

The scientist as a journalistic source and as a communicator of science. Review of the role of journalism and scientific dissemination

CARLOS ANDRÉS URREGO ZULUAGA¹

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Traducción: María Del Pilar Gutiérrez. Departamento de Idiomas - Universidad de Manizales

Abstract

While in the so-called developed countries, scientists have among their tasks to disseminate and bring knowledge to as many spheres of society as possible, in Latin America and occasionally in Colombia, this role is fulfilled only by some interested investigators, while the majority of them find themselves from the tools of the dissemination of science, and in most cases, they take this work as an addendum without justification. This essay will analyze the situation of journalism and scientific dissemination, the cover of journalistic sources when they are researchers and the possibility that these, at some point, become communicators of their own developments. It shows the case of the University of Manizales, not only from its research collection but also from the potential of a dissemination culture that permeates training needs for the scientific dissemination of scientific knowledge.

Key words: Scientific journalism; Science dissemination; Communication; Knowledge society.

1. Introduction

One of the great challenges of journalism and the dissemination of science is to train journalists who “live science” or researchers who can assertively communicate their results and methodologies. Understanding the intricacies of years of research by a scientist in a few hours is a complex task, nevertheless, necessary to build better informed societies and that, possibly,

1 Social Communicator and Journalist Universidad de Manizales. Master in Political Studies at the University of Caldas. National Prize of Journalism Fasescolda 2013. Collaborator in science topics of La Crónica del Quindío, El Espectador and Semana Magazine. He has worked in TvA Noticias, Telecafé Noticias, Caracol Radio, among other media. Leader of the BIOS Communications Unit and is currently a professor at the School of Social Communication and Journalism of the University of Manizales, member of the Communication Research Group and editor of the scientific magazine and radio program on science, both called Eureka. Email: caurrego@umanizales.edu.co

make better decisions when choosing representatives in the government or supporting or not laws, decrees and others.

The guild of scientific journalists in Colombia is small, the Colombian Association of Scientific Journalism (ACPC) was founded in 1976 and has had several stages. After several years without functioning, in 2018 a group of journalists revived it but most of the members are university professors, journalists or heads of communication units of institutions that have something to do with science but, the reality is that most it does not live on scientific journalism (as it happens in many other countries).

In the country there are cases like those of Ángela Posada Swafford and Pablo Correa, who were awarded scholarships by MIT in their Knight Fellow of *Scientific journalism*; Lisbeth Fog, who has a master's degree in the subject of Boston University and has been making national science more than 30 years ago; Ramiro Velásquez at El Colombiano, who has also focused on talking about science. There are few cases in which journalists live on science in Colombia, the rest, the vast majority, support other tasks in institutions, science centers, laboratories or universities or simply address scientific issues when they have more time for hobbies and passion than for doing part of his work.

Meanwhile, apparently, few scientists are focused on spreading and democratizing science in the country (although they are increasing), mainly because they do not have the tools or the motivation to do so. Examples like Santiago Vargas or Luis Núñez can be counted on the fingers of the hand. In most of the country's media, scientific information comes from news agencies. In the research *Analysis of the role of the media in the scientific dissemination in the framework of science, technology and innovation public policies* (Urrego, 2016), it was found that a large percentage of information is carried out by journalists outside the media and who, for the most part, focus on foreign and non-national investigations.

In his speeches, Bernardo Esteves of Brazil's Piauí Magazine points out that the role of the scientific journalist is not to make important what is interesting but interesting what is important, this as a call to diminish the headlines of media that say things like: "The meditation in couple intensifies the orgasm" or "When kissing prefers the inclination to the right"; topics that are suggestive but do not provide positive meanings to the construction of society, to the improvement of life and to the pillars of the existence of science when searching for answers to the questions of human nature.

And to this phrase, I add another that Leonardo Da Vinci raises more than 500 years ago: "Only science is transmissible science"; he already knew that science is for people, for the passer-by. With this, it is sustained that:

The scientific journalist has the responsibility of making the government and the society of his homeland see this character of obligatory nature of scientific research for all those communities that are willing to carry out an authentic development. To do this, he must impregnate himself with such concepts using as much material as he can get his hands on (Calvo, 1965, p. 9).

