and the almost punishing attitude of some evaluation systems.

BS: Thank you very much for the interview!

EE: Thanks a lot and good work with your project!

15. Interview with ERC grantee Martin Carver

Martin Carver[84] is an archaeologist and professor at the University of York[85] in the United Kingdom. The interview was published on 17 Nov 2020 at the EOSCSecretariat website[86].

Interview by: Bernd Saurugger (TU Wien)
Interview Title: EOSC: helping to assemble interdisciplinary projects and avoid the disjuncture caused by Brexit

BS: What does your work currently focus on?

MC: My research is focused on European and Mediterranean Medieval people and their past experience, using archaeological, bio archaeological and bimolecular methods. To this end I have conducted large scale projects in England (Sutton Hoo), Scotland (Tarbat)

[84] See https://www.york.ac.uk/archaeology/people/academic-staff/martin-carver/
[85] See https://www.york.ac.uk/
[86] See https://www.eoscsecretariat.eu/news-opinion/visions-needs-requirements-research-environments-erc-grantee-martin-carver

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and currently in Sicily (ERC project with colleagues in Rome and Lecce). I am looking for the intimate experience of the people without history, their mobility, adaptability and resilience under different political and religious regimes. I think this experience is highly relevant to people today.

BS: What datasets are you working with and how do you analyse these datasets?

MC: In the field, I use mostly spatial and descriptive digital records of survey and excavation. In the lab, I initiate analyses of macroscopic and microscopic parameters of artefacts and human, animal and plant remains with my team who use biomolecular determinations, especially of radiocarbon, aDNA and stable isotopes. My ambition is to use these data in pursuit of the appearance, health and life experience of individuals, the history of settlements, the meaning of cemeteries and monuments (and from these the way that people thought), and the definition of communities, placed in historical context.

BS: What kind of research are you currently unable to do, because you lack knowledge, time or technology?

MC: I believe that my subject needs more creative syntheses, and I feel that the academic ethos discourages them because they may not be substantiated in the academic mode. But this means we risk losing support from both the general public and from fellow professionals. The results from Humanities research need to be communicated in multiple media – books, graphic novels, artists' impressions, films. Such things exist, but they need peer review and a higher profile. Properly done these are just as valid as the 'scientific paper' or large synthesis (and based on both) and vital for the health of the subject.

BS: How will research look in 5-25 years? What will be the effect and impact on research environments like infrastructures, services and policies?

MC: In the UK, much depends on what arrangements we have after Brexit and whether or not there is a deal. If there is a deal, the UK can participate in Horizon Europe, which will be a welcome opportunity for us. If there is no deal, then I believe we should still align with Horizon Europe, since its priorities reflect the global Sustainable Development Goals of the UN. This seems to me the right way for the UK and Europe to go, but it will need a bit of rethinking since most universities are currently organized by traditional disciplines and have an 'individualist' culture for selecting research areas. My guess is that the lead of Horizon Europe will result in an enlarged, flexible research network, which is both interdisciplinary and international; research may eventually be institutionalized by objective, rather than single academic discipline, technique or country. We are already moving in this direction. It may be that membership of a particular country or power bloc will one day be irrelevant to research funding. This would encourage the thrust of research to be more global than national. Horizon Europe could also need to give more weight to the humanities – although I think it is actually for the humanities to show how they can contribute to modern aims through the 'advocacy of the past'. The close engagement of the humanities is also necessary if the objectives and achievements of the dominating disciplines (ie science) are to be effectively communicated and attract public support.

BS: What does it take to foster interdisciplinary research in Europe and beyond?

MC: Inter- or multidisciplinarity is a leitmotiv of the new agenda and archaeology is well placed to serve it, since it equally professes STEM and SHAPE subjects. However the level of multidisciplinary collaboration envisaged in Horizon Europe could probably only be achieved if the ERC panels (PE, LS, SH) were replaced by panels that represented the six new Clusters (medicine, cultural heritage etc., with subsections). Since University departments are not currently organised in these Clusters, assembling research teams would need considerable assistance from the EU. This could be a useful role for a pan-European agency.

BS: Having said all that, what would you need the EOSC to be to support you in your research endeavours?

MC: Perhaps the EOSC could be the body that maintains a professional register of every project and researcher in Europe, including UK and FTA countries, i.e. paradata as well as metadata and scientific data. It could thereby act as a mart where potential partners could find each other and assemble multi-disciplinary projects. This might be a tall order, but could be an extension of the digital resource that EOSC already plans.

