Open Access

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Abstract
The paper gives an introduction of the movement to open access to scientific publications and data. Organizations and countries promoting open access are listed. Some European projects in these fields are highlighted. Information about open access resources is given. Some recommendations for further open access work are given.

Introduction
In 2001 a meeting on scientific publicizing held in Budapest adopted the phrase *Open Access*. Open Access (OA) is the provision of free access to peer-reviewed, scholarly and research information to all. It envisage that the rights holder grants worldwide irrevocable right of access to copy, use, distribute, transmit, and make derivative works in any format for any lawful activities with proper attribution to the original author [1]. The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities is a major international statement on OA / access to knowledge. It emerged in 2003 from a conference on open access hosted in the Harnack House in Berlin by the Max Planck Society. Organizations that commit to implementing this definition of open access can sign on to the declaration. Now there are more than 495 organizations all over the world signing the declaration.

Countries have started to supports OA for the benefit of the global flow of knowledge, innovation and equitable socio-economic development. Access to scientific information is a problem even for the best endowed universities, especially due to a high and increasing cost of peer-reviewed journals and fluctuations in the exchange rates. OA has inspired a global movement that is revolutionizing the way research information is shared, disseminated and utilized. Essentially, it is about removing the financial and access barriers and use

restrictions present in traditional publishing allowing key stakeholders and the public to view and use research and documentation generated within one's own country and around the world. Requirements for such credible research and data are critical for policymakers, and those that are part of the decision-making process, to help them take informed action in seeking solutions to national issues. It has also allowed for scholarly research and information, which had mainly been the field of elite universities and wealthy countries that could afford it, freely available to the public. Further, OA is evolving the way research is reviewed, developed and measured creating new paradigms of interaction and evaluation.

A study funded by the European Commission (EC) suggests that open access is reaching the tipping point, with around 50% of scientific papers published in 2011 now available for free: *The tipping point for open access (more than 50% of the papers available for free) has been reached in several countries, including Brazil, Croatia, Estonia, Lithuania, Macedonia, Switzerland, the Netherlands, the US, as well as in biomedical research, biology, and mathematics and statistics* [2].

Organizations and countries promoting OA
The European Commission (http://ec.europa.eu/) emphasizes open access as a key tool to bring together people and ideas in a way that catalysis science and innovation. To ensure economic growth and to address the societal challenges of the 21st century, it is essential to optimize the circulation and transfer of scientific knowledge among key stakeholders in European research - universities, funding bodies, libraries, innovative enterprises, governments and policy-makers, non-governmental organizations and society at ¿large. The Commission envisions a future in which the data infrastructure becomes invisible and the information itself is an infrastructure from the user's perspective. To improve access to scientific information, Member States, research funding bodies, researchers, scientific publishers, universities and their libraries, innovative industries, and society at large need to work together [3].

The UNESCO (http://en.unesco.org/) Open Access strategy approved by the Executive Board in its 187th session and further adopted by the 36th General Conference identified up-stream policy advice to Member States in the field of Open Access as the core priority area amongst others.

SPARC: the Scholarly Publishing and Academic Resources Coalition (http://www.sparc.arl.org/) is an international alliance of academic

and research libraries working to create a more open system of scholarly communication. SPARC believes that faster and wider sharing of the outputs of the scholarly research process increases the impact of research, fuels the advancement of knowledge, and increases the return on research investments. SPARC focuses on taking action in collaboration with stakeholders – including authors, publishers, and libraries – to build on the unprecedented opportunities created by the networked digital environment to advance the conduct of scholarship.

EIFL: Electronic Information for Libraries (http://www.eifl.net) enabling access to knowledge in developing and transition countries. Working in collaboration with libraries in more than 60 countries in Africa, Asia, Europe, and Latin America, EIFL enables access to knowledge for education, learning, research and sustainable community development. EIFL advocates for the adoption of open access policies and mandates. EIFL also builds capacities to launch and sustain open access repositories.

COAR: Confederation of Open Access Repositories (https://www.coar-repositories.org/) is an international not-for-profit association that aims to promote greater visibility and application of research outputs through global networks of OA digital repositories. As organizations committed to the principle that access to information advances discovery, accelerates innovation and improves education. COAR endorse the policies and practices that enable OA – immediate, barrier free access to and reuse of scholarly articles.

