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**“Reporting science journalism in Peru: A qualitative study of  
challenges and opportunities”**

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## Table of contents

Abstract .....	iv
List of tables and figures .....	v
1. Introduction .....	1
1.1.Problem statement .....	1
1.2.Purpose and objectives .....	1
1.3.Scientific field .....	2
1.4.Limits of research.....	3
1.5.Structure of work.....	4
2. Understanding science journalism .....	6
2.1.Definition and topics .....	6
2.2.Historical overview .....	8
2.3.Tasks and functions .....	10
2.4.News selection theory .....	12
2.5.Science news selection criteria.....	14
2.6.Producing a science news.....	17
2.7.Current relevance .....	19
3. Science journalism in Latin America .....	21
3.1.Status quo of science journalism.....	21
3.2. Development of science journalism .....	25
3.3.Journalism in Peru.....	29
3.3.1. Peruvian media market.....	29
3.3.2. Journalism culture .....	31
3.3.3. Science reporting in Peruvian media.....	33
4. Methodology .....	35
4.1.Research questions and hypotheses.....	35
4.2.Research approach.....	35
4.2.1. Qualitative content analysis .....	35
4.2.2. Interview guideline and category system .....	36
4.2.3. Sample selection.....	37
5. Presentation of results .....	39
5.1. Description of results .....	39

5.1.1. Status quo of science journalism in Peru .....	39
5.1.2. Strengths and challenges in science journalism reporting .....	45
5.1.3. Future perspectives in science journalism reporting .....	57
5.2. Discussion of results.....	63
6. Conclusions .....	67
6.1. Concluding remarks .....	67
6.2. Future research .....	69
Bibliography.....	70
Appendixes.....	80

## **Abstract**

Science journalism is a specialization that has not been thoroughly studied in Peru. A lack of research on this subject reflects this situation. In this context, this master's thesis "Reporting science journalism in Peru: A qualitative study of challenges and opportunities" can be considered a first examination of certain characteristics of this specialization in this country. Its main goal is to point out and explain the limitations that exist in reporting a science news—from finding a story to writing an article—and the factors that can contribute to overcoming them. A qualitative analysis of interviews with journalists and scientists provides insights about these two aspects. The results of this study show that the reporting of science journalism in Peru faces educational, economic and organizational limitations, with the lack of specialization courses being one of the main problems.

## List of tables and figure

Table 2.1: Aspects valued by scientists and journalists when communicating about science .....	7
Table 2.2: News values identified by Johan Galtung and Mari Holmboe Ruge....	14
Table 3.1: Science and technology popularization system of members of Convenio Andrés Bello in 2005 .....	28
Figure 5.1: News headline from August 15, 2016 about an earthquake where the word degrees (grados in Spanish) appears.....	43
Figure 5.2: News headline from May 26, 2019 about an earthquake where the word magnitude (magnitud in Spanish) appears. ....	43
Figure 5.3: “Bill wants to declare of historical interest supposed humanoid mummies”. News headline from November 11, 2018 about alien mummies. ....	59

# **Chapter 1: Introduction**

## **1.1 Problem statement**

Currently, there are no previous studies on the challenges and opportunities of science journalism reporting in Peru. In fact, science journalism is a topic that has not been thoroughly researched in this country. A possible reason for this could be that this journalistic specialization does not have many frequent pages or sections in Peruvian mainstream media<sup>1</sup> and thus has not generated interest. The literature on this subject is limited to a monograph and a lecture. In this context, this research is relevant and above all necessary to define the practice of science journalism in Peru.

If there are no previous studies, why is science journalism in Peru supposed to have challenges? Because this specialization in Latin America, a region that includes Peru, has not developed the same way such as the United States and Europe.<sup>2</sup> Journalists there must face different challenges to report on science: the lack of specialized training, the lack of resources to cover this topic and the lack of interaction between scientists and media. The topic is so important that in 2007 an event highlighted the challenges in science journalism that Ibero-American countries had.<sup>3</sup>

## **1.2 Purpose and objectives**

This research aims to describe the challenges and opportunities of science journalism reporting in Peru. According to the opinion of journalists and scientists, it is discussed how limitations shape the practice of this specialization, and then possible solutions are suggested. This study can be considered exploratory considering that this is a subject that has not been intensively researched in this country.

An objective of this analysis is to provide an explanation of some characteristics of science journalism in Peru. Its main tasks and most popular topics are explored in order to better

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<sup>1</sup> See Polino, Carmelo (2008): *La investigación en salud en diarios de América Latina: reporte de un estudio comparativo*, p. 46.

<sup>2</sup> See Ortiz, Bruno (2011): Tomás Unger: “Hay interés en la ciencia, pero poco conocimiento”.

<sup>3</sup> The name of the event was Challenges and the evaluation of science journalism in Ibero-America. Journalists from Guatemala, Colombia, Chile, Bolivia, Uruguay and Argentina mention the word challenge in the title of their lectures.

understand this specialization. Furthermore, this search seeks to establish connections between these factors and the challenges and opportunities.

A second objective includes assessing the perception of the development of science journalism in Peru. With this information, it is possible to understand the status of this specialization and in which areas improvements are needed. This task is necessary to evaluate this development in the Latin American context. The comparison can indicate how advanced science journalism is in Peru.

A final objective is to serve as a starting point to future studies focusing on science journalism in Peru. In this way, this country can participate more actively in the discussion on this specialization in Latin America.

### **1.3 Scientific field**

Regarding science journalism in Peru, a lack of studies can be observed. During the literature revision, a monograph and a lecture were the only sources that address this subject. The monograph *Science Journalism in El Comercio newspaper* by Janette Lozano Mora<sup>4</sup> describes the reporting of science and technology news in this media. The researcher analyzes which are the most popular topics, the sources they used, and the graphic resources included in the news. On the other hand, the lecture *Scientific institutions and media management: the role of science communicator* by Zoraida Portillo describe the problems of the lack of these professionals in Peru. Apart from these two sources, the article *The challenges for Environmental reporting in Peru: coverage of small-scale mining in Peruvian newspapers* by Willer and Takahashi evaluates this field of science journalism in this country.

In Latin America, the work of Brazilian researcher Luisa Massarani is fundamental to understand science journalism in this region. The scope of her studies includes science coverage in newspapers and the perceptions of the practitioners about this specialization. One of her main conclusions points out that the science journalism in Latin America are still

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<sup>4</sup> See Lozano Mora, Janette (2016): *Periodismo científico en el diario El Comercio*. Lima: Universidad Jaime Bausate y Meza.

dependent on foreign news.<sup>5</sup> The doctoral dissertation *Science journalism and development. A view from Latin America* by Argelia Ferrer Escalona provides relevant information on the contribution of this specialization in the region. Lectures at Latin American science journalism conferences are essential for learning each country's problems, make comparison and finding tendencies.<sup>6</sup> The video material of lectures works as a complementary source on this subject.