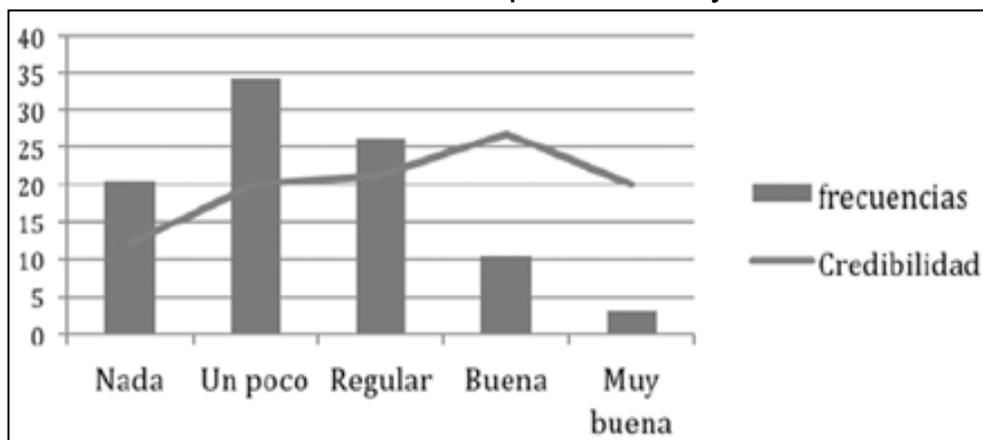
A struggle of parameters makes this a complex situation. Understand a topic far from the day to day of the journalist in a short time, have a scientist who takes the time to explain, step by step, what he found in his research, build a striking article that impacts public opinion and, what not, in public policies and, finally, score high in digital metrics ranging from those that analyze reach to the behavior of audiences. A challenge that those who wish to disseminate and cover science topics have in front of them.

In Latin America, from the First Inter-American Seminar on Scientific Journalism in Chile in the mid-1960s and the signing of the Declaration of Punta de Este in 1967, in which the leaders of the area supported this specialty of journalism, they spoke of the need to institutionalize and strengthen this journalism specialization. But as assured by María Fernanda Gutiérrez and Jairo Antonio Rodríguez Leuro, in the article *Scientists and journalists in the dissemination of science*, we focus on a problem of social responsibility, since between the journalistic effort versus the results scientists there is a big gap:

Researchers work hard to bring advances to knowledge, journalists work tirelessly for people to be informed, however something is happening so that the results of research in biomedical sciences do not manage to communicate or be part of the knowledge pool of the hearings (2012, p. 36).

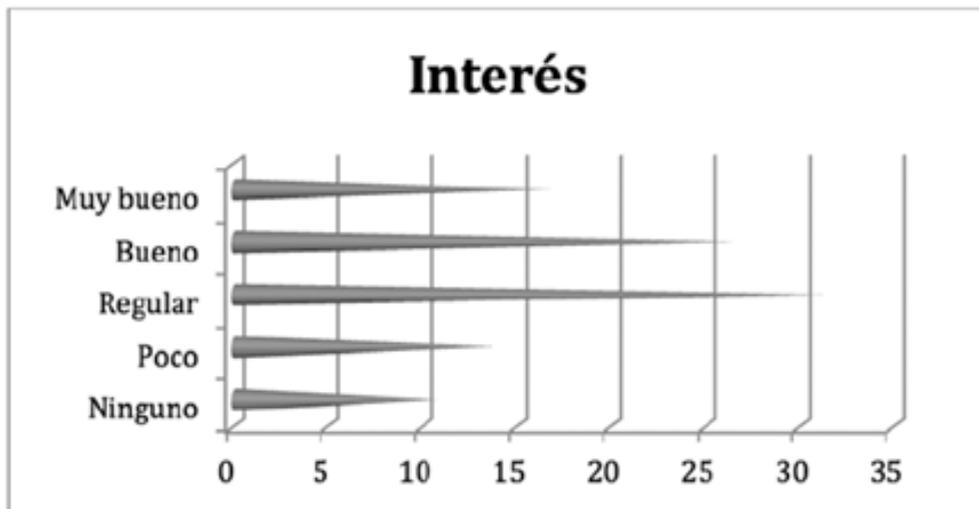
In their research, these two biomedical researchers ask about the impact, credibility and readability of the news that have to do with biomedical sciences, they record significant data as we observe in the following graphs:

Table 1
Comparison between the frequency with which respondents read about biomedical science topics and what they believe



Source: Gutiérrez & Rodríguez, 2012, p. 41

Table 2
Interest of the interviewed by the news about biomedical sciences that appear in the written press



Source: Gutiérrez & Rodríguez, 2012, p. 41

The investigation found, among others, that sometimes audiences do not understand what they are talking about, which makes them quickly lose interest in the articles (lack of scientific education in Colombia); the credibility does not go through the sources that are included in the products but because of the confidence generated by the media and, finally, the interest to learn and read about these issues is between regular and little. The researchers call for the construction of “hybrid” journalists and scientists who can develop an attractive news story without falling into the shade of yellowness or researchers who can decant their language in the media and in this way make visible the different research results in this discipline.

