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Scientific reviews: considerations regarding their evolution

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Introduction

Since the first, the Journal of Savançs, was published in 1665, scientific reviews have been the vehicles par excellence for the spreading of information and scientific knowledge, and instruments of communication between researchers from the same field. In the general framework of scientific communication "authors resort to the scientific journals with intention of ensuring ownership of their ideas (a public register) and with the certainty that the knowledge published is valid, is scientifically verified and respects the academic norms of scientific method, and this because it has been evaluated fairly and impartially by the members of the scientific community themselves, thus becoming an instrument of certification, validation and knowledge"¹.

The importance of scientific reviews reaches its greatest expression in the case of medicine, where they are the medium most used for the interchange of ideas, to review and to update knowledge, making them a true reflection of the evolution of this scientific community.

Since their appearance in the 17th century, the evolution of scientific reviews has been linked with the changes in the way science is conducted and especially, to the events in the purely technological realm. In recent years, especially since the appearance and spreading use of the internet in the 90s, and after its consolidation as the main medium for searching for information and spreading content, we are experiencing great transformations in the process of scientific communications which directly affect the way in which reviews are written and published: the step from the printed form to the electronic, the appearance and consolidation of the Open Access movement which has modified the way scientific knowledge is published, spread and visualised, and the incorporation in the scientific reviews of the technologies of the so-called Web 2.0, "a system of applications on the internet which can be integrated to facilitate the publication of content by the users"²,

turning it into more attractive products for the final user. All this has produced significant changes in the editorial guidelines of scientific publications, as well as in the way of consulting with, and participating in, these journals. I think that these conditions make this the time for reflexion and to try to give a response to questions such as: Will the print media survive or will the digital format definitely take over? Will the reviews be accessible by subscription or free access? Will the reviews be 2.0?

Taking into account how, and by how much, the scientific communication scene has transformed in recent years, the difficulty associated with predicting how scientific reviews will be in just a few years will have escaped no one, but we attempt here to give some broad brushstrokes to give us a glimpse, at least, of the general picture.

The step to digital format

We are saying nothing new when we state that newly created scientific journals are already being created in digital form and, on only a very occasions, coexisting with ever more reduced numbers of paper examples. In addition, the most traditional scientific reviews have already migrated their formats to a digital version. The new generations have grown up in direct contact with computers and the internet: the so-called "digital natives" are much better familiarised with consulting digital versions of the reviews than the traditional printed versions. I recently heard how a young director of a university hospital said that until very recently he had neither seen or handled an example of the British Medical Journal on paper. This anecdote may give an idea of how much has changed in the panorama of scientific communication in recent years.

The advantages of digital reviews have been widely described in professional bibliography and it is not the purpose of this work to analyse them in detail, although it is worth recalling a few of them in order to be able to answer some of the questions raised. Some

of the most obvious are the savings in the costs of printing and distribution, the richness of the content (hypertext links, new formats of audio and video, etc.), greater accessibility and speed in getting content to the reader, greater potential audience, the possibility of searching within the reviews' collections, interconnection with search engines and open science portals, the possibility of including social participation tools, connection with bibliographical reference managers avoiding problems of space in libraries, not to mention the notable contribution to a more ecological and sustainable planet which will result from the elimination of paper. Although the advantages are many, there are also some disadvantages: dependence on computers, unstable web sites, confusing navigation systems, discomfort in reading from screens, etc.

There was a period when a good part of the scientific community showed their reticence with respect to electronic reviews, questioning the guarantee of quality and the scientific validity of the work published in them. Today, an enormous number of electronic scientific reviews is available on the web, with similarly formal characteristics to their printed homologues, which use the peer review mechanism for the control and selection of their contents, which comply with international norms and standards of publication, which can count on the collaboration of highly prestigious editorial and scientific teams and in which so-called "opinion formers" in different subjects are published, have overcome this initial reticence from the scientific community themselves.

Each day there are more reviews produced solely in electronic format, which on occasion co-exist with their paper version, although this is very much the minority. In the case of the **Review of Osteoporosis and Mineral Metabolism**, organ of the Spanish Society for Bone and Mineral Metabolism Research, which was launched in 2009 and with, as was stated in its launch editorial, "the aim of the review [is] to achieve the greatest diffusion and to reach the highest number of specialists, the publication will have a printed edition in Spanish, which will be distributed only to SEIOMM members and subscribers, and a bilingual version on-line"⁷³.

Taking into account the fact that in carrying out a bibliographical search these days it is necessary to consult the internet, a presence on the web is absolutely essential for any scientific review which has the intention of reaching its potential readers and which wants to survive in the long term. But it will not be sufficient solely to have a presence on the web, but the review will have to have visibility among the hundreds of thousands of medical reviews which are published today, and will therefore need to have different entry points to its content on the internet though its presence in databases, catalogues, indexes and directories, review portals or specialist search engines such as Google Scholar.