In Europa and the United States, science journalism has been extensively research. In his 2017 book *Science Journalism. An introduction*, Martin W. Angler makes a comprehensive revision on this specialization, focusing on the steps involved in the production of journalistic content from finding a story to writing an article in a magazine or online. This publication is significant due to its actuality and Angler's experience as a science journalist. The literature on this subject from German authors is crucial. Researchers Franziska Badenschier and Holger Wormer have elaborated a detail news values criterion for science stories. The contributions of Campenhausen and Illinger give more insight into the definition and tasks of science journalism.

#### **1.4 Limits of the research**

A limitation since the beginning of this research has been the lack of literature on science. The very little information about it complicated the development of this study. This problem affected especially the formulation of hypotheses. As a result, they had to be elaborated in a broad way and based partially on the experience of the researcher on a science department of a newspaper.

Initially, the research included the participation of academics in this specialization or in a related field such as environmental journalism. However, during the field research it was only possible to interview one of the four suggested experts. This problem led to the removal

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<sup>5</sup> See Massarani, Luisa et. al (2007): *Growing, but foreign source dependent: Science coverage in Latin America*. London, New York: Routledge.

<sup>6</sup> For this research, lectures from two conferences have been selected: *Periodismo y comunicación científica en América Latina* from 2010 and *Los desafíos y la evaluación del periodismo científico en Iberoamérica* from 2008.



of the group of academics from the sample selection. This only interviewee was later added to the journalist's group.

Even though the results of this master's thesis are interesting and revealing, they cannot be considered conclusive on this subject. Since this is an exploratory research, its findings only describe certain patterns of science journalism in Peru. These should be analyzed in further studies to prove their accurateness. There are still some areas of this work that could be deepened and clarified.

The small sample used in this research is a limiting factor. Due to its size, it cannot be generalized for the whole population. On the other hand, the sample have not been chosen randomly. Its representativeness is affected by this circumstance. It is worth noting that social scientists were not included in the study and one human scientist was part of it, that might reflect a bias towards the so-called "hard" sciences.

The concept of science journalism was problematic at the time of content analysis. During interviews with journalists and scientist, this term was also interpreted as science popularization or science communication, although there are certain differences between their definitions. However, for the purpose of this investigation, science journalism will incorporate these two related concepts.

## **1.5 Structure of work**

This master thesis consists of six chapters. The introduction explains to the reader the problem statement and purpose behind this research. It then examines the literature on this subject and the limitations of this study.

The theoretical part covers two chapters, whose aim is to present concepts involved in this research. The first one provides an overview of science journalism: its definitions, history, tasks, news criteria, and current relevance. The next describes the status quo of this specialization in Latin America —its limitations and development policies— and essential features of journalism in Peru.

The fourth chapter explains the methodology used in this thesis, which includes the research questions, hypotheses and the sample selection. In this fifth chapter, the results of the content analysis are presented along with the verification of the hypotheses. In the conclusions, the key findings of this study are described and further areas on the subject are suggested for future research.

## Chapter 2: Understanding science journalism

Journalism is responsible for reporting on different topics and one of them is science. The discovery of a new planet, the development of a treatment for cancer, the consequences of global warming. Science journalism deals with these kinds of stories. Its purpose is to inform about what is happening in the various scientific disciplines to a general public.<sup>1</sup>

Besides reporting on major advancements in science, this specialization fulfills other functions. Some of them have become more important in recent years. In fact, science journalism is fundamental in a world like the current one shaped by technology. And without its involvement it will not be possible to understand the changes humanity will undergo in the future.

This chapter begins by defining what science journalism is and the topics it covers. A historical overview of this specialization and its tasks and functions are described next. Then news selection theory and its criteria applied in science journalism are addressed. This chapter closes with an explanation of the current relevance of this subject.

### 2.1 Definition and topics

Science journalism can be defined as a journalistic specialization that foremost reports on scientific research, their findings and their possible implications.<sup>2</sup> Its stories explain the processes, methods, motivations, adversities and achievements involved in conducting a study. Its purpose is to facilitate information about scientific developments to a lay and wider audience than those who read journals.<sup>3</sup>

This specialization can be problematic because of how journalism and science inform about scientific research.<sup>4</sup> While the aim of scientists is the dissemination of their discoveries in a journal, reporters are looking for an interesting story to recount that breakthrough. This means that each profession considers specific aspects to communicate this information.

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<sup>1</sup> See Campenhausen, Jutta von (2011): Wissenschaftsjournalismus. Konstanz: UVK, p. 14.

<sup>2</sup> See Angler, Martin W. (2017): Science journalism. An introduction. London, New York: Routledge, p.3. See Campenhausen (2011), p. 11.

<sup>3</sup> See Angler (2017), p. 8.

<sup>4</sup> See Fjæstad, Björn (2007): Why journalists report science as they do. London, New York: Routledge, p. 123.

These aspects can be even contradictory as shown in Table 2.1. This distinction between journalists and scientists explains the existence of a certain struggle.

Table 2.1 Aspects valued by scientists and journalists when communicating about science. Source: Fjæstad (2007).

<b>Scientists</b>	<b>Journalists</b>
Aim: dissemination of research results, teaching, PR for science	Aim: news, enlightenment, exposure large audience
Slow information dissemination	Fast dissemination
Factual orientation	Personal orientation
Rational appeal	Emotional appeal
Consensus gives best picture	Diverging voices give best picture
Theoretical relevance important	Practical relevance important
Comprehensive	Selective coverage
Details important	Details unimportant
Results are qualified	Results are overstated
Work judged by colleagues, thus reinforced and reproduced.	Work judged by colleagues thus reinforced and reproduced.

Like other fields of journalism, it must report critically on the work of scientists. Journalists need to check the reliability of a study, the methodology used and the funding for its execution. This specialization is not intended to replicate exactly what a researcher or a press release wants to be published. Without a skeptic and cautious approach, science journalism is at risk of becoming a “surrogate public relation spokesperson”<sup>5</sup> of scientists and their institutions.

The specialization of reporters that cover scientific topics is a relevant factor because reporting on science requires specific knowledge. According to science journalism professor Ellen Ruppel Shell, the argument “that one can just walk into science journalism without having previous experience or knowledge of science has become much more difficult to

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<sup>5</sup> Angler (2017), p. 3.

support”.<sup>6</sup> Reporters need to be trained to report properly on these issues. This training can allow them to take a critical look at science.

Science journalism covers a diversity of topics and disciplines that are constantly being updated. Its scope includes traditional sciences such as medicine, zoology, mathematics or astronomy. As a result of scientific development, some other issues have gradually been incorporated like environmental and nanotechnology. Among all the topics, the most popular worldwide are health and biology.<sup>7</sup>

It should be noted that not all news on technology can be considered as science journalism.<sup>8</sup> The reporting of technological advancements and innovation should be excluded if they do not explain a scientific background. For example, an article describing the new features of the latest mobile phone.