BS: What could be the main added value that you see in the EOSC?

MC: I assume that EOSC objectives include the maintenance of research databases with links to existing data repositories, with open access to them. If it was appropriate and feasible I would like EOSC to maintain an up-to-date database not just of research, but of the people doing it, its researchers and their links to each other. This would greatly facilitate the future building of multidisciplinary research teams with aligned interests. For me, the participants in European research, and especially in the UK, are the main assets for us. They have never been more international, diverse, promising and important than they are today.

BS: Thank you very much!

16. Interview with ERC grantee Richard Hodges

Richard Hodges[87] is an archaeologist and Emeritus President of The American University of Rome[88] in Italy. The interview was published on 24 Nov 2020 at the EOSCSecretariat website[89].

Interview by: Bernd Saurugger (TU Wien)
Interview Title: Telling new stories to the public

BS: What does your work currently focus on?

RH: My ERC project is concerned with a big issue in a small area. The issue is a historical one, using archaeology to understand what happened between the Mediterranean and Central Europe in the period between the 7th and the 11th centuries. In other words, historians believe that they have all the answers from written sources, but we as archaeologists have long since known, that if you can assemble a great deal of archaeological evidence, you can look at these historical sources from a different perspective. In particular, we have been looking at major resources within this period, namely silver and the use of coinage, in the context of a study of a fluvial valley between the metal-bearing hills of western Tuscany (the Colline Metallifere) and the Mediterranean Sea (at the place called Follonica on the Tyrrehenian Sea). We have analyzed this area, using an array of archaeological and scientific tools over the last five years, with a view to rewriting the history, not just of this area (the Maremma of Western Tuscany), but also the history of the Mediterranean of this time and its relationship with central Italy and, beyond, Central Europe – the Carolingian world and Ottonian periods.

BS: Which tools and services exactly are you using for your research?

RH: So, we have a big team based at the University of Siena. This essentially consists on the one hand of young historians who have looked at the documentary resources (which is fairly straightforward), and a team that has done pure archaeological work. Where we really made a huge difference (thanks to the ERC grant) is to use a team of scientists of different kinds, to analyse all the materials that we have excavated. In the valley, we have looked at all the geomorphological issues, the palynological issues (that is the pollen) and all the buried carbon residues to reconstruct the environmental history of this area and its changing importance for this time. Then, at the excavated site of Vetricella, we have used a full array of tools to understand the nature of the metals that have been made, used and worked there. We have analysed all the ceramics to try to look at their relationship typologically and spectrographically, in terms of the minerals they contain. We have examined all the animal bones that we have found and equally we have analysed all the human remains in the same way. No one in the history of Italian archaeology has ever done this before. That is all, thanks to the ERC grant, which has allowed us to bring in all these scientists, not just to excavate and understand the contexts of the history, all on which is fairly familiar, but also to really drill down on the detail of the material culture in a way which frankly is fantastic.

BS: How do you think research will look in 5 to 25 years and what would be the impact to research environments?

RH: So, the EU through ERC has given a new life to archaeology in Europe. It has done brilliantly and in 25 years the stories we were told as students will come to look like fairy stories. Fairy stories compared to the new research that has been made possible from the Palaeolithic to the modern era, thanks to archaeology and thanks in particular to being able to pursue material analyses in such a

[87] See https://www.richardhodges.net/
[88] See https://aur.edu/
[89] See https://www.eoscsecretariat.eu/news-opinion/interview-erc-advanced-richard-hodges

detailed way. That will be the lasting impact, to have new stories that will give us a new sense of what we are and were. If you want to do real research in archaeology you need not just to understand that a certain building was constructed at a certain time, but much more, how society was constructed. To do this, you need to understand who those people were in those times: how they ate, how they lived, and how they died.

BS: What is the biggest barrier for a researcher to open his data in your field?

RH: The biggest barrier that archaeologists face is actually the ongoing management of the datasets afterwards. Because museums and institutions are not keen to do this without the resources necessary. That is why getting the datasets (the material) into the public domain, in particular institutional public domain (like a region, like a commune, in a museum) is a key step forward. Traditionally, when you go to Rome what you will see is the very tip of an iceberg of its museum collections. Underneath, in storage there are millions of objects that are uncatalogued, because no one has ever looked at them since they were discovered as far back as the Renaissance – and that is a metaphor for the challenge we as archaeologists face. In addition to that our discipline requires the resources to do the level of interdisciplinary field research possible at our project in the Maremma. The only way we can justify the money to undertake such interdisciplinary research is to have public support. The public is very interested in archaeological research. They love the idea that we can tell new stories, new narratives from archaeological research. They love the minutiae of it as well. In my particular case, the stories need to be accessible to the local public and there is a strong will in my team to do this. We have been working with the region of Tuscany and with the local commune in the Maremma to develop trails and museum exhibits, which are based on the data, where the public can actually access and work with the data we found. So, before the pandemic came I was very optimistic that our data would be accessible.