Although it is clear that the two systems of publication and diffusion of scientific information are perfectly compatible, the context for scientific publication is today the internet, and it is perhaps not unreasonable to assert that the co-existence of paper and electronic formats have a "sell-by" date. The electronic reviews are already not the future, but a fact, a reality which has naturally established itself within the process of scientific communication.

Open access to scientific reviews

The movement for open access to scientific literature advocates free access to the products of scientific research without either economic or copyright restrictions. As Malero asserts, it is important here to distinguish between "free" and "open": the first is synonymous with "gratis" or "without payment", while "open" includes access without economic barriers and claims of authors' rights over their articles⁴. For the implementation of this new model of scientific communication two strategies have been put into motion: the publication of open access reviews (known as the gold route) and their deposition or self-archiving in institutional or thematic repositories (known as the green route). The main adherents to the initiatives for open access to science were reflected in three well-known declarations: the Declaration of Budapest, signed in February 2002, and the later declarations of Bethesda and Berlin signed in 2003^{5,7}, to which, little by little, have been added a large number of universities, research institutions and those funding research. One of the most significant boosts to open access happened in the year 2008 when the National Institutes of Health (NIH) of the US, one of the biggest funders of research in the world adopted a mandate which obliged all researchers funded by them to put the resulting articles of this research in an open repository after 6 months. This was created the PubMed Central repository (<http://www.pubmedcentral.com>). The British Wellcome Trust has followed the same example, with the establishment of UK PubMed Central (<http://ukpmc.ac.uk/>), another major repository of biomedical research funded by that organisation. In our country, last May, Law 14/2011 of Science, Technology and Innovation was passed which established in its article 37 a mandate to self-archive in repositories the results of investigations financed by public money, within one year, as well as calling on the public servants in the Spanish system of science, technology and innovation to create repositories in which to house them⁸.

The movement for open access to scientific research is being implemented very rapidly in the scientific communication system and, far from being a minority trend, each day there are more examples of open access reviews on the market, from the pure open access reviews, in which the author or their institution pays a fee to be published in them and reserves their copyright; hybrid reviews, paid for by subscription but with the option of publishing in open access (pre-payment of fees); or free access reviews which are not pure open access but which are offered free on the web, with or without an embargo period, while the exclusive copyright is held by the publisher and not the author. This is the case with the **Review of Osteoporosis and Mineral Metabolism**, available free on the web at <http://www.revistadeosteoporosis-ymineralmetabolismomineral>. Most of this last type are included on publicly-funded open access platforms or portals, such as SciELO (<http://www.scielo.org>) or Redalyc (<http://www.redalyc.unam.mx>).

There are ever-increasing numbers of scientific reviews which are published according to the open access approach. The Directory of Open Access Reviews maintained by the University of Lung, the DOAJ (<http://www.doaj.org>), currently has registered (data for October 2011) 7,295 open access scien-

ce reviews, of which almost 3,000 have been added in the last year (between November 2010 and November 2011). Of all the reviews registered, 472 belong to the general medicine category and 182 are in the area of public health, as compared with 3,303 reviews in the areas of social sciences and humanities, which is to say 45%, as opposed the 8% which represent biomedicine. It seems clear that, at the moment, the scientific reviews which have most adopted this model of open publication have been those in the area of the humanities, with the biomedical reviews being much more recent.

However, there are increasing numbers of reviews in the area of biomedicine which are banking on a strategy of increasing their visibility and spread using open publication. Although studies carried out to date on the relationship between the number of citations obtained by a review and its open publication are contradictory, it seems obvious that those articles which are at the disposal of the general public, at no cost and from the moment of their publication, will have more possibilities of being cited than those which require a subscription to be taken out in order to access them.

It is probable that the decision of the editorial team of the **Review of Osteoporosis and Mineral Metabolism** to publish its content at no charge and without embargo (while not being able to be considered as open access in the strict sense, since the intellectual property rights are not ceded by the authors) will result, in time, in the arrival of a greater number of manuscripts to the publication, in an increase in the number of citations these receive, and that its accessibility will make the review more attractive to its potential public. There are already many reviews which, published under the open access model, have high standards of quality and even "Impact Factor" in the prestigious ISI database, which shows that the model of open access to content is a success and has the support of authors and institutions, although we cannot say that that this is well consolidated or its sustainability guaranteed. Taking into account the distance travelled in recent years and the willingness of those responsible for science policy to promote open access to public research, it seems that the future panorama will be the coexistence of the traditional model of access by subscription with the open access model.