## 2.2 Historical overview

The origins of this specialization can be traced back to the seventeenth century.<sup>9</sup> In 1665 the French *Journal des Sçavans* and the English *Philosophical Transactions*, the first science journals, were published. In the next century, during the Enlightenment, science began a process of popularization that allowed the dissemination of findings and theories a broader public. In addition to traditional fields such as physics and mathematics, others like botany or zoology came to prominence through specialized media.<sup>10</sup>

In the nineteenth century newspapers and magazines reported about the discoveries of scientists who travelled around the world. One of the most emblematic cases is the German geographer and naturalist Alexander von Humboldt, who made an extensive expedition to America from 1799 to 1804. Print media informed about his findings<sup>11</sup> but simultaneously

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<sup>6</sup> Angler (2017), p. 4.

<sup>7</sup> See Badenschier, Franziska/ Wormer, Holger (2012): Issue selection in science journalism: Towards a special theory of news values for science news? Dordrecht: Springer, p. 61.

<sup>8</sup> See Angler (2017), p. 3.

<sup>9</sup> See Calvo Hernando, Manuel (1977): *Periodismo científico*. Madrid: Paraninfo, p.83. See Daum, Andreas W. (2008): *Geschichte des Wissenschaftsjournalismus*. Gütersloh: Verlag Bertelsmann Stiftung, p. 156.

<sup>10</sup> See Daum (2008), p.156.

<sup>11</sup> See *El Mercurio de España* (1807): *Viage de Humboldt y de Bonpland á lo interior de América*, pp. 107-119. See *Variedades de Ciencia, Literatura y Artes* (1805): *Nuevas observaciones sobre la formación de las montañas*, p. 144.

he published the achievements of his journey in his work *Cosmos*. For this reason, Humboldt is considered a pioneer of science journalism.<sup>12</sup>

The breakthrough of this specialization came in the twentieth century. In 1920 Science Services, the first science news agency, was founded in the United States. This media and others reported on the scientific development caused by the Second World War because society understood that science could have an impact in their lives. The threat of an atomic bomb suddenly motivated an interest on the public. Later it was a key factor during the Cold War in the race to conquer space. In this context, media founded exclusive sections to inform about science and technology, especially in the United States.<sup>13</sup> In 1974 *The New York Times* published for the first time its science supplement that exists until now. In the eighties, the idea was introduced that journalists should report critically on science.<sup>14</sup>

Since the nineties the advent of the internet led to drastic changes in this specialization. Blogs allowed scientists and aficionados to communicate their knowledge, along with journalists, about their preferred scientific field. Therefore, issues that were not given enough coverage in traditional media found on the web a place to be discussed.<sup>15</sup> However, the abundant information on these topics offered on the internet makes it difficult to check one by one. And the possibility that anyone can write about science on the internet has also resulted on the proliferation of pseudoscience, hoaxes and fake news.

In 2002 the promotion and improvement of this specialization was enhanced with the creation of the World Federation of Science Journalists (WFSJ). This non-governmental organization represents 59 science journalists' associations and has approximately 10000 members.<sup>16</sup> Every year it organizes a conference where trends and challenges in this field are discussed.

However, the following years were problematic for science journalism. The 2008 financial crisis affected it because media had to make cuts and the number of specialized journalists decreased.<sup>17</sup> Simultaneously the print media crisis threatened the publication of science

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<sup>12</sup> See Daum (2008), p. 157.

<sup>13</sup> See Román, Valeria (2016): Conferencia Periodismo Científico.

<sup>14</sup> See Angler (2017), p. 6.

<sup>15</sup> See Trench, Brian (2007): How the Internet changed science journalism. London and New York: Routledge, p. 134.

<sup>16</sup> See World Federation of Science Journalists (2019a): Mission and objectives.

<sup>17</sup> See Román (2016).

sections in the newspapers and magazines.<sup>18</sup> Despite this situation, new formats such as web videos or podcasts have improved and expanded the way science news are produced and presented nowadays.

### **2.3 Tasks and functions**

One of the main tasks of science journalism is to inform about scientific research and achievements to the general public.<sup>19</sup> One of the prejudices about science lies in the difficulty of understanding it due to several factors such as technical jargon or scientific illiteracy. For this reason, it is fundamental to explain how science works in a simple and engaging way that addresses people who are not aware of these issues. However, the journalists must prevent that their reporting becomes an advertising tool for the industries behind some discoveries.<sup>20</sup>

This previous task is strongly related to another that considers that science journalists should translate scientific jargon into a comprehensible language.<sup>21</sup> Journalists are able to analyze and interpret research; therefore, they can clarify their procedures and results. The translation task includes turning the theoretical and rational approach of a paper into an appealing and emotional story. However, this image of the journalists as a translator is considered by some authors to be outdated or misleading.<sup>22</sup>

The science journalist can be also seen as a link between the scientist and the public.<sup>23</sup> The relationship between these two is limited when researches interact mostly within their academic circle. By reporting their findings, journalists generate interest in the population for scientists. This may later translate into recognition of their work by a wider audience.

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<sup>18</sup> See Angler (2017), p. 2.

<sup>19</sup> See *ibid.*, p. 9.

<sup>20</sup> See Ferrer Escalona, Argelia (2002): *Periodismo científico y desarrollo. Una mirada desde América Latina*, p. 253.

<sup>21</sup> See Campenhausen (2011), p. 14. See Massarani, Luisa et al. (2012): *Periodismo científico: reflexiones sobre la práctica en América Latina*, p. 75.

<sup>22</sup> See Campenhausen (2011), p. 14. See Franklin, Jon (2007): *The end of science journalism*. London, New York: Routledge, p. 155.

<sup>23</sup> See Ferrer Escalona (2002), p. 294.

Giving advice to its audience so that they can make informed decision is regarded as a task of science journalism.<sup>24</sup> For example, an article about a new medical treatment may help to assess whether it is beneficial or not for certain patients. This duty has become more relevant in a context where health news is frequently reported on media. In their role as advisors, science journalists should also present to the public the difference between what is scientifically based and what is not.

Science journalists should actively assume a gatekeeper function in their media. They are responsible for filtering science stories or inflated press releases in the newsroom.<sup>25</sup> Their duty is to warn and suggest that these kinds of articles are not published due to lack of scientific basis. This task avoids informing about fake news and pseudoscience that can mislead the public.

This specialization promotes science literacy among the population. When journalists report on scientific advances, they contribute to the education of those who are interested in these topics, but especially to a lay audience. This task is significant in a world where technology and innovation are part of the daily lives and scientific illiteracy is still a problem that if left unattended could become a threat.<sup>26</sup>

Science journalism is responsible to investigate the methods employed and the results of a study.<sup>27</sup> Its function is not limited to supporting findings, but also to scrutinize them. Journalists should expose manipulations, examine tendentious questions and explain the limitations of a research.<sup>28</sup> This task includes reporting conflict of interests between the different actors involved in science. However, fast-paced news flow prevents this work from being accomplished, because a critical analysis requires time and expertise. This constraint causes the journalists to validate the study without having read it or contrasted with other sources.<sup>29</sup>

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<sup>24</sup> See Angler (2017), p. 10.

<sup>25</sup> See Illinger, Patrick (2006b): *Recherche im Wissenschaftsbetrieb*. Berlin: Econ, p. 85. See Angler (2017), p. 10.

