Revista Lusófona de Estudos Culturais / Lusophone Journal of Cultural Studies, Vol. 9, No. 2, 2022, pp. 139–146
https://doi.org/10.21814/rlec.4044

Interview With Eloy Rodrigues: "There Will Be No Open Science If the Excessive and Wrong Use of Metrics Is Not Abandoned"

Entrevista com Eloy Rodrigues: "Não Haverá Ciência Aberta, Se Não For Abandonado o Uso Excessivo e Errado das Métricas"

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Eloy Rodrigues is a member of the Expert Group on Science 2.0/Open Science of the European University Association, representing the Council of Rectors of Portuguese Universities. Deeply aware of open science issues and one of the main stakeholders of this movement in Portugal, he is the director of the Documentation and Library Service of the University of Minho (UMinho) and one of the main advocates for the adherence to open science practices and for the inclusion of open access in institutional policies. Eloy Rodrigues has coordinated UMinho's participation in more than a dozen projects (such as *OpenAIRE*, https://www.openaire.eu/, and *FOSTER*, https://www.fosteropenscience.eu/) funded by the European Union and concerning repositories and open science. He is a distinguished player in implementing open access from institutional repositories. He was the Chairperson of the Executive Board of the Confederation of Open Access Repositories (https://www.coar-repositories.org/) from 2015 to 2021 and is, since 2008, the coordinator of the UMinho team that develops the project *Repositórios Científicos de Acesso Aberto de Portugal* (Open Access Scientific Repositories of Portugal; www.rcaap.pt).

Elsa Costa e Silva (ECS): The open science movement is expanding and getting widespread institutional support. In November 2021, the General Assembly of the United Nations Educational, Scientific and Cultural Organization, UNESCO, approved a recommendation on open science (UNESCO Recommendation on Open Science, 2021), calling on member states to develop policies and incentives for open science. What do you think is the reason for this consolidation of open science?

Eloy Rodrigues (ER): Open science encompasses several dimensions, such as open access to the results of scientific activity, namely publications and research data, and openness in the research process. The concept and the movement of open science have gained ground in the last decade from the open access movement (open access to publications), which is now over 20 years.

I believe the consolidation of the open science movement in recent years is due to the convergence of several phenomena and factors. On the one hand, the growing maturity and scale of open access to scientific publications, despite contradictory and worrying

aspects (such as those relating to the model based on publication fees), has proven its advantages both for authors and the institutions where they work (visibility and increased impact). It also has advantages for the agencies and governments that fund them (maximizing the return on their investment in research and development) and the overall operation of the scientific system. On the other hand, there has also been a growing awareness of the benefits of managing and sharing research data, whose importance is growing in an environment where science is increasingly digital.

Finally, the COVID-19 pandemic, and the way the scientific community and society at large have reacted since the early 2020s, has demonstrated what the advocates of open science have been claiming: research conducted in an open, collaborative and transparent way, facilitating the sharing and communication of processes and results (data, publications and others), is the most efficient means to promote the progress of science and the generation of new knowledge.

The political support for open science, which already had a significant outreach before, has been greatly strengthened since the pandemic.

ECS: The COVID-19 pandemic was a moment of great expansion of open science. Do you believe it was an emergency solution, or are we facing a new normal?

ER: Open science has already been the answer to past health emergencies, such as those related to ebola or zika. However, given the global nature of the COVID-19 pandemic, the impact was much faster and more profound than in previous situations. Research practices and dissemination of results changed profoundly during the pandemic, particularly in the biomedical field, with the adoption of open science tools and principles: publication and sharing of results as quickly and openly as possible, allowing their reuse, adoption of innovative publication and dissemination channels and models (preprints, open peer review, overlay journals, social media, etc.).

The pandemic has demonstrated the benefits of these practices, and the ethical question we should ask ourselves (if we make knowledge relating to SARS-CoV-2 and COVID-19 available, why should we not do the same for other diseases, such as cancer, problems such as climate change, or other societal challenges?). However, it is not certain that the pandemic has mortally wounded the old practices and the scholarly communication model controlled by commercial interests.

The traditional scholarly communication system has so far proved to be quite resilient due to the strategic action of the commercial entities that dominate it and benefit from it, and, above all, to the conservatism and lack of vision and courage of the scientific community and its institutions. Therefore, it is legitimate to question whether adopting open science will survive the pandemic.

For open science to become a new normal, the institutions that do or fund research need to be able to sustain infrastructures run and controlled by the scientific community (and not by the dominant commercial entities) and to reform the evaluation of careers and research deeply. If the evaluation and reward systems are not changed, researchers will be driven back to old habits and practices.

