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SCIENCE, ITS PUBLICS AND NEW MEDIA

REFLECTING ON THE PRESENT AND FUTURE OF SCIENCE COMMUNICATION

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Scientific journalism faces the challenge of adapting not only to new formats but also to new information exchange dynamics. New online platforms, making it easier to access and produce scientific content, are forcing science publics to evolve. The online environment has turned into science communication reality, and both scientists and communicators must adapt to it. This paper discusses these changes and their implications for science journalism and an informed citizenry.

Keywords: science communication, science and social media, online communication, public understanding of science.

In 1967, Nirenberg argued in an editorial for *Science* magazine that «decisions concerning the application of [genetic] knowledge must ultimately be made by society, and only an informed society can make such decisions wisely» (Nirenberg, 1967). Nirenberg was referring to scientific advances in biochemical genetics. Almost 50 years later, his quote is more than ever relevant. Rapid scientific developments in innovative fields such as synthetic biology, geo-engineering and nanotechnology, to name just a few, raise ethical, legal and social questions that require more than ever an informed citizenry. However, the traditional source of scientific knowledge for lay audiences, scientific journalism, is facing challenges posed by the rapid development of the Internet (Dudo *et al*., 2011).

Science journalism (as all journalism nowadays) faces the need for adaptation not only to new dissemination formats, but also to new dynamics of information exchanges. Consumers of science news can access online content from virtually anywhere and can now produce science content themselves on social media platforms. Lay audiences can easily get involved in online deliberations regarding questions that were traditionally discussed mainly in scientific spheres or in science popularization media. And scientists themselves are now embracing roles that were conventionally taken upon by trained science communicators. In short, the online revolution has made a profound impact on science communication (Brossard, 2013; Brossard and Scheufele, 2013). The goal of this paper is to discuss these changes and their implications for science journalism and an informed citizenry.

«THERE IS NO SHORTAGE OF SCIENCE CONTENT ONLINE FOR THOSE WHO CARE TO FIND IT. AND EMPIRICAL EVIDENCE SUGGESTS THAT AUDIENCES DO GO ONLINE FOR SCIENCE CONTENT»

CHANGES IN MEDIA PLATFORMS

The news environment is facing tremendous changes, with traditional newspapers shrinking and social media booming. As science columns continue to disappear from mainstream newspapers' platforms, traditional science-public channels rapidly deteriorate (Dudo *et al*., 2011). This does not mean that science content is not available for interested parties. In the mid-2000s, the second generation of Internet-based services (i.e. Web 2.0) became widely accessible to online users. These social networking sites, wikis and other communication tools made scientific topics easy to share and discuss. One can now find science content on YouTube (a Google-owned video-sharing site created in 2005), on Facebook and Google Plus (the two largest

social networking sites respectively established in 2004 and 2011), on Wikipedia (a free online encyclopedia created in 2001) and on many other online platforms. More significantly, blogs devoted to science content have been multiplying in the online environment. These blogs are hosted by specialized science magazines (such as *Scientific American* or *Popular Science*), online mainstream newspapers or independent sites. Non-traditional, «online only» sources of science news are increasing in number and credibility. For instance, *Inside Climate News* – a seven staff non-profit blog devoted to news-related climate change – won the 2013 Pulitzer prize for national reporting, a clear indication that these newcomers have joined the rank of respectable media organizations. Further, numerous blogs are now directly reporting on peer-reviewed scientific research. In 2012, the online organization *Research Blogging* registered over 1,200 active blogs focusing on analyses of peer-reviewed studies for the benefit of lay audiences (Fausto *et al*., 2012).

A number of prominent American science writers have moved from large, mainstream papers to write for science blogs or online-only science sources (Economisti-Associati, 2011). But the development of science blogging points to an evolution of science communication extending beyond changes in reporting practices and dissemination formats. A significant number of science blogs is developed and maintained by scientists themselves (Colson, 2011). A recent study among scientists at a top research university in the United States found that 16% of scientists blogged at least once a month about topics related to their research and close to one out of five tweeted about their research on the microblogging platform Twitter (Brossard *et al*., 2013). These telling numbers indicate a change in the cultural outlook toward public communication activities within the scientific community. Indeed, younger scientists do tend to support direct communication with lay audiences (Corley *et al*., 2011), a trend confirming the cultural change mentioned above.