<sup>26</sup> See Pew Research Center (2015): *A Look at What the Public Knows and Does Not Know About Science*.

<sup>27</sup> See Angler (2017), p. 3.

<sup>28</sup> See Campenhausen (2011), p.18.

<sup>29</sup> See Gallardo, Susana (2010): *Profesionalización del periodismo científico. Avances y desafíos. ¿Qué se espera hoy de un periodista científico?*, p. 34.



Science journalism can also monitor the fulfilment of laws related to environmental issues.<sup>30</sup> If they are not being followed, its duty is to report on these cases. But the most fundamental point is to demonstrate the negative impact with scientific evidence. This task has become relevant due to journalistic investigations about the effects of pesticides on animals and mining on deforestation.<sup>31</sup>

Another function of science journalism is risk communication. Journalists should assess any information about environmental or health threat before deciding how to communicate it.<sup>32</sup> A hurried reporting could give a false impression of the danger involved. On the contrary, a correct risk communication by the journalist will allow a better prevention or handling of a serious situation. This function is helpful in the field of medicine when stakeholders try to hide the risks of a new treatment and not affect their interests.

One of the roles of science journalism involves mobilizing public opinion.<sup>33</sup> Its influence can even reach decision-makers so that they promote greater funding for the development of different fields. This objective is relevant in any society; however, in developing countries this becomes crucial because scientific issues are often missing from public debate. This indirectly affects scientists who do not receive enough financial support and cannot continue their research.

## **2.4 News selection theory**

One of the main concerns in understanding the mechanism of news production are the values or criteria for determining what is newsworthy. This issue was discussed during the last century. In 1922 Walter Lippman implied in his book *Public Opinion* that journalists followed a pattern for choosing news.<sup>34</sup> In the fifties, social scientists in the United States

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<sup>30</sup> See Ferrer Escalona (2002), p. 260.

<sup>31</sup> See Dobb, Edwin (2018): Why Poison Is a Growing Threat to Africa's Wildlife. See Sierra Praeli, Yvette (2019): Deforestación por minería ilegal alcanza niveles históricos en Perú.

<sup>32</sup> See Lundgren, Regina A./ McMakin, Andrea H. (2009): Risk communication: A handbook for communicating environmental, safety and health risks. Hoboken: John Wiley & Sons, p. 14.

<sup>33</sup> See Massarani et al. (2012), p. 75.

<sup>34</sup> See Lippman, Walter (1998): The Public Opinion. New Brunswick: Transaction Publishers, p. 223.

developed the concept of 'gatekeeper'.<sup>35</sup> This term described the role of a media when choosing what information was published and what was not.<sup>36</sup>

In the sixties, Galtung and Ruge were among the first to systematize the factors that are at play in assessing whether an event is newsworthy. After reading 1,262 journalistic pieces in the Norwegian press, they identified twelve news values, which can be consulted in detail in Table 2.2.<sup>37</sup> The results of this study were fundamental to understand this journalistic process. Both media researchers concluded that the publication of a story in the newspapers depends on the number and the magnitude of values that are present in the news.<sup>38</sup>

A different perspective on this issue was proposed by Michael Schudson. This researcher suggests three aspects for analyzing news selection: the political economy, the social organization and the cultural symbols.<sup>39</sup> The political economy highlights the political and economic ideology of the media. News selection is restricted and follows these factors.<sup>40</sup> Social organization considers the relation of journalists in the newsroom influential. Their routines and their colleagues can shape this process.<sup>41</sup> Cultural symbols refer to how hegemonic values of a society can influence news selection.<sup>42</sup>

Another model for news selection was developed by Shoemaker and Reese, who proposed that there are five kinds of influential factors.<sup>43</sup> These factors work as layers ranging from a micro to macro level. The first level includes journalists themselves who select news based on their gender, political views or beliefs. The next layer is media routine that refers to the news values or the interests of the audiences. Then comes organizational factors that includes economic goals and hierarchies within the organization.<sup>44</sup> The fourth layer are factors from

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<sup>35</sup> The term was coined in the previous decade by German-American psychologist Kurt Lewin.

<sup>36</sup> See White, David Manning (1950): The "gate keeper": A case study in the selection of news.

<sup>37</sup> See Galtung, Johan/ Ruge, Mari Holmboe (1965): The structure of foreign news. The presentation of the Congo, Cuba and Cyprus crises in four Norwegian newspapers, pp. 70-71.

<sup>38</sup> See *ibid.*

<sup>39</sup> See Schudson, Michael (1989): The sociology of news production, p. 266.

<sup>40</sup> See *ibid.*, p. 268.

<sup>41</sup> See *ibid.*, p. 273.

<sup>42</sup> See *ibid.*, p. 277.

<sup>43</sup> See Shoemaker, Pamela J./ Reese, Stephen D. (1996): *Mediating the message. Theories of influences on mass media content.* New York: Longman.

<sup>44</sup> See *ibid.*, p. 133.

outside the media such as sponsors or government policies. Finally, ideological and cultural factors can influence news selection based on the hegemonic paradigms of a society.

Table 2.2 News values identified by Johan Galtung and Mari Holmboe Ruge. Source: Galtung and Ruge (1965).

<b>News values</b>	<b>What does it mean?</b>
1. Threshold	The greater the impact of a story, the greater the chance that it will become news.
2. Frequency	Events that suddenly happen are most newsworthy.
3. Negativity	Bad news is more attractive than good news.
4. Unexpectedness	An extraordinary event is more newsworthy than an everyday incident.
5. Unambiguity	The implications of an event can be clearly understood.
6. Consonance	The readiness and preparation of the media to cover a story.
7. Continuity	A story that has been reported has a greater chance of remaining in the spotlight.
8. Composition	A story on a different topic has greater chance to be reported if there is an excess of news in another section of the newspaper.
9. Reference to people	A story with recognizable characters is more powerful than without them.
10. Meaningfulness	Cultural identification the audience has with the topic.
11. Reference to elite nations	The world's powers receive greater coverage than other countries.
12. Reference to elite persons	Due to their influence, famous people are always of interest.

## 2.5 Science news selection criteria

Thousand of research are conducted annually worldwide; however, not all of these are portrayed in the media. This situation raises the following question: what makes one science story more newsworthy than another? The news selection in science journalism is not very different from other sections, but it has been argued that it has at least some specific criteria.<sup>45</sup>

First, it is worth noting that this specialization has a characteristic concerning topicality. In general, stories are less dictated by breaking news and can be selected regardless daily

<sup>45</sup> See Badenschier / Wormer (2012), p. 67.

actuality.<sup>46</sup> The exception to this trend occurs when a major scientific discovery is announced, such as the cure of a disease. In spite of this, science journalists have some freedom to decide what news they want to report compared to those in other sections.<sup>47</sup>

One of the main factors involved in selecting a science news is the surprise effect it can have on the audience. The astonishing aspect is considered more relevant in this specialization than in politics or business.<sup>48</sup> The more spectacular a scientific breakthrough, the more likely it is to be reported in the media. An example is the publication of the first photograph of a black hole taken in March of this year. Until then nobody had any idea how one looked like. This factor can be detrimental because pseudoscience and fake news are published due to this element of surprise.