BS: A topic that often comes up is that researchers need a better reward system and more recognition. What are your thoughts on that?

RH: It is very hard to judge who should win these grants. I think the criteria by which the EU chooses its grant winners are fairly transparent, but publication of results is absolutely fundamental and that has to be scrutinized at the beginning, during and afterwards. I can tell you honestly, we have published more than we need to have done because I am so insistent on getting it out there. But I am insistent, not because of the teaching and academy (which I see as a function of our society), but because I think that the impact on local economies is enormous if you get the stories right. What we are learning now from this pandemic is that the tourist industry is bigger than almost every other industry we have. I am a great believer that we as scientists have to move beyond just thinking “gosh, when we meet our fellow colleagues, we are going to talk about what the carbon dates are”, but rather “how the hell we keep our society alive? So that we can give some future to the students we teach.” Many (students) of whom, in the case of our project, I hope will end up in projects around this very area helping economic development. What is needed are discrete successor projects (with resources that amount to more than 100.000€ in size) and to try and get the particularly young scientists into other networks (other systems), so that there is capacity built on this enriching experience. The danger at the moment is that the (ERC) experience will die with the end of the project, which would be really sad. Yes, the proof of concept idea (which we will apply for) is good, but it is not enough to take the dozen graduate students or postdocs in the different fields (from history through to analysing charcoals) onwards and into the larger academic arena. That is a sadness for European university research. I know, these are tough times, but I hope that some of our experiences will filter back to Brussels in a way that will help, in particular my young associates.

BS: Thank you very much!

RH: Thank you!

17. Interview with ERC grantee Poul Holm

Poul Holm[90] is a historian at the Trinity College Dublin[91] in Ireland. The interview was published on 10 Dec 2020 at the EOSCSecretariat website[92].

Interview by: Bernd Saurugger (TU Wien)
Interview Title: The beginning of a new Copernican Revolution

BS: Thank you very much for doing the interview with me! What is your work currently research focused on?

PH: My current focus is on the North Atlantic fishery history. I am looking at the early modern fish revolution, which happened as the grand banks of Newfoundland were discovered in the 15th century and how that took off and sustained food security in the European fish market in the next 200 years.

BS: What are the things that drive your work and why?

PH: For the past 30 years, I have been looking at the impact of humans on the seas and how human societies were dependent on marine resources. I have done that in different contexts, but the main focus has really been to try and develop a long time series which has made it possible to me to develop a very cross disciplinary collaboration between historians, archeologists, biologists, oceanographers and climatologists, which is sort of bridging the gap between the humanities and natural sciences and also between narrative approaches and modelling approaches. The marine community is focused by training on getting strict protocols, experimental data according to a very tight schedule, whereas historical information tends to be messy. It is obviously derived from protocols, which depend on bureaucratic needs in different countries and cultures. In the early days, we were sort of met with a lot of suspicion and really basically the attitude was: "Your historical data is not relevant – forget about it!" So, we had to overcome that mountain of discussions you might say, by employing a couple of data scientists who were able to work with us and develop protocols, so that we could make our information intelligible to the others, while not losing what we wanted to keep. So that has been really a driver for me and I think I can say, I have been a pioneer in developing this type of research and had a huge opportunity for ten years to direct a global research initiative to look at this in 15 different regional teams across the globe.

BS: What does it take to foster this interdisciplinary research in Europe and beyond?

PH: Most historians work in very small teams or as lone scholars. They typically write narrative books, whereas I have taken a very different approach. I think my formative experience was really this opportunity to direct the HMAP[93] project (History of Marine Animal Populations) between 2000 and 2010. It was funded by an American foundation (the A.P. Sloan foundation), which quite uniquely has the approach of funding fundamental research with a long dedication of funding and with very low expectations of outputs in the formative years. Their philosophy is, that if you want to do something really innovative you should not be driven by expectations of deliverables. With that patience on the side of the funders, it was possible to train some PhD students to work with me and a few other people across the globe and develop this research project. So that has been really formative for me. It dawned on me how difficult it is to establish a new research field, but also the huge gains that head from having patience. So patience and serendipity has been absolutely crucial and it would have been impossible in a European funding context, because there is no European funding that would allow this approach.