Here it is worth mentioning the conclusions of the analysis carried out in 2016, in which I found, among others:

There is no alignment between the objectives of dissemination of science and the media. Each one goes his own way, a situation that generates little critical mass in society to demand greater state and media presence in communication of research and generation of new knowledge.

Science has gained space in the media, but it is still much smaller than that of other subjects. In Colombia, this space is confused with technology and is sometimes occupied by news agencies instead of research and original texts.

There is a need for more depth in the training of science journalists, it is still a very small guild, in addition to not being a specialized segment in most cases, that is, journalists who cover science must work on other topics (Urrego, 2016, p. 32).

And a point that does not enter the analysis of this article is the impact. Lisbeth Fog said it in *Scientific communication in Colombia: ALL A CHALLENGE! (sic)*:

But how many Colombians read newspapers? Are we really popularizing science through written media? The largest circulation of *El Tiempo* is presented on Sundays, with around 500,000 copies.

In radio, most commercial broadcasters sporadically and irregularly transmit scientific information, especially in health issues, biographies or interviews with scientists, in the event of congresses or seminars, as well as social issues (Fog, 1999, p. 36).

Situation that, even, almost 20 years later is still very similar. And on television, then initiatives such as *Universesor Eureka* in Colombia single unit projects, documentaries or some stakeholders are that in networks social networks or YouTube, do some *videoblog*son scientific topics.

It is clear that spaces for science have increased in the pages of written media, such as the section *Live* of *El Espectador*, the science articles of *El Tiempo* or the opinion columns on regional advances in *The Colombian*, but this issue is far from the national discussion of the public agenda, a point that was clear in the presentation of the National Government's budget in 2017, which proposed a reduction close to 41.5%, which was ultimately lower after mobilizations and some citizen requests. But the budget for CTel is and will continue to be one of the lowest (if not the most). And to this we add that while in 1996 0.7% of the Gross Domestic Product was allocated to these issues, today it does not pass 0.2%.

Ideas are the soul of the investigative processes, under this postulate these are the pretext for social transformation, also, they become the founding element of economic growth. However, the ideas that generate social and economic transformations are not the result of the reproduction of systems applied in other latitudes, on the contrary, they are the result of rational and intentional action, supported by policies strong and serious organisms that ensure effective compliance with the practical fact of knowledge (Montenegro, 2014, p. 12).

That is, it is necessary to strengthen the national scientific system to provide solutions to our problems in an original way and not copying others. But without resources and without an internalization of the importance of science in society, this is and will remain an idyllic point. For this it is necessary that there is education and budget to turn those ideas into prototypes, projects, initiatives, *spin off* and so on and finally the company integrates them as their own.

2. Similarities and differences

In a shallow review there can be found many more differences than similarities between the scientist and the journalist. While the journalist has one or two days to deliver his piece, for the researcher some years normally. For the journalist water is that, water, but for the

scientist, there are thousands of bacteria, animals, a whole universe of life; for the journalist to breathe is simply an action that we must do to continue with our lives, for a researcher it is a complex process in which several systems and organs intervene.

The scientific journalist Lisbeth Fog, in her article *From the sources to the public*, names the following as dissimilar elements between journalists and scientists:

The level of education differs markedly: while it is common for researchers to have graduate degrees -among all the university is one of their most frequent habitats-, journalists barely have an undergraduate degree [...]. Language is one of the barriers that differentiate us and separate us from our scientific sources. When the researcher speaks of three-dimensional tensors and geodesics to explain the theory of relativity, or the sequencing of deoxyribonucleic acid in the genetic code of the human being, the journalist begins to have problems. As he specializes in his specific branch of science, the scientist acquires a metalanguage that he assumes as everyday. Error. Scientific jargon is understood only by colleagues; and if the journalist does not understand it, less will the potential recipients of the information (Fog, 2002, p. 3).