We currently have contradictory indicators in this field: on the one hand, worrying signs that part of the scientific community is returning to the pre-pandemic "normality" but, on the other hand, a strong stimulus and political support to reform initiatives in research evaluation.

ECS: We have witnessed a greater openness of the scientific community to society, dialogue strategies, and calls for citizen participation. To what extent can we consider that the open science movement also contributes to the democratisation of science?

ER: While in some cases the access to knowledge only benefits the scientific community itself (due to the degree of specialisation and prior knowledge necessary for its reuse), in many others, it provides an immediate benefit, direct or indirect, to citizens and society, democratising its availability and facilitating its use.

As I mentioned earlier, open access to results is only one part (though the fundamental one) of open science. The other dimension is openness in methods, tools and infrastructures: the openness "in the doing" of research. Such openness also helps make science more socially responsible and more aware of the social consequences and implications of decisions taken in research, from the definition of agendas to the participation of citizens in research, to the methods and tools used for sharing or privatising its results. Open science and responsible research and innovation (RRI) are concepts with different origins but with many affinities and overlaps.

ECS: Alan Irwin (1995) coined the term "scientific citizenship" in 1995 to describe a new approach to involving citizens by calling on them to participate in the production of knowledge. How does open science relate to this citizen science movement?

ER: Citizen science is another element or dimension of open science, increasingly drawing attention and interest. When we talk about citizen science, in the context of open science, we are not only referring to the participation of citizens in research activities, such as observation or data collection, in a totally subordinate and relatively passive way. As we have already mentioned, we are also referring to participation in discussing and setting research agendas, evaluating projects and discussing their results and impact.

ECS: Open science has been growing as opposed to a closed and hierarchical model of science, organised according to impact factors. What do you believe are the main problems of this model of scientific production and dissemination?

ER: The current model has many problems. It is very expensive, and the high prices borne by the scientific community bear little relation to production costs and are largely determined by an "economy of prestige". The system lacks transparency and is controlled by a handful of large, monopolistic groups (about three-quarters of the articles indexed in databases such as Web of Science or Scopus are published by the five largest

publishing groups). It is hardly innovative and does not allow one to capitalise on the digital environment's potential.

Most importantly, it is closed and ineffective: research is hampered because researchers cannot access the entire corpus of literature in their field, they cannot perform text and data mining to extract new knowledge, and research results are not available and cannot be easily adopted by other social players, thus not serving the interests of research, the scientific community and society.

Using metrics such as the impact factor to evaluate research and the people and institutions that do it is an essential aspect of the current model, with very negative consequences. Firstly, because the impact factor is a completely inadequate metric to evaluate people/institutions, it was created to evaluate journals. Secondly, metrics can and have been increasingly manipulated. Finally, evaluation based (in some cases exclusively) on metrics has led to a research culture that encourages competition and the production of a specific outcome, the scientific article, in the largest quantity possible, in journals with the highest possible impact factor. That hinders the research agenda, the topics chosen, the methods used, and the results sought to its "publication potential".

As I often say provocatively, I fear that in some contexts, to satisfy the metrics and rankings, one stops publishing because one is researching and starts researching mainly to publish.

ECS: There is also a fact noted, for example, in a 2002 paper (Bordons et al., 2002), about geographical inequalities, since in peripheral countries, national publications are rarely published in the most prestigious databases...

ER: Yes, that is another problem getting worse. The lack of equity in scholarly communication, which has an obvious geographical dimension (although there are others among disciplines or institutions in the same country or region), has not diminished in recent years. In fact, the model involving the payment of publication fees (APC, or article processing charges) for publication in open access, which the large publishing groups quickly adopted and, unfortunately, is supported by several countries and institutions with greater economic resources, only magnifies the problem. It replaces (or rather adds to) the challenges many have in accessing articles published in scientific journals with the impossibility of being able to publish in those same journals.

ECS: A key variable to consider in this context is the financial side and the turnover revolving around scientific publishing. Don't you believe this aspect will be one of the major obstacles to developing open science?

ER: Yes, of course. The big publishing groups have fantastic business. The scientific publishing market is estimated to be worth more than $10,000,000,000, and each paper published in a traditional scientific journal generates about $5,000 in revenue on average. The APC in traditional journals is around $2,500. However, the Springer Nature

Group has signed an agreement with the Max Planck Society, whose researchers will publish in open access in Nature-branded journals for $9,500 per article. According to available data, the profit rate of the publishing business of the Elsevier group has been over 30% in recent years.

Hence, it is only natural that these large groups strongly resist change or try to make it only in the payment model/moment, maintaining their control over the entire scholarly communication system.