Last but not least, it should be mentioned that searching and monitoring the Internet on a wide variety of topics has become a regular practice, with Google being the favored search engine (Anderson *et al*., 2013). Online news aggregators, such as those provided by Google (Google news) or Yahoo (myYahoo) are becoming increasingly important and are the most popular way to find news online (Olmstead *et al*., 2011). Similar aggregator tools are offered as «apps» (applications) on iOS and Android mobile devices, with *Pulse* and *Flipboard* being two of the most used ones. Individuals can easily follow a specific science topic and get regular updates through a wide range of providers. In sum, there is no shortage of science content online for those who care to find it and with multiple ways to access it. And empirical evidence suggests that audiences do go online for science content.

EVOLUTION OF SCIENCE PUBLICS

At the end of 2011, 2.3 billion Internet users worldwide (i.e., one out of three individuals) had access to the Internet (International Telecommunication Union, 2012). Although different patterns can be detected for different countries and cultures – for instance, Germany and France continue to show a relatively strong loyalty to traditional news brands, i.e., print newspapers and television, compared to other developed countries – reliance on digital news is steadily growing, particularly among younger audiences who in majority favor online sources for their news (Newman and Levy, 2013). And these younger cohorts are turning away from traditional news brands even if these also have an online presence. Across countries, online users aged 45 and under are consistently more likely to use social media and aggregator brands as their news sources (Newman and Levy, 2013). In some countries (Spain, Italy, urban Brazil and the U.S.), alternative news formats (i.e., blogs and other social media) are now the preferred source of news across all age groups online (Newman and Levy, 2013).

«MODERN SCIENCE COMMUNICATION SHOULD LEVERAGE ONLINE MARKETING STRATEGIES SUCH AS KEYWORD OPTIMIZATION TOOLS AND ONLINE SEARCHING DYNAMICS»

Audiences for science news follow the same patterns. More and more, individuals are going to digital platforms to follow science topics and traditional brands are less and less the main provider of science news. A recent study among the American population found that although 62% of individuals still turned to traditional brands (either in print, broadcasted, or online) for science news, patterns drastically changed when different age groups were considered. Over 50% of those relying exclusively

While traditional science-public channels rapidly deteriorate, social networking sites, wikis and scientific blogs multiply and allow access to specific science content for interested parties.

on online only sources for their science news diets (i.e. blogs, video-sharing platforms, etc.) were less than 35 years old. It should be noted that very often individuals turn to an online search engine tool such as Google to learn about a specific scientific topic. As early as 2006, 70% of all American Internet users had looked up the meaning of a scientific concept or term using the Internet (Horrigan, 2006). When searching the Net, individuals are offered pages of suggested links and are more likely to choose one listed on the first page of results, independently of the type of source it links to (Ladwig *et al*., 2010). In short, it is clear that individuals rely more and more on online sources for science news. It is therefore necessary to reflect on the characteristics of this online environment and on subsequent implications for an informed citizenry.

THE SPECIFICITY OF THE ONLINE ENVIRONMENT

So what makes the online environment different with regards to science news? First, new media environments provide essentially unlimited information on a substantial number of scientific issues, material that can be obtained anywhere and with relatively limited effort (Brossard, 2013). Although one might argue that this content is not always of quality, this is overall good news for science communication as it increases the likelihood for individuals to easily find science content. Interested individuals can follow science «live» and through multiple sources as issues develop, and less interested individuals can get exposed to science news indirectly through friends' posts on Facebook or elsewhere.

Indeed, as I indicated earlier on, the production and distribution of the news has been radically transformed by the development of Web 2.0 applications. In 2006, Jay Rosen (a New York University journalism professor and influential blogger) infamously talked about «the people formerly known as the audience» in a column on his blog PressThink. He was describing a shift in the power dynamics between the media and the public. The traditional notion of «news gatekeeping» (the idea that the journalist, the editors or another actor in a media organization decide what news items the public will consume) is obsolete since all individuals can theoretically produce such news items and post them on a blog, social networking site or another online platform (Shoemaker and Vos, 2009).