And finally:

Different audiences: if the scientist aims to write for his colleagues, in specialized scientific journals, the public of the journalist is the people of the street, which is a saying, because it is also impossible to speak of a 'public in general'. Even within the same citizenship of a country there are societies and communities with their own characteristics of educational formation, of the environment, of different economic and political conditions. The challenge is even greater. One of the journalist's first tasks is to define and get to know his audience, identify the most appropriate language and reach his message effectively (Fog, 2002, pp. 3-4).

In summary: time, vision of the world, language, audiences, and training are some of the elements that differentiate us from the journalists of scientists. Each one is a challenge to overcome. It is, therefore, necessary that the editor or director of a media can understand that by covering specific and complex topics such as computational biology, string theory, the second law of thermodynamics, mental illness or sociological processes, among others, The journalist needs time to achieve a clear, informed and correct message, as well as to get a little closer to the researcher's life and understand the way his vision of the world works. "Everyone who is an expert in a subject is very grateful that you spend a lot of time researching what they know [...] because they are used to seeing the journalist as the madman who wants to get his wisdom out in twenty minutes and run away" (García quoting Eva Belmonte, 2017, p. 60).

Although in Colombia only some scientists try to speak to large audiences, modify their language so that any citizen understands their work and their research (and of course, if those who benefit from their developments are them), it must be a fundamental step for the called "locomotive of science, technology and innovation". This also goes through the stimulus system of science centers and universities in which to publish a research in an indexed journal,

which only reads a very small number of pairs of the researcher, gives points and generates benefits, while developing elements of communication as *podcast*, articles, videos, magazines, blogs, multimedia reports, among others, do not score in many of these institutions; However, since 2014 Colciencias included in its model a category of *social appropriation of knowledge* in which some of these initiatives can be included, which has gradually improved production within this scope.

The journalist speaks to a diverse audience, in which hundreds, thousands or even millions of readers, listeners, viewers and netizens move and although the media should be clear to whom they speak, social networks and the internet have made such audiences reach numbers never before imagined; For his part, the scientist, as I said before, speaks to his or her peers (and to a limited group of teachers) in his technical language in articles of indexed journals, seminars or congresses with specialized topics.

Therefore, one of the challenges is for scientists to use a language that enables the fluency of an interactive communication, which allows exemplifying and why not, using metaphors, metonyms, hyperboles and other rhetorical and literary figures.

As Carlos Elías explains:

Scientific language tends to a system of signs such as mathematics or symbolic logic. Its ideal is the universal language like the *characteristica universalis* that Leibniz had begun to project at the end of the 18th century. That is, an extensive scientific text can be written without the need to use any vocabulary terms from the literary language. Anyone who observes what is written on the blackboard after an organic chemistry class or quantum mechanics will find it very difficult to know the mother tongue with which the teacher who has just taught the class usually communicates [...]. (Whereas) literary (language) is often deficient in certain aspects, it abounds in ambiguities, like any other historical language, full of homonyms, of arbitrary and irrational categories, such as grammar. Others are clearly unscientific (Elías, 2008, p. 141).

At this point, among the examples used by Elijah is the use of “sunset” or “sunset”, when from Galileo it is clear that the Sun does not move. He also comments on the differences between the scientific language and the narrative, pointing out that the latter: “It is far from being merely significant. It has its expressive side, involves the tone and attitude of the speaker or the writer, and does not declare or simply express what it says, but wants to influence the attitude of the reader, to persuade him and, ultimately, make him change” (2008, p. 142).

This discrepancy in the use of language distances scientific and journalistic objectives. As Elias also explains, scientists despise phonic symbolism and praise symbolic logic, while journalists, on the other hand, seek not only literary beauty, but even the literary profile.

The use of language is a challenge but there are medium points in which it is possible to decode the codes of science into elements of easy understanding without losing the rigor. For this, Elias speaks of the use of the synonymy that gives strength to the discourse, of the example as a narrative concretion that allows the “indirect understanding of the thesis or the

affirmation that tries to establish itself”, of the definition as a statement of the properties of the material concept or immaterial that is defined, from the analogy that seeks to seek relations of similarity with different things and concepts, from metaphor, with which concrete terms are transferred to abstract experiences and the use of quotation (journalistic) (Elías, 2008 , p. 154).

Gutiérrez and Rodríguez found, in interviews with journalists in their research, that they always ask themselves “what would my mother think of this, how did I get my mother on the scientific basis, how do I achieve an idea that seems totally distant, scientific, it becomes a potentially useful thing, that is impregnated in people” (2012, p. 38).