However, building data in a new field also needs planning. If you want to be able to build information on very incongruous datasets, you need to be very clear about your research question and you need to be very clear about the protocols that you put in place.

[90] https://www.tcd.ie/history/staff/holmp.php
[91] https://www.tcd.ie/
[92] https://www.eoscsecretariat.eu/news-opinion/interview-erc-advanced-poul-holm
[93] http://www.coml.org/history-marine-animal-populations-hmap/

Because otherwise you just have a messy lot of data that won't really tell you much – you just create a bigger fog of information. So we have been trying to develop protocols as a big initiative. A lot of this is taking base on a voluntary basis in the past 20 years since that HMAP project began. We have developed what we call the Oceans Past Initiative, which is a scholarly community of historians, archaeologists and marine scientists across the globe.

BS: What kind of research exactly are you currently unable to do because you lack this technology, time or knowledge?

PH: Let me give you a concrete example. I have worked for a very long time (literally 30 years) on the Danish Chancery records, which are sort of 16th and 17th century bureaucratic report letters from the Danish Royal Chancery to the governors of the country. So these letters contain a huge amount of information about marine phenomena. We are looking at 15000 letters and it is full of information, anything from person names, place names, marine species, fishing technology, boats, information about prices and people and so on. You can sort of imagine there is enormous amount of information in these letters. So what I have done is, I have transcribed them and I have actually used my previous ERC grant to put a sub portion of this text base online and this is just for the Danish Chancery records. Then, if you would think about the enormous amount of bureaucratic information that is available in the early modern age – the data is just phenomenal. There is so much out there. And the beauty of it is that it is actually accessible. It is a simple question of scanning these published editions and doing either some intelligent mark-up or have some intelligent software to make this searchable and the gains from a scientific perspective will be phenomenal. One thing is of course that we could write better histories, and the other thing is that the current concern about our understanding of long-term climate change or long-term changes of biodiversity for example would be enormously influenced by having access to this kind of information, because it is there. It is not that it is undocumented, which most people think. Most people think that we don't know what happened before the age of modern statistics, which is completely wrong - it is a nonsense. So we have this huge knowledge, we just don't have the key to unlock it. So this is the promise of big data: That actually history has so much more to offer than it is usually suspected. Historians don't advocate this, because most of us were not trained to think in those terms.

BS: How will research look like in 5 to 25 years and what would be the impact on infrastructures services or policies?

PH: I think in the humanities, there will be two very different developments. I would say half of the humanities academic population is going the route of insisting on the lone scholar model writing books that sort of take a strong narrative approach and it will sort of be indifferent to technological innovation. So that is one pass which will continue to be strong. The other one is clearly the pass I am going down, which is focusing on multidisciplinary collaboration at a very big scale. I think the opportunities are immense. It is happening really fast and I would say in the last five years it has really come off the ground. It is so obvious now. Even the big science journals like Science and Nature are regularly publishing studies, which depend on large-scale collaborative teamwork, involving both, natural scientists and humanists. So that is a big change and we are only at the very beginning of this. I think that fundamentally we are at the beginning of a new Copernican Revolution. We are looking at this transformation from an analogue to a digital world, where we have so many more information possibilities that are opening up. I would say the humanities is one of the fields where this will have the biggest impact, because in many ways most science has gone at least through the early stages of quantification. In the humanities, it is only happening now. That will fundamentally change how we do our work and it will rapidly increase the applicability of our findings in a much broader context. So, that I think is the big change that is happening and it is happening so fast, that I would say even in five years' time, things will look massively different from what they are now and I can't even imagine how this will impact us 15 to 25 years into the future. The possibilities of big data are just staggering. So I think the biggest challenge is that part of the humanities is still training our students and our researchers in ways that is simply not fit for purpose. So there is a huge need training a new type of, maybe not humanities scholars, but human scientists (or whatever you would call them). People who are able to work in this cross-field. That is a big challenge. The universities (or most of them) are not really up to it, but it is happening simply by people voting with their feet. It is happening in so many PhD grant applications, in graduate schools, but especially in big collaborative research teams, where you see people are really trained to address these challenges.

BS: Thank you very much!