Less natural and understandable is that the scientific community is still unable to free itself from this control, from this kind of Stockholm syndrome from which it seems to suffer. That it has not yet managed to reform the scholarly communication system, making it more efficient, innovative, inclusive and governed by the community. By establishing a system driven by the primary purpose of scholarly communication and the first journals created in the 17th century — to record and disseminate the results of research and scholarly work — and not steered by commercial interests.

ECS: Considering the costs related to publishing, is it possible that open science will intensify the already known inequalities in access to the production of science and that it is only a movement for the so-called "developed countries", the only ones with the means to support these new structures?

ER: That is a serious risk if the fee-paying model of open access publishing becomes dominant, as the commercial publishers want. The regional, institutional and disciplinary inequalities mentioned above could be accentuated, and there are already some signs of this. In the project *ON-MERRIT* (Observing and Negating Matthew Effects in Responsible Research & Innovation Transition), we are part of, explored this problem and produced recommendations: ON-MERRIT *Recommendations for Maximising Equity in Open and Responsible Research* (Cole et al., 2022) to mitigate the inequalities identified.

ECS: What is the role of institutional repositories in this new context? Can they really be a new trend in institutions producing science?

ER: Repositories and other institutional infrastructures will be pivotal for a new model of scholarly communication. Not only as another outlet for content originally published elsewhere but as the starting point for scholarly communication.

Whereas when journals were published on paper, which meant that the roles of registration, certification, dissemination and archiving, essential for scholarly communication, were handled by the same entity (the journal), in the digital world, these four roles can advantageously be distributed among different players and infrastructures.

Repositories can be the foundation of a distributed and globally connected infrastructure for scholarly communication. They can ensure registration and archiving roles and facilitate external value-added services (such as peer review, certification, and

dissemination) provided by other entities and infrastructures, such as journals or publishing platforms.

That is an innovative vision of scholarly communication, which we have been promoting, namely through the Pubfair framework proposal (Ross-Hellauer et al., 2019) and the *Notify* project (Confederation of Open Access Repositories, n.d.).

ECS: One of the constraints for open science is that indexing provides clear references to the visibility and reputation of publications. Will there be conditions for the emergence of new models for validating the scientific quality of publications within the context of open science?

ER: There will be no open science if the excessive and wrong use of metrics is not abandoned. And I say the same about the possibility of a good evaluation system for researchers and research. Metrics, such as the impact factor, shift the evaluation from the content (intrinsic to the publication) to the container and circumstances (extrinsic) and replace human qualitative evaluation with an automatic quantitative evaluation.

The excessive use of metrics, and especially indirect metrics such as impact factor, has been strongly criticised for almost 1 decade, with successive declarations (such as the San Francisco Declaration on Research Assessment, in 2012, and the *Leiden Manifesto for Research Metrics* [Hicks et al., 2015], in 2015, or, more recently, the Paris Declaration — Paris Call on Research Assessment, 2022). It seems consensual today that the current model will have to be replaced by alternatives that combine qualitative and quantitative assessment and, in the latter dimension, by the limited and responsible use of metrics.

ECS: Among the main challenges to the idea of open science, which do you think are the most difficult to overcome?

ER: I honestly think that the main challenges and obstacles are inertia and the difficulty in coordinating and taking concerted action on the part of the scientific community and its institutions. Open science does not require more financial resources (it is quite likely that if it is led by the scientific community and not by commercial entities, it will allow for savings regarding the publication and dissemination of results). On the other hand, it has advantages repeatedly proven in emergency situations and everyday science, so there is no significant opposition to open science in the scientific community.

However, although it already has a very significant adherence in some countries, institutions and scientific disciplines, and among young researchers, the spontaneous adoption of open science practices is still limited, and the major advances were made through "top-down" political stimuli. Traditional academic conservatism, inertia, and especially evaluation systems that reinforce the incentives to use traditional practices make old habits die hard. Cultural changes are always difficult and time-consuming, and this is particularly evident in academia.

Finally, the widespread adoption of open science, managed by the scientific community, and serving the interests of science and society, calls for a systemic change, which requires the coordinated and concerted action of all institutions, from funding agencies to universities and other research organisations. Such alignment must happen globally, involving the main institutions and their members in the different regions, which is anything but trivial.

Translation: Anabela Delgado

Acknowledgements

This work is supported by national funds through FCT – Fundação para a Ciência e Tecnologia, I.P., under the project UIDB/00736/2020 (base funding) and UIDP/00736/2020 (programme funding).

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Submitted: 29/04/2022 | Accepted: 06/06/2022