A factor linked to astonishment is unexpectedness, which is significant when choosing science news. In the words of Badenschier and Wormer, it highlights the “extent to which an event was not expected”.<sup>49</sup> This criterion can be relevant in the case of a research about a new consequence of global warming. The coverage of natural disasters is also influenced by this factor. A hurricane is more likely to become news if its intensity suddenly increases and represents a threat.

Another aspect to consider in this selection is the relevance of the finding. According to Badenschier and Wormer, this term is described as the degree of impact —positive or negative— that an event can have.<sup>50</sup> The possibility of a science story being reported depends on how many people can be affected by it. An article is more likely to be published, if its consequences involve a significant part of the population, as in case of a health or environmental threat.

The usability factor can be decisive in the process of assessing what is newsworthy.<sup>51</sup> This means that a science story has a greater chance of being covered in the media, if it offers advice that contributes to a better daily life. Health articles tend to be chosen more often than

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<sup>46</sup> See Badenschier / Wormer (2012), p. 64. See Illinger, Patrick (2006b), p. 82.

<sup>47</sup> See Illinger (2006b), p. 82.

<sup>48</sup> See Badenschier / Wormer (2012), p. 74.

<sup>49</sup> *Ibid.*, p. 73.

<sup>50</sup> See *ibid.*, p. 72.

<sup>51</sup> See *ibid.*, p. 66.

other disciplines for this reason. Their impact on personal wellness makes them attractive to an audience eager to change certain habits.

Studies are worth covering when their results support value judgements, as Lehmkuhl states.<sup>52</sup> This matter becomes particularly important with regard to ideas that are widespread among the population. The studies that confirm the risks of passive smoking exemplify this by demonstrating an assumption. The relevance of the source plays a role in these cases: a study about passive smoking will receive more coverage if it is conducted by an institution such as Deutsches Krebsforschungszentrum.<sup>53</sup>

For the specific news values of this specialization, Badenschier and Wormer have established certain criteria. These authors argue that classical parameters are “incomplete and not sufficient to describe the selection processes in science journalism precisely”.<sup>54</sup> Among these factors, this research focuses on the scientific proximity, the scientific relevance and the intention of the author as the most interesting.

Scientific proximity is determined by the relationship between mainstream disciplines and the coverage they receive in the country.<sup>55</sup> Fields that produce the most research are likely to be reported often. The same logic works with areas that have a considerable number of scientists. Therefore, disciplines that are popular and prolific are expected to receive more attention from media than small ones.<sup>56</sup> For example, an article on biology is newsworthy in a country where this kind of specialists are numerous.

Scientific relevance refers to the impact an event has on the progress of its field.<sup>57</sup> Based on this factor, a paper on a new AIDS treatment or the announcement of a space probe at a conference are newsworthy. In the case of papers, journals are influential in assessing this criterion. A discovery published in a renowned journal is considered more impactful and therefore more likely to be reported.<sup>58</sup>

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<sup>52</sup> See Lehmkuhl, Markus (2006): Auswahlkriterien für Wissenschaftsnachrichten. Berlin: Econ, p. 99.

<sup>53</sup> See *ibid.*, p. 100.

<sup>54</sup> See Badenschier / Wormer (2012), p. 80.

<sup>55</sup> See *ibid.*, p. 61.

<sup>56</sup> See *ibid.*

<sup>57</sup> See *ibid.*, p. 73.

<sup>58</sup> See *ibid.*, p. 79.

On the other hand, the intention of the author can be influential on science news selection. Badenschier and Wormer describe it as the goal that the journalist hopes to achieve with the publication of a story.<sup>59</sup> This purpose may be intended to clarify a misconception among the population, popularize an obscure issue or support a science policy.

## **2.6 Producing a science news**

Every science story should involve certain stages before being published in the media. This process does not differ much from what political or sport journalism has to do. However, science journalists must be prepared in a particular way in order to understand complex scientific concepts and explain them to the audience.

To find stories, journalists in this field work primarily with scientific journals where they can examine several studies. Reading the abstract is useful in identifying which story is worth developing. Press releases are another source of news that is easier to understand than papers because they provide the most valuable information in digestible language and in just a few paragraphs.<sup>60</sup> Scientific conferences are also an opportunity to hear about new topics and interview experts.

After choosing a research, the next step is to prepare a pitch that explains the idea and the approach of the story and send it to an editor, who will decide if the topic deserves to be reported.<sup>61</sup> At this point, journalists need to be informed about the topic and narrow it down. At the same time, they should know the structure and the sources of the article. Based on this work, they can provide the relevance of the subject and a fresh angle on it.<sup>62</sup>

Once the editor has approved the pitch, journalists must interview the scientist. Particularly in this specialization, interviews can be favorable for more than one reason. First, they provide additional background information not covered in the paper. Second, they enhance the understanding of complex topics.<sup>63</sup> Later this can help the journalists when explaining

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<sup>59</sup> See *ibid.*, p. 72.

<sup>60</sup> See Angler (2017), p. 43.

<sup>61</sup> See *ibid.*, pp. 56-57.

<sup>62</sup> See *ibid.*, p. 59.

<sup>63</sup> See Angler (2017), p. 85. See Campenhausen (2011), p. 109.

the whole perspective surrounding a study. Third, they are the main source for anecdotes and curiosities that occurred during the research.<sup>64</sup> These details are what make a science story entertaining and lively.

With the information gathered throughout this process, journalists produce a science story following certain considerations. They are aware that technical jargon and intricate concepts confuse and frighten the public. Still it must be avoided to minimize the scientific aspect of a feature. Science news should hold the attention of the audience without compromising its purpose to inform.

However, writing a science story depends on whether it will be published in a newspaper, a magazine or online. Each of these formats has characteristics that influence the work of journalists. In newspapers, the space to tell a story is rather limited. Journalists should be more fact oriented and concise when writing science news.<sup>65</sup> Newspaper readers play a role here. They do not have an exclusive interest in science compared to magazine readers, who are concerned about these topics.<sup>66</sup> This distinction requires the journalist to emphasize the usability or practical effect of the story.

Conversely, journalists working in a magazine have more space and time to write a science story. Their task is to keep the reader's attention on a longer text. To cope with this challenge, magazine articles have more human touch and narrative approach.<sup>67</sup> In this kind of stories, it is essential to find a balance between hard facts, characters and anecdotes that were part of an investigation.

On the internet, the aim is to draw the reader's attention as soon as possible with the tools it offers. The text can be complemented with videos, hyperlinks and interactive infographics to explain concepts more easily. On the other hand, journalists should be aware of the lengths of the paragraphs and sentences to avoid losing the reader's interest.<sup>68</sup> In the case of multimedia content, there is a trend that is also featured in science journalism. The idea is to

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<sup>64</sup> See Angler (2017), p. 85. See Campenhausen (2011), p. 109.

<sup>65</sup> See Angler (2017), p. 155.