Are these questions also basic so that a researcher can communicate not only the results but the methodology applied in their work? But among all these differences there are similarities that come to light, which I consider most relevant: the search for truth, to answer questions. The journalistic truth is different from the scientific truth, that is, in journalism there are as many truths as there are sources (if a good job of reporting is done), on the other hand, the researcher proposes a hypothesis, performs experiments to prove or deny it and with this it generates some conclusions, its scientific truth, that can be confirmed or denied by others.

Finally, we both share a common goal, and that is that both journalists and scientists fulfill a social function and we owe it to the public that receives the messages in the first case, as to the one who applies that knowledge in the second. Adequate and relevant information to a society that needs it can help you improve your quality of life, while a society with the knowledge that your scientific community produces and the applications you may have and can benefit it also helps you raise your quality of life. Lifetime. Journalists fulfill our social function when society learns about scientific news, news on science and technology, the processes used, in the same way that scientists fulfill their social function when they make a discovery, when they corroborate the effectiveness of a drug, when they shape its observations (Fog, 2002, p. 4).

Here I make a parenthesis to talk about the difference between disclosure and scientific journalism. In the book *Fundamentals of scientific journalism and media outreach* by Carlos Elías (2008) it is explained that disclosure is always made by the sources (in this case scientists) and, therefore, aims to benefit the environment from the source. Scientific journalism does not stop there. Contrast, deepen and contextualize information are necessary elements to be understood as journalism. “The journalist does not seek to benefit the source but society” (Elías, 2008, p. 16).

Now, a scientist does not live in a bubble, there are also hidden interests (as in any subject that is addressed from journalism). This is another problem encountered when covering this type of sources. How to know that this research is important? How can I corroborate that the results are closely related to an investigative process and do not seek to benefit specific interests? Who confirms that this person I am going to interview is the ideal source?

These questions are asked all the time by those who at some point covered science topics and in a world in which some 2,000,000 scientific articles are published every year. How to

know how important is the one I am reading? in *Nature*, *Cell* or *Science* is the dream of many scientists, this does not mean that such research is relevant or has impact on public opinion or political decision making. This is not yet resolved, in this regard Francisco Villatoro in his article *How to identify the relevant research?* says that:

The most important metrics to measure the relevance and impact of an article are based on the citations it has received. The problem is that accurately determining these appointments is very difficult at present. You can use the citations in the *Web of Science* of Thomson Reuters, or *Scopus* of Elsevier, or even *Google Scholar*, but in each case a different result is obtained (2013, sp.).

At this point, the journalistic work, the good reporting, the search for contrasts, contexts and others are transcendental, even more so in a country like Colombia in the which although there is interesting science, with high impact, sometimes it does not reach to the large indexed magazines. So here you have to enter what Gutiérrez and Rodríguez write in their article: *Someone who likes to see the world through the eyes of science* (2012), that is, to enter into Science world.

Find pairs of the researcher and know their position on what is being presented, read the articles written on the subject, ask: In the first article was developed a breakthrough, almost out of nowhere or several publications have been recorded recording the steps and research difficulties, search for international researchers (who do not know the scientist) and raise concerns about the importance of such research, its possible impact and problems, for this it is necessary to start building an agenda of valid consultants, interlocutors that help to make decisions when reporting is done on a difficult topic.

In general, in schools of communication and journalism they teach that scientists should be treated as rational, impartial sources, experts in subjects. As Luisa García says in *Tell me about your sources* when quoting Monserrat Quesada: "We must distinguish (the sources) from those that are not directly involved in the facts that are being investigated should include all experts who can help the journalist clarify the issue in question" (2017, p. 50). But what to do when that expert is the main source, who should be applied step by step of journalistic reporting? There it is necessary to take the scientist as a journalistic source, with their possible interests and motivations to hide information, possible patrons or errors in the methodology.

To be able to interview a scientist (or any journalistic source) it is necessary to prepare, you have to study the character, read his articles and publications, try to understand what he studies, this in order to show the researcher that there is a genuine interest in understanding and communicate your research. A good advice is to spend the day with him, participate in his classes and interact with him or her in the laboratory, you cannot expect him to summarize in 30 minutes what he has accomplished in several years of work.

Over the years, little by little, the image of the scientist has been broken as a person far from society, almost pariah, "crazy", who lives in his laboratory. Finding the human side of a researcher is an interesting hook to make newspaper coverage. In this way, the scientist is

approached by the audience and common elements can be found between the history of the same and who consumes the journalistic product.