Reviews 2.0

The move to digital format has also been a decisive and catalytic factor in the process of adopting on the part of the scientific reviews some of the tools belonging to the so-called Web 2.0, or social web, thus framed within the movement which has come to be called Science 2.0⁹. The Web 2.0 concept covers a series of applications which provide interactive services which allow users to produce and share information. Among these should be mentioned blogs and social networks, the greatest exponents of the Web 2.0, with Facebook (<http://www.facebook.com>), Tuenti (<http://www.tuenti.com>) or their more scientific versions, such as Mendeley (<http://www.mendeley.com>), being some examples. Also to be included in this group of 2.0 tools are microblogging services such as Twitter (<http://www.twitter.com>), the wikis or the syndication channels such as RSS. The social tagging sites for storing, classifying and sharing favourites

(bookmarks) such as Delicious (<http://www.delicious.com/>) or Sympy (<http://www.simp.com>), and the social bibliographical reference managers such as Zotero (www.zotero.org/), Connotea (www.connotea.org) or CiteUlike (<http://www.citeulike.org>), which offer the functionality of a reference manager combined with the possibility of sharing this information with other colleagues over the web¹⁰, are other examples of successful tools of the Web 2.0 increasingly used in the world of science. The virtual spaces in which various types of content such as photographs (Flickr:www.flickr.com), presentations (slideshare:<http://www.slideshare.net>), videos (Youtube:<http://www.youtube.com>) are also 2.0 tools. All are applications which exist on the web to allow the sharing of information and resources, and facilitate the participation of the user.

Although many reviews have migrated from print to digital format, the majority of them are merely a copy of their print version. However, some have started to explore the new possibilities offered by these tools which use the web as a platform. It is already some years since scientific reviews started investing in improving and modifying their traditional service with its one-way approach, in which the user is a mere reader of the published content who consults the review passively, by offering them possibility of participating, giving opinions and creating content. This is possible thanks to these social information management tools which allow the shared generation of knowledge, the publication of all types of content and their universal diffusion. The use by these scientific reviews of these technological tools to improve communication between scientists, authors and readers has given rise to the suggestion of the scientific review 2.0, which may be defined as "that which incorporates in its electronic version original technological elements of the Web 2.0, and at the same time, maintains the policy of generating the participation and interaction between readers, authors and editorial team in an open way"¹¹.

It is a fact that some of the most prestigious scientific publishers such as Nature, Science, JAMA, Lancet, Plos-One or the British Medical Journal, to list some of the most significant examples, are in the vanguard of this new approach and are incorporating 2.0 tools into their electronic editions.

For example the ability to make comments or notes on published works (as is the case of the Rapid Responses in the BMJ which has been a great success with researchers), the establishment and maintenance of blogs by the reviews as an extension of their publications and a more agile form of communication with their readers, the publication of content in different formats from PDF/HTML such as videos and/or podcasts (sound files), the interconnection with social software such as bibliography managers or social tagging services, the installation of RSS content syndication channels or a presence on social networks such as Facebook, are some of the tools of this new web most used by the scientific reviews. In addition, the great scientific review platforms, both private (see Elsevier or Springer) and public (see SciELO portal or Redalyc) are already following the 2.0 trend and attempting to multiply their diffusion channels and the visualisation of their contents, as well as recruiting and keeping new readers, especially the younger ones.

While the adoption of these technologies by Spanish biomedical reviews is still at quite an embryonic stage, and there are very few reviews which have incorporated 2.0 functionalities¹², we think that these tools are destined to play a significant role as channels for visualisation and diffusion of their content in the scientific and professional world, as well as providing new ways of communication with authors and readers.

Torres Salinas offers clear examples which sketch out the usefulness of these tools, such as the introduction of comments on published articles, which will make scientific debate more agile, and facilitate the control of fraud, systems of scoring or voting as a way of highlighting works, connection with the so-called social bibliography managers which allow the sharing and relating of articles with other users with similar interests, the generalist social networks such as Facebook or Twitter which facilitate the diffusion of content, or RSS which allows the reader the more effective use of the review¹³.

Last year a study was published on the use of these types of tools on the part of British researchers which found that only 13% of researchers regularly use Web 2.0 tools, 45% of them occasionally use these tools, and 39% never use them¹⁴. In spite of this, we believe that the gradual incorporation into scientific publications of these participative technologies will improve the process of communication and diffusion of the research published in them, making them more attractive for younger users, reaching a wider potential audience and a wider public, offering value-added services to readers and, lastly, making the scientific review more dynamic and complete. Reviews 2.0 are the reviews of the future.

Final reflection

At the heart of the considerations expressed, and not forgetting the great degree of difficulty in predicting what is going to happen in the world of scientific reviews, we believe that the future panorama will consist of:

1. Digital reviews with a web presence, as well as being incorporated into major portals and directories.
2. Increasing amounts of content, if not the whole review, will be offered openly and at no charge, either immediately or after an embargo period.
3. Web 2.0 tools will be incorporated into the reviews which will broaden their services and make them more attractive to their readers.

It seems clear that the central nucleus of the system of scientific communication will continue to be the peer-reviewed scientific review, but offered over the internet, openly and with a great degree of participation on the part of the user. These systems, based on the web and Web 2.0 will enrich the reviews, and the formal process of communication will become more universal and democratic. It will be necessary for the reviews to be attentive to this situation and to maintain an open attitude; only in doing so will they be successful in adapting to, and surviving, these changes.

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