<sup>66</sup> See *ibid.*, pp. 148-149.

<sup>67</sup> See Illinger, Patrick (2006a): *Fünf Fragen an Patrick Illinger*. Wiesbaden: VS Verlag für Sozialwissenschaften, p. 26.

<sup>68</sup> See Angler (2017), p. 173.

tell stories through short videos, which usually last between thirty and a couple of minutes.<sup>69</sup> When it comes to news about science, they are characterized by a surprise factor.

## **2.7 Current relevance**

Nowadays science is considered as one of the most productive and topical subject fields.<sup>70</sup> Innovation in the different disciplines is constantly changing the world and altering gradually our daily lives. In our current society surrounded by technology, science journalism plays a key role providing a context in which the audience can understand how the latest findings. This information will help the public to better adopt the changes that these discoveries will generate. In this process of transformation there is no better ally than the science journalist.

Ironically, this technological development is one of the main factors that has affected the specialization. The functions and responsibilities of science journalism have been modified because of the proliferation of news and sources caused by the internet. Getting valuable information is even more complicated in this abundance of news. In this context, journalists should guide and educate the audience in order to discern between a valid research and fake one.

This task becomes essential considering that pseudoscience is often portrayed in media and spreads quickly over the internet. A miraculous medicine or a supernatural event, for example, immediately draws the attention of the audience, who could believe that to be true. This phenomenon has aggravated during this decade due to the clickbait culture, which is based on sensational news. Science journalists are responsible, along with scientists, for exposing the lies behind these contents.

The correct communication of risks by science journalists is seen as a relevant aspect today.<sup>71</sup> In times when climate change is a central issue, they examine research or press releases that inform about environmental threats and determine the appropriate way to

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<sup>69</sup> See *ibid.*, p. 292.

<sup>70</sup> See Campenhausen (2011), p. 13.

<sup>71</sup> See Angler (2017), p. 18.



report these findings. Journalists must be careful about communicating this kind of information, especially if they do it through social media. Minimizing or exaggerating risks can lead to a detrimental situation for the affected population.

## **Chapter 3: Science journalism in Latin America**

The practice of science journalism in Latin America has characteristics that distinguish it from other regions. One of them are the limitations that prevent journalists from informing properly.<sup>1</sup> Given this situation, several countries—for example Mexico or Colombia—have considered crucial to develop policies and strategies to promote science journalism. Efforts in this field have focused on the training of journalists, the creation of specialized online portals and the collaboration through networks.

On the other hand, it is necessary for the purpose of this study to understand what determines journalism and media in Peru. Several sources emphasize that in this country most of the media are highly concentrated in a few conglomerates.<sup>2</sup> In this context, there are a small number of them dedicated to the production of science news.

This chapter initially describes the situation and the features that defines science journalism in Latin America. Next, the several limitations faced by this specialization in this region and the proposals designed for its development in this will be addressed. The chapter concludes with an overview of journalism culture in Peru and the media landscape, especially those reporting on science topics.

### **3.1. Status quo of science journalism**

The professionalization of science journalism in this region began in the sixties<sup>3</sup>. In 1962 the First Inter-American Seminar on Science Journalism was held in Santiago, Chile, with the support of the Organization of American States (OEA). This event focused on the teaching of this specialization. Three years later, the first course in science journalism was taught in Ecuador.<sup>4</sup> In 1969 two institutions were founded in this field: the Inter-American Center for

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<sup>1</sup> See Duran, Jorge (2010): *Algunas consideraciones sobre el periodismo científico en América Latina*, p. 6.

<sup>2</sup> See Reporters Without Borders (2019): Peru. See Freedom House (2015): Peru.

<sup>3</sup> See Ferrer Escalona (2002), p. 281.

<sup>4</sup> See Calvo Hernando, Manuel (1999): *El nuevo periodismo de la ciencia*. Quito: Ediciones Ciespal, p. 120. See Massarani et. al (2002), p. 74.

the Promotion of Educational and Scientific Material for the Press and the Ibero-American Association of Science Journalism.<sup>5</sup>

Two fields of science journalism become more relevant in Latin American because their issues affect their countries particularly. Health issues in this region are a priority due to its poor sanitary situation.<sup>6</sup> The contribution of this specialization is vital in this context to improve this unfavorable condition. In this discipline, it is essential to report on advances in the prevention and treatment of tropical diseases such as dengue fever or malaria, which are endemic in this region, or anemia.<sup>7</sup> This work can encourage governments to promote greater support for the eradication of these diseases.<sup>8</sup>

As important as health are environmental issues in the countries of this region. Deforestation in the Amazon rainforest —which extends through Brazil, Peru, Bolivia, Colombia, Venezuela and Ecuador— and the conservation of its biodiversity make it a central place to place to report on these matters. Between 2000 and 2005, around 4,7 million hectares of rainforest were lost in Latin America.<sup>9</sup> Science journalists are called upon to report on environmental problems and the violation of the laws in this field. They are responsible for raising an environmental awareness in the population.<sup>10</sup>

Compared to developed countries, science journalism in Latin America has been at a disadvantage.<sup>11</sup> Several authors share the same opinion about the limited situation of this specialization in the region.<sup>12</sup> Journalists face problems that affect the publication of science news. These limitations are related to educational, social and economic aspects, which shape the practice of science journalism in the region.

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<sup>5</sup> See Ferrer Escalona (2002), p. 28.

<sup>6</sup> See *ibid.*, p. 255.

<sup>7</sup> See Organización de las Naciones Unidas para la Alimentación/ Organización Panamericana de la Salud (2017): 2016: América Latina y el Caribe. Panorama de la seguridad alimentaria y nutricional. Sistemas alimentarios sostenibles para poner fin al hambre y la malnutrición, p. 97.

<sup>8</sup> See Vásquez Solís, Jennie (1998): Salud: buen negocio para los medios, p. 46.

<sup>9</sup> See Food and Agriculture Organization of the United Nations (2019): Sustainable forest management in Latin America and the Caribbean.

<sup>10</sup> See Ferrer Escalona (2002), p. 259.

<sup>11</sup> See Polino (2008), p. 46.

<sup>12</sup> See Ferrer Escalona (2002), p. 9. See Duran (2010), p. 6.

Among the main factors it is worth noting the lack of courses on its specialization in universities until the late nineties<sup>13</sup>, and currently some countries still do not have this training. This fact has a strong impact in different ways. First, the fact that there will be less specialized journalists who report on the latest discoveries in a comprehensible language, which is considered a problem in this region.<sup>14</sup> At the same time, this restriction hinders the work of reporters. How are they supposed to inform about these issues if they do not have a proper training in science journalism? This lack of expertise leads journalists to avoid reporting on science news because they do not feel prepared and are afraid of making mistakes<sup>15</sup>, or to learn it in practice without further help.