When journalistic coverage of scientific issues is made, Carlos Elías (2008) speaks of the need to ask: "Why is this important? Why should I publish this?" And I add: Who finances this research and why? what? The impact of the results of an investigation on the consequences of sugary drinks financed by a public institute to one by a company that lives on cereals or soft drinks is different.

Other necessary concerns when approaching a scientist as a journalistic source are:

- ✓ How big was the sample for this research? The impact of a news report from an investigation with two thousand people in a city like Manizales is different from if there are two thousand in the whole country.
- ✓ How long did the investigation last? Science, good science, takes time.
- ✓ In which indexed journal, that is, with peer review, was this research accepted? So you have a first clue about what other scientists think about the results but this is not a conclusive element. It is worth remembering the case of Haruko Obokata of the RIKEN Institute (Japan), who published in *Naturesome* supposed scientific advances in the management of stem cells. In 2014, the magazine published two rectification letters after finding that the scientist and his group had lied.

3. Our experience at Universidad de Manizales

The University of Manizales was founded on July 24, 1972. At 45, it has 19 undergraduate degrees (between virtual and face-to-face) and about 30 postgraduate degrees. 18 research groups, some in the highest categories granted by Colciencias (A1 and A) and four research centers. This university focuses on humanism, although its investigations include basic science and interrelations between the so-called hard and soft sciences.

This institution has an interesting collection of research products published in international indexed journals (about 46), a patent granted and several in progress; for this reason, since mid-April 2017, we began with the Directorate of Research and Graduate Studies the launch of a scientific means of dissemination of the university, the magazine *Eureka*, as response to the need to give a different treatment to how to communicate scientific developments and to make visible the impact of the science of the U. de Manizales.

Immediately I started as editor of that publication, the themes were decided for the first edition, among which are engineering, genetics, risk management, psychology and some views on the role of law in the country. A thematic menu between basic and social sciences. The goal was to continue with the good legacy of publications such as *Researcher Intellecta*.

In the development of the journal, which will be four-monthly and will have its first issue in August 2018, we find points that must be improved by researchers to better communicate their inventions. Just to name a few examples:

- ✓ Although initially it was thought that some of the articles should be written by the same scientists, we found several stumbles. The most alarming, the lack of empathy with the disclosure of their own developments, that is, researchers have not internalized that their scientific process ends when society accesses their results. Here we note the disconnection of researchers with communication.
- ✓ A researcher was asked for an article of maximum 700 words in which she described her work, her lines of research and results. One of them sent a document (not made for publication) of 17,850 words. This demonstrates the lack of tools to concretize ideas and sell a novel subject for, for example, a means of communication.
- ✓ One of the texts, made by a journalist *freelance*, had the difficulty that it took almost two months to contact the main researcher and her peers in other countries never answered the questions to construct the text, which it became a problem between the expectations of the Research Directorate and the possibility of fulfilling them without the support of the scientists.

In Colombia, in specific cases such as the Javeriana University with the magazine *Pesquisa*, the University of North with *Intellecta*, Eafit and some others are not common these efforts in disclosure. There are efforts to make science popular; For example, the University of the Andes conducts intensive courses of about two weeks in which its researchers learn to write for the media, develop journalistic leads, headline, sell a story, among others, but they are not constant.

Manizales has not been the cradle of dissemination and scientific journalism, as it is well highlighted in the article *Analysis of the role of the media in the face of scientific dissemination within the framework of the Public Policies of Science, Technology and Innovation*:

From November 2015 to May 2016 BIOS and Universidad de Manizales carried out a diploma in scientific journalism, in which about 25 institutional and organizational communicators, journalists in practice and scientists participated during 120 hours of this training activity, sponsored by the Caldas BIO-region royalties project. But this milestone was a unique moment and can hardly be repeated, even taking into account that 22 people graduated and delivered 10 multimedia products about science in the region (Urrego, 2016, p. 32).

Although the University of Manizales is interested in the dissemination of science, training is essential but, without the support of the resources of the royalties (with which the diploma was made), it seems that this initiative will not be repeated.

So there remains the possibility of training in other parts of the country or the continent. In the article *Postgraduate in Science Communication in Latin America: a map and*

some reflection talk about a varied map of possibilities in which the majority (19 of 22) are offered for a mixed audience, which it moves between science and communication, although there are cases in which lines are presented: one for journalists and another for researchers.