> «SCIENCE JOURNALISM FACES THE NEED FOR ADAPTATION NOT ONLY TO NEW DISSEMINATION FORMATS, BUT ALSO TO NEW DYNAMICS OF INFORMATION EXCHANGES»

Simply stated, the rules of the game have changed. An author has limited control about how his or her content may be modified and disseminated once it is posted online. Information can go viral in ways not yet fully understood and news items conventionally deemed trivial can receive more public attention that originally anticipated. Science content carefully crafted by a trained science writer can be posted with a comment on Facebook or other social networking sites, or can simply generate (not necessarily constructive) comments on a blog, or even on an online newspaper column. And research has established that the contextual information provided by these comments can have detrimental effects on readers. Notably, incivility in the comments following an online science story about nanotechnology produced change in the readers' perceptions of the technology itself (Anderson *et al*., 2013). Compared to people reading polite comments, individuals who read uncivil comments (which only differed with regards to tone and not content) ended up walking away from the story with much more polarized views of the actual risks of the technology.

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News sites have been worried about the potential detrimental effects of disruptive comments since observing the wide-spreading behavior of «trolling» (referring to individuals disrupting an online discussion by posting inflammatory comments). Online platforms have tried different types of comment moderation mechanisms. Some news sites allow all types of comments and have only general guidelines specifying what should be excluded. Others (such as the *New York Times*) devote significant resources to comment moderation, while others ban them all together. Some let the readers themselves rate the appropriateness of the comments, which leads the favored comments to the top of the comment list. Recently, the online magazine *Popular Science* (the iconic American science magazine created in 1872) generated an intense debate when deciding to close down their comments section. They did so based on the available empirical evidence (particularly our study mentioned above) and while stressing the goal of their magazine, which is to provide their readership with carefully written popular science content used to inform judgments about scientific topics. In other words and according to *Popular Science*, if comments change the way a well-written science story is perceived and impair sound judgment-making, they have no place in a scientific magazine (LaBarre, 2013).

Popular Science magazine's decision to kill online commenting started a healthy widespread discussion regarding commenting practices: what is the purpose of online commenting, and how can we promote constructive discussions online? New media provide opportunities for citizens to connect with others through social media and other 2.0-type tools to make sense of information, and being able to discuss a complex science story in the comments section can be very useful. Indeed, it is clearly established that civil discussions can promote learning, particularly if they are among people holding different viewpoints (Scheufele *et al*., 2006). In short, the problem is not these discussions taking place, but rather the absence of social reprimand for uncivil behavior online. What remains

«ONE CAN NOW FIND SCIENCE CONTENT ON YOUTUBE, FACEBOOK AND GOOGLE PLUS, AND BLOGS DEVOTED TO SCIENCE CONTENT HAVE BEEN MULTIPLYING»

clear is that online users want a space for discussion, whatever form it might take. As Dave Winer, one of the founders of blogging, infamously stated in 1994, «Once the users take control, they never give it back.» Future will tell if media organizations can find models that take this into account while allowing for constructive discussions.

THINKING OF THE FUTURE

So what is the future of science communication? Newspaper science columns are not the main source of science news for lay audiences anymore, and even if popular science magazines have a loyal readership, these may not always be the channel of choice for those interested in a scientific topic. In other words, we cannot talk anymore of science writers being the main interface between scientists and the public. Audiences can access scientific publications directly if they wish to do so through open access journals, or read science blogs maintained by individuals outside of mainstream science writing. And a significant number of these science bloggers have gained expertise through experience rather than through formal training. Some of the most successful bloggers are experiencing with other channels as well. PBS (Public Broadcasting Services) Digital Studios, for instance, has recently asked Joe Hanson, a trained biologist and a seasoned science blogger, to host a science show on YouTube called *It's Okay to be Smart*.[1]

This multimedia, multi-platform approach may be the future of organized science communication. The magazine *Popular Science* has understood this very well by offering paid subscriptions for iPad, Kindle, Nook and other platforms earlier on and developing different smartphone applications. For content, it relies mainly on freelancing. Of course, the long-term profitability of the model will have to be monitored.

In sum, we need to stop talking about the future of science journalism. We need to talk about the present reality of science communication, which involves making sure a science story is read in a context promoting sound judgment. Modern science communication should leverage online marketing strategies such as keyword optimization tools (KOT) and online searching dynamics. Search engines are constantly evolving and stories get disseminated through not always well-understood, interconnected pathways such as social networks, referring links, email, blogs, etc. Science communication should take advantage of these pathways.

Should scientists be blogging and tweeting about their research? There is no reason they should not if they do so in an informed way. Should writers be trained in science communication? Most certainly, since the stakes are high for science and society. Reliance on the knowledge provided by social sciences and other disciplines regarding the online context may very well be the key to successful science communication and a science informed citizenry.

[1] <http://www.itsokaytobesmart.com/>.

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