This lack of specialization is complemented by a lack of scientific education. Journalists do not have the basic knowledge —because they do not learn it in university— to understand a paper or other scientific publication.<sup>16</sup> This factor limits the access to one of the mainly sources in this field. The reporting of a science story is also restricted by language barriers.<sup>17</sup> Thousands of papers in journals are published in English. For some journalists it is difficult to read an academic text in this language.<sup>18</sup>

The space dedicated to science journalism in print media is considered another limiting factor in Latin America. The tendency in this region shows that few newspapers have a section or pages exclusively reporting on these topics.<sup>19</sup> This situation is related to an unfavorable reality. Media in Latin America are mostly not interested on this specialization.<sup>20</sup> What is the explanation for this indifference? The low or lack of incidence of these topics in the public opinion.<sup>21</sup>

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<sup>13</sup> See Ferrer Escalona (2002), p. 281.

<sup>14</sup> See Duran (2010), p. 6.

<sup>15</sup> See Portillo, Zoraida (2008): *Instituciones científicas y manejo de medios: el papel del comunicador científico*, p. 89.

<sup>16</sup> See Dellamea, Amalia Beatriz et. al (2000): *Evaluación de 24 cursos de divulgación científica y periodismo científico para graduados universitarios y terciarios en la Argentina (1986-1999)*. See Willer, Hildegard/ Takahashi, Bruno (2018): *The challenges for environmental reporting in Peru: coverage of small-scale mining in Peruvian newspapers*. Cham, CH: Palgrave Macmillan, p. 148.

<sup>17</sup> See Willer/ Takahashi (2018), p. 148.

<sup>18</sup> See Dellamea et. al (2000).

<sup>19</sup> See Duran (2010), p. 6.

<sup>20</sup> See Calvo Hernando (1999), p. 122.

<sup>21</sup> See Duran (2010), p. 6. See Calvo Hernando (1999), p. 44.

Another explanation for this disinterest is an economic factor. Mostly, newspapers do not have resources to cover local science news or send their journalists on field research.<sup>22</sup> This especially affects environmental reporting where it is essential to travel to the rainforest.<sup>23</sup> This restriction prevents the public from being informed about environmental problems or research conducted at a national level.

This lack of resources in newspapers has caused an interesting phenomenon in Latin America. Instead of covering local stories, the press tends to report on foreign scientific findings, especially from developed countries.<sup>24</sup> Why does this happen? Newspapers in this region reproduce news cables or stories from foreign media<sup>25</sup>, which is simpler and more affordable than sending a journalist to report. However, there is another factor that influences this decision. Journalists think that research done in developed countries is better than that conducted locally<sup>26</sup>, probably because it is perceived that peer review is more reliable in journals from First World countries.

Another factor that limits this specialization is the associations of science journalists. Not all Latin American countries have one<sup>27</sup> and the few that do exist are weak<sup>28</sup>. In the case of countries that do not have one, this prevents their participation in the World Federation of Science Journalists and its training courses and mentoring project. Currently, only Argentina, Chile, Brazil, Colombia, Mexico and Haiti are members of this organization.<sup>29</sup> This represents just six countries out of twenty that belong to the region.

The number of scientists can be considered a restriction on the development of science journalism in the region. According to the UNESCO Science Report, Latin America and the Caribbean represented 3,7 percent of the total number of researchers in the world in 2013.<sup>30</sup> This figure means a disadvantage because the fewer scientists there are, the lower the

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<sup>22</sup> See Duran, Jorge (2010), p. 6.

<sup>23</sup> See Willer/ Takahashi (2018), p. 148.

<sup>24</sup> See Massarani et. al (2007), p. 76.

<sup>25</sup> See *ibid.*, pg. 73.

<sup>26</sup> See *ibid.*, pg. 77.

<sup>27</sup> See Duran (2010), p. 6.

<sup>28</sup> See Román (2016)

<sup>29</sup> See World Federation of Science Journalists (2019b): Member associations.

<sup>30</sup> See United Nations Educational, Scientific and Cultural Organization (UNESCO) (2015): UNESCO Science Report: towards 2030 – Executive Summary. Paris: UNESCO Publishing, p. 14.

production of scientific studies. This is detrimental to this specialization that works primarily with research.

Regarding Latin American scientists, it has been pointed out that they “lack of a tradition interacting with mass media and giving interviews to the press. In North America, however, scientists promptly respond to request from journalists of any nationality”.<sup>31</sup> If the researcher does not collaborate with the journalists it hinders the production of science news. Not only scientists, but also research institutions, especially those in the public sector, make this task difficult. One of the problems these organizations face is that they do not have strategy for the dissemination of research.<sup>32</sup> This attribute is reinforced by another circumstance. The lack of specialized communicator in the press offices of these institutions who can cooperate with the science journalist.<sup>33</sup>

The work of reporters who cover environmental issues is limited for a reason that happen specifically in Latin America. The violence against journalists is one of the highest in the world.<sup>34</sup> For example, Barbara d’Achille, who is regarded as a pioneer of environmental journalism in Peru, was killed by the terrorist group Shining Path in 1989. This factor can influence the reporting in cases of illegal mining<sup>35</sup>, where the groups in charge of these activities want to avoid any information against their interests. For them, journalists are considered as a threat, as well as activists.<sup>36</sup>

### **3.2 Development of science journalism**

To address the limitations of science journalism in Latin America, initiatives and policies have been proposed to promote its development. Governments and institutions have understood the impact that it has on the popularization of the country’s scientific activity. The implementation of training in this field for journalists was considered necessary.

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<sup>31</sup> Massarani et. al (2007), p. 77.

<sup>32</sup> See Portillo (2008), p. 87.

<sup>33</sup> See *ibid.*

<sup>34</sup> See Takahashi, Bruno et. al (2018): Challenges in the reporting of environmental issues in Latin America and the Caribbean. Cham, CH: Palgrave Macmillan, p. 7.

<sup>35</sup> See Carrillo, Jimmy (2015): Agreden y roban equipos a periodista que cubría operaciones de minería ilegal.

<sup>36</sup> See Takahashi et. al (2018), p. 7.

Countries have incorporated of science popularization in educational projects.<sup>37</sup> As a result, the specialization has experienced a “significant growth”<sup>38</sup> since the mid-nineties.

One of the main initiatives that has strengthened it at the regional level is the inclusion of science journalism or science communication in the university curricula. According to Ferrer Escalona, undergraduate or master’s courses in this field were held in universities in Mexico, Colombia, Venezuela, Brazil, Argentina and Chile in 2000.<sup>39</sup> For example, the National Autonomous University of Mexico has a specialization in science communication within its postgraduate programs. However, this training is not only aimed at journalists. Scientists who are willing to report on their studies are participating in these courses<sup>40</sup> because they understood the relevance of making their work public to a wider audience.

Another factor that has stimulated the development of science journalism in Latin American is the creation of specialized online news organizations whose team is distributed in different countries of the region. In the twenty-first century, three such projects have been founded: N+1, Mongabay Latam and SciDev.Net. These media have contributed to this specialization in three ways. First, they have provided a space that traditional media could not to inform about science.<sup>41</sup> Second, they have encouraged the coverage of local news. Third, they provide material and organize internships so journalists can be trained in the reporting of scientific topics.<sup>42</sup>

The creation of regional networks that connect various institutions involved in the production of scientific production has support this specialization. One of the most influential is the Latin American and Caribbean Network for the Popularization of Science and Technology (RedPOP in Spanish), created in 1990 as an initiative request by UNESCO. Its objective is to generate a space for exchange and cooperation between institutions and programs

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<sup>37</sup> See Ferrer Escalona (2002), p. 252.