In total, 22 programs were identified for the training of science communicators with the established characteristics. As in other countries outside the region [Trench, 2012] in Latin America there is a wide variety of proposals and approaches [Reynoso, Monterrosa and Macias, 2015]. As Jon Turney [1994] and Felicity Mellor [2013] point out, the approaches depend to a large extent on the institutions that host these programs, giving rise to different proposals according to the interests, lines of work, needs of the institution and the experience of the professors [...]. The programs analyzed in this study are located in five countries: Argentina (4), Brazil (9), Chile (1), Colombia (2) and Mexico (7). The venues are in 13 cities. In Mexico, both the Mexican Society for the Dissemination of Science and Technology (SOMEDICyT) and the DGDC of the UNAM have taught several diploma courses, often jointly, for different institutions in the country designed for the specific needs of the context in which is offered (Massarani & others, 2016, p. 3).

Below, I present the graduate programs and courses found by Massarani and others in Latin America:

Table 3
Courses and postgraduate courses offered in Latin America
on journalism and scientific dissemination

Nombre del curso	Institución que ofrece el curso	Ciudad	País
DIPLOMADOS			
Diplomado de Divulgación de la Ciencia	Dirección General de Divulgación de la Ciencia de la Universidad Nacional Autónoma de México (UNAM)	Ciudad de México	México
Diplomado en Comunicación Pública de la Ciencia y la Tecnología	Sociedad Mexicana para la Divulgación de la Ciencia y la Técnica	Ciudad de México	México
Diplomado en Comunicación de la Ciencia y Periodismo Científico	Centro Morelense de Comunicación de la Ciencia	Cuernavaca	México
Diplomado en Periodismo Científico	Centro de Bioinformática y Biología Computacional de Colombia, Universidad de Manizales	Manizales	Colombia
Postítulo en Comunicación de la Ciencia	Facultad de Ciencias de la Universidad de Chile	Santiago	Chile
ESPECIALIZACIONES			
Especialización en Comunicación Pública de la Ciencia y Periodismo Científico	Universidad Nacional de Córdoba (UNC)	Córdoba	Argentina
Carrera de Especialización en Comunicación Pública de la Ciencia y la Tecnología	Facultad de Ciencias Exactas y Naturales, Facultad de Filosofía y Letras, Facultad de Ciencias Sociales de la Universidad de Buenos Aires (UBA)	Buenos Aires	Argentina
Especialización en Divulgación de la Ciencia, la Tecnología y la Innovación	Sede Andina de la Universidad Nacional de Río Negro (UNRN)	Bariolche	Argentina
Especialização em Educação e Divulgação Científica	Instituto Federal do Rio de Janeiro (IFRJ)	Río de Janeiro	Brasil
Divulgação da Ciência, da Tecnologia e da Saúde	Fundação Oswaldo Cruz (Fiocruz), Museu de Astronomia e Ciências Afins, Fundação CE-CIERJ, Instituto de Pesquisa Jardim Botânico do Rio de Janeiro, Casa da Ciência (UFRJ)	Río de Janeiro	Brasil
Curso de Pos-graduação — Especialización en Periodismo Científico	Laboratório de Jornalismo Científico (Lajor), Departamento de Política Científica e Tecnológica del Instituto de Geociencias; Departamento de Multimeios del Instituto de Arte, Universidade Estadual de Campinas (Unicamp)	Campinas	Brasil
Especialidad en Divulgación de la Economía	Museo Interactivo de la Economía (MIDE)	Ciudad de México	México