RDA: The Research Data Alliance (https://rd-alliance.org/about.html) builds the social and technical bridges that enable open sharing of data. The RDA vision is researchers and innovators openly sharing data across technologies, disciplines, and countries to address the grand challenges of society. The current global research data landscape is highly fragmented, by disciplines or by domains, from oceanography, life sciences and health, to agriculture, space and climate. When it comes to cross-disciplinary activities, the notions of building blocks of common data infrastructures and building specific data bridges are becoming accepted metaphors for approaching the data complexity and enable data sharing. The Research Data Alliance enables data to be shared across barriers through focused Working Groups and Interest Groups, formed of experts from around the world – from academia, industry and government. It was started in 2013 by a core group of interested agencies – the European Commission, the US

National Science Foundation and National Institute of Standards and Technology, and the Australian Government's Department of Innovation. Other agencies, countries, companies, associations and institutes are due to join. RDA also has a broad, committed membership of individuals – now 1600 from 70+ countries.

OASPA: the Open Access Scholarly Association (http://oaspa.org/) mission is to represent the interests of OA journal and book publishers globally in all scientific, technical and scholarly disciplines. This mission is carried out through exchanging information, setting standards, advancing models, advocacy, education, and the promotion of innovation through a shared interest in developing appropriate business models, tools and standards to support OA publishing.

In July 2012 the European Commission issued COMMISSION RECOMMENDATION on access to and preservation of scientific information [4]. In 2013 after years of wrangling in America's Congress the white House stepped in to require federal agencies that spend more than $100m a year on research to publish the results where they can be read for free [5]. Spain has recently taken the legislation route to OA by enacting law on Science that includes provision for OA mandate. Similarly, Argentina has just passed a policy, which demands all big institutions to maintain Open Access Repository for the benefit of science, technology and innovation. In 2014 the Finnish Ministry of Education and Culture established Open Science and Research Initiative to incorporate open science and research to the whole research process. The Chinese Academy of Sciences and the National Natural Science Foundation of China have both issued new OA policies which will contribute to making research more available. The announcement on the Policies on OA to Research Articles from Publicly Funded Research was made on May 15, 2014 during a briefing on the Annual Meeting of the Global Research Council in Beijing, China. Governments of Argentina, Mexico and Peru have introduced national open access mandates and open access is now required by law in these countries. The Bulgarian steps in this direction are given in [6, 7].

European OA projects

OpenAIREplus (https://www.openaire.eu/) built a 2nd-Generation Open Access Infrastructure by significantly expanding in several directions the outcomes of the OpenAIRE project, which implements the EC OA pilot. Capitalizing on the OpenAIRE infrastructure, built for managing FP7 and Europa Research Council funded articles, and the associated supporting mechanism of the European Helpdesk System,

OpenAIREplus *develop an open access, participatory infrastructure for scientific information.* OpenAIREplus retain its European footprint, engaging people and scientific repositories in almost all 27 EU member states and beyond. The technical work are complemented by a suite of studies and associated research efforts that are partly proceed in collaboration with *different European initiatives* and investigate issues of *intellectual property rights, efficient financing models, and standards.* The new OpenAIRE2020 will expand and leverage its focus from: (1) the agents and resources of scholarly communication to workflows and processes, (2) from publications to data, software, and other research outputs, and the links between them, and (3) strengthen the relationship of European OA infrastructures with other regions of the world, in particular Latin America and the U.S. Through these efforts OpenAIRE2020 project will truly support and accelerate Open Science and Scholarship, of which Open Access is of fundamental importance. OpenAIRE2020 project continues and extends OpenAIRE's scholarly communication infrastructure to manage and monitor the outcomes of EC-funded research. It combines its substantial networking capacities and technical capabilities to deliver a robust infrastructure offering support for the Open Access policies in Horizon 2020, via a range of pan-European outreach activities and a suite of services for key stakeholders. It provides researcher support and services for the Open Data Pilot and investigates its legal ramifications. The project offers to national funders the ability to implement OpenAIRE services to monitor research output, whilst new impact measures for research are investigated. OpenAIRE2020 engages with innovative publishing and data initiatives via studies and pilots. By liaising with global infrastructures, it ensures international interoperability of repositories and their valuable OA contents. To ensure sustainability and long-term health for the overall OpenAIRE infrastructure, the OpenAIRE2020 project will establish itself as a legal entity, which will manage the production-level responsibilities securing 24/7 reliability and continuity to all relevant user groups, data providers and other stakeholders.

EUDAT: European data infrastructure (http://www.eudat.eu/) vision is to support a Collaborative Data Infrastructure which will allow researchers to share data within and between communities and enable them to carry out their research effectively. EUDAT aims to provide a solution that will be affordable, trustworthy, robust, persistent and easy to use.