<sup>38</sup> Massarani et. al (2007), p. 71.

<sup>39</sup> See Ferrer Escalona., p. 282.

<sup>40</sup> See *ibid.*, pp. 246-247.

<sup>41</sup> See Massarani, Luisa (2015): Conferencia: Periodismo científico en América Latina: el caso de SciDev.Net.

<sup>42</sup> See SciDev.Net (2019): Guías prácticas. See N+1 (2019): Programa de Pasantías 2019 de N+1 para periodistas de habla hispana.

dedicated to science journalism or popularization.<sup>43</sup> It also organized a congress every two years and awards in this field.

Based on their realities, each Latin America country has developed its own projects to improve science journalism. Authors have suggested that it is fundamental, considering the situation of the country, to promote specific strategies.<sup>44</sup> Two of the most successful cases in this region are Chile and Colombia, according to a 2005 study about appropriation of science in the members of Convenio Andrés Bello.<sup>45,46</sup>

Since 1995, the Chilean government, through the National Commission for Scientific and Technological Research (CONICYT in Spanish), promotes a project designed to popularize science. The program Explora has among its objectives the dissemination of science and technology in children, teenagers and their teachers.<sup>47</sup> It coordinates science journalism workshops and competitions in schools around the country so that students have an early approach to this specialization. It also organizes meetings to discuss the relationship between the media and scientific dissemination such as “After Science” events.<sup>48</sup>

The case of Colombia is just as interesting as Chile. This country has demonstrated a greater development in public policies and strategies concerning science and technology.<sup>49</sup> Since the nineties, the work of the Administrative Department of Science, Technology and Innovations (Colciencias in Spanish) stands out. This institution has supported television and radio shows and print media that report on these issues.<sup>50</sup> Apart from this it participated in the creation of a specialized news agency called NOTICyT. This media not only contributed to the publication of more science stories in the media, but also served as a practical training for

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<sup>43</sup> See Red de Popularización de la Ciencia y la Tecnología en América Latina y el Caribe (2019): *Objetivos de la RedPOP*.

<sup>44</sup> See Bunge, Mario (1990): *La opinión pública y el desarrollo científico y técnico en una sociedad democrática*, p. 25. See López de la Roche, Fabio (1997): *Las ciencias sociales y la formación de comunicadores sociales*, p. 88.

<sup>45</sup> See Lozano, Mónica et. al (2016): *La apropiación social de la ciencia, la tecnología y la innovación (ASCTI): políticas y prácticas en Chile, Colombia, Ecuador y Perú*, pp.38-39.

<sup>46</sup> Convenio Andrés Bello is composed of twelve countries: Bolivia, Chile, Colombia, Cuba, Ecuador, Spain, Mexico, Panama, Paraguay, Peru, Dominican Republic and Venezuela.

<sup>47</sup> See Comisión Nacional de Investigación Científica y Tecnológica (2019): *¿Qué es Explora?*

<sup>48</sup> See Comisión Nacional de Investigación Científica y Tecnológica (2015): *“After Science” del PAR Explora Los Lagos*.

<sup>49</sup> See Lozano et. al (2016), p.31.

<sup>50</sup> See Fog, Lisbeth (2004): *El periodismo científico en Colombia, un lento despegue*, p. 62.



journalist on these topics.<sup>51</sup> The association of Colombian science journalists, created in 1996, has contributed to this improvement. It hosts seminars, conferences and workshops for reporters and researchers interested in this field.<sup>52</sup>

In contrast to these experiences, the development in this specialization in other Latin American countries has been smaller. Until 2005 some of them do not have strategies or programs to support science journalism or popularization. The study on Convenio Andrés Bello includes Peru, Bolivia, Venezuela, Paraguay and Cuba in this group.<sup>53</sup> All countries and their respective groups are shown in Table 3.1.

Table 3.1 Science and technology popularization system of members of Convenio Andrés Bello in 2005. Source: Lozano et. al (2016).

<b>Group</b>	<b>Characteristics</b>	<b>Countries</b>
1	<ul style="list-style-type: none"> <li>• There is a popularization policy linked to the national one.</li> <li>• Defined objectives and strategies.</li> <li>• Execution in national science and technology agencies with other actors.</li> <li>• Actors with capacity and expertise for program development.</li> </ul>	Spain and Chile
2	<ul style="list-style-type: none"> <li>• There is a legal framework.</li> <li>• Defined objectives and strategies.</li> <li>• There is no interrelation with other entities.</li> <li>• Privileges national science and technology agencies as executor.</li> <li>• Actors with capacity and expertise for program development.</li> </ul>	Colombia, Ecuador and Panamá
3	<ul style="list-style-type: none"> <li>• There is a legal framework.</li> <li>• No program, no objectives, no strategies.</li> <li>• Mechanisms and strategies included in science and technology policy.</li> <li>• Actors with the capacity and expertise to develop strategies.</li> </ul>	Venezuela and Cuba
4	<ul style="list-style-type: none"> <li>• Not covered.</li> <li>• There are no objectives.</li> <li>• Strategies are isolated efforts.</li> <li>• Actions carried out by NGOs or private and public entities</li> </ul>	Peru, Bolivia and Paraguay

<sup>51</sup> See *ibid.*, p. 63.

<sup>52</sup> See Asociación Colombiana de Periodismo Científico (2019): Formación.

<sup>53</sup> See Lozano et. al (2016), p.28.

### 3.3 Journalism in Peru

#### 3.3.1 Peruvian media market

Several authors and international organizations agree that the media market in the country reveals a high concentration.<sup>54</sup> This means that the ownership of these companies belongs to a few conglomerates, which constitutes an oligopoly. A research by the Media Monitor Ownership (MOM) proved that ten groups control the market and its different sectors (print, radio, television and digital).<sup>55</sup>

The conglomerate that holds the largest amount of media is El Comercio Group. According to the MOM research, its ownership includes 20 newspapers and magazines, 3 television channels and 17 websites.<sup>56</sup> This position gives it a commercial advantage over its competitors. The sum of the revenues of the remaining conglomerates does not reach that of El Comercio Group: its declared income in 2014-2015 was approximately 1.472 million soles compared to 1.138 million accumulated by the others.<sup>57</sup>

Regarding print media, Peru is characterized by contradicting a trend in journalism. Despite the global decline of newspapers, their national sales in this country increased 55 percent from 2007 to 2012.<sup>58</sup> Furthermore, Peruvians read newspapers the most in Latin America. A report by the Regional Center for the Promotion of Books in Latin and Caribbean found that the reading index of newspapers represented 71 percent of the population.<sup>59</sup> Coincidentally, the best-selling newspapers in Spanish language is published in Peru. The tabloid *Trome*, owned