Nombre del curso	Institución que ofrece el curso	Ciudad	País
MAESTRIAS			
Maestría en Ciencia, Tecnología e Innovación, Orientación en Divulgación de la Ciencia, la Tecnología y la Innovación	Universidad Nacional de Río Negro (UNRN)	Bariolche	Argentina
Ensino em Biotécnicas e Saúde	Instituto Oswaldo Cruz (IOC), Fundação Oswaldo Cruz	Rio de Janeiro	Brasil
Divulgação Científica e Cultural	Laboratório de Estudos Avançados em Jornalismo Instituto de Estudos da Linguagem Universidade Estadual de Campinas (Unicamp)	Campinas	Brasil
Mestrado em Divulgação da Ciência, da Tecnologia e da Saúde	Casa de Oswaldo Cruz/ Fundação Oswaldo Cruz (Fiocruz); Instituto de Pesquisa Jardim Botânico do Rio de Janeiro; Museu de Astronomia e Ciências Afins; Fundação CECIERJ; Universidade Federal do Rio de Janeiro (UFRJ). Colaboração: Cornell University (EEUU); Oregon State University (EEUU); Scuola Internazionale Superiore di Studi Avanzati (Italia); Université Paris 8 (Francia).	Rio de Janeiro	Brasil
Programa de Pós-Graduação Stricto Sensu em Informação e Comunicação em Saúde (PPGICS)	Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (Icict), Fundação Oswaldo Cruz (Fiocruz)	Rio de Janeiro	Brasil
Educação, Difusão e Gestão em Biotécnicas	Instituto de Bioquímica Médica Universidade Federal do Rio de Janeiro (UFRJ)	Rio de Janeiro	Brasil
Posgrado en Filosofía de la Ciencia, línea de Comunicación de la Ciencia	Instituto de Investigaciones Filosóficas, Facultad de Filosofía y Letras, Facultad de Ciencias y Dirección General de Comunicación de la Ciencia, Universidad Nacional Autónoma de México (UNAM)	Ciudad de México	México
Maestría en Comunicación de la Ciencia y la Cultura	Instituto Tecnológico y de Estudios Superiores de Occidente	Jalisco	México
Estudios de Ciencia, Tecnología e Innovación (CTS+i)	Instituto Tecnológico Metropolitano (ITM)	Medellín	Colombia
DOCTORADOS			
Ensino em Biotécnicas e Saúde	Instituto Oswaldo Cruz (IOC), Fundação Oswaldo Cruz (Fiocruz)	Rio de Janeiro	Brasil
Doutorado Multi-institucional e Multidisciplinar em Difusão do Conhecimento	Universidade Federal da Bahia; Universidade Estadual de Bahia; Instituto Federal de Educação, Ciência e Tecnologia; Universidade Estadual de Feira de Santana; Federação das Indústrias do Estado de Bahia; Laboratório Nacional de Computação Científica; Instituto de Humanidades, Artes e Ciências de Bahia	Salvador de Bahia	Brasil
Programa de Pós-Graduação Stricto Sensu em Informação e Comunicação em Saúde (PPGICS)	Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (Icict), Fundação Oswaldo Cruz (Fiocruz)	Rio de Janeiro	Brasil
Educação, Difusão e Gestão em Biotécnicas	Instituto de Bioquímica Médica Universidade Federal do Rio de Janeiro (UFRJ)	Rio de Janeiro	Brasil
Posgrado en Filosofía de la Ciencia, línea de Comunicación de la Ciencia	Instituto de Investigaciones Filosóficas, Facultad de Filosofía y Letras, Facultad de Ciencias y Dirección General de Comunicación de la Ciencia, Universidad Nacional Autónoma de México (UNAM)	Ciudad de México	México

Taken from Massarani & others (2016, pp. 12-14).

Of the 22 courses and graduate programs offered in Latin America, only two are from Colombia, the previously named diploma between the University of Manizales and BIOS -which only had one cohort- and the Master's degree in Science, Technology and Innovation Studies from ITM, although it is worth noting that the Universidad Javeriana is about to open a Master's Degree in Scientific Journalism. Now, the analysis focuses on whether scientists and journalists are interested in doing a postgraduate in these topics and if the institutions in which they work support them to do them. In a glance *grosso modo* I would say no, so the courses and diplomas are a great option but, apparently, the universities and science centers of Colombia and of Manizales have not internalized the importance of the dissemination and scientific journalism to make visible their scientific developments.

4. Conclusions

- The institutions in which scientists work must initiate training processes to train them in issues of dissemination and communication of science, this with two purposes: the first, improve relations between researchers and media, and second, so that scientists

can expand the impact of their research on society, decision makers, business managers, politicians and others.

- In the Coffee Region recently, a diploma course has only been carried out to qualify researchers and journalists on issues of dissemination and scientific journalism. In Colombia there is only one active program -and a possible master's degree shortly- that goes in this direction. It is necessary that the institutions, occasionally the universities, integrate their extension courses and even their curricula, subjects or modules on these subjects for both lines, journalists and researchers.
- Universities and scientific institutions must analyze their systems of stimuli and motivations to integrate the dissemination of science to their processes, in this way, researchers will have greater reasons to build science products that address their research.
- One of the most urgent challenges to address is to bring communication as a discipline to the training of scientists and vice versa. Researchers to improve their approaches to the media and society and journalists to understand the scientific world and understand, at least, the foundations of science.
- Although communication programs and schools have modules or subjects that address political or economic issues, it is not common in Colombia to find those who talk about science. Therefore, when entering a media, journalists are not familiar with the importance, methodology and impact of science in society so they do not have the tools or the journalistic nose to identify the scientific news, much less to be able to cover it correctly.

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