PASTEUR4OA: Open Access Policy Alignment STrategies for European Union Research (http://www.pasteur4oa.eu/) is a project that supports the aim of encouraging the development of matching policies on open access and open data in the European Union according to the EC's Recommendation on *Access to and preservation of scientific information* and in view of maximizing alignment with the Horizon 2020 policy on access to the research funded by the EC.

FOSTER: Facilitate Open Science Training for European Research (https://www.fosteropenscience.eu/) identifies content that can be reused in the context of the training activities on open access and open data, enhances/repackages/reformats it to be used on the portal to support e-learning, blended learning and self-learning.

RECODE: The Policy REcommendations for Open Access to Research Data in Europe project (http://recodeproject.eu/) leverage existing networks, communities and projects to address challenges within the open access and data dissemination and preservation sector and produce policy recommendations for open access to research data based on existing good practice.

OA resources

Directory of Open Access Journals (DOAJ) (http://doaj.org/) is a service that indexes and provides access to quality, peer reviewed Open Access research journals, periodicals and their articles' metadata. The Directory aims to be comprehensive and cover all open access scientific and scholarly journals that use an appropriate *quality control* system and is not limited to particular languages or subject areas. The Directory aims to increase the visibility and ease of use of open access scientific and scholarly journals regardless of size and country of origin thereby promoting their visibility, usage and impact. Now it includes 10,067 journals, 5,940 searchable at article level, 136 countries and 1,777,441 articles.

ROAD the Directory of Open Access scholarly Resources (http://road.issn.org/) is a service offered by the ISSN International Centre with the support of the Communication and Information Sector of UNESCO. ROAD provides a free access to a subset of the ISSN Register (1.7 millions of bibliographic records, available on subscription, http://www.issn.org/en/understanding-the-issn/the-issn-international-register/). This subset comprises bibliographic records which describe scholarly resources in OA which have been assigned an ISSN by the ISSN Network: journals, conference

proceedings and academic repositories. ROAD records are also downloadable as a MARC XML dump and are available as RDF triples. DOAB: Directory of Open Access Books (http://www.doabooks.org) providing open access to scholarly monographs is a growing movement and lists now - 2396 academic peer-reviewed books from 79 publishers.

RoMEO (http://www.sherpa.ac.uk/romeo/) is a searchable database of publisher's policies regarding the self- archiving of journal articles on the web and in OA repositories. It contains publishers' general policies on self-archiving of journal articles and certain conference series. Each entry provides a summary of the publisher's policy, including what version of an article can be deposited, where it can be deposited, and any conditions that are attached to that deposit.

ROARMAP: Registry of Open Access Repositories Mandatory Archiving Policies (http://roarmap.eprints.org/) lists now institutional mandates - 238, funder mandates - 90, thesis mandates -121.

OpenDOAR: The Directory of Open Access Repositories (http://www.opendoar.org/) is an authoritative directory of academic open access repositories. Each OpenDOAR repository has been visited by project staff to check the information that is recorded. This in-depth approach does not rely on automated analysis and gives a quality-controlled list of repositories. OpenDOAR lets you search for repositories or search repository contents. Additionally, it provides tools and support to both repository administrators and service providers in sharing best practice and improving the quality of the repository infrastructure.

There are over 9700 OA journals and over 2500 institutional OA repositories. The major institutional repository software, DSpace, has reached over 1300 installations recently. However, only 20% of scientific journal articles are available via Open Access. Although many have started to argue that a tipping point has been reached. Since 2000, the average annual growth rate has been 18% for the number of OA journals and 30% for the number of articles [8].

Conclusions

Based on the analysis of current state of OA we suggest some recommendation for further OA work:
• To define clear policies for the dissemination of and open access to scientific publications resulting from publicly funded research. It should be on the basis of the green model, within which quality is ensured by scientific publications. This should embrace all

research institutions which perform and/or disseminate fully or partially state-funded research. Access to the results of state-funded research should be provided to the greatest possible extent.
• To ensure that research funding institutions are responsible for managing public research funding and that academic institutions receiving public funding implement the OA policies.
• To define clear OA policies for the dissemination and OA to research data resulting from publicly funded research.
• To reinforce the preservation of scientific information.
• To explore the opportunities for coordination between the bibliometric indicator and the OA policies. An investigation should be carried out to find out if it is possible to achieve coordination between the bibliometric indicator and OA.
• To create a service for a long-term storage of scientific publications. A service for long-term storage should be created, which will ensure that the digital publications can be read and used for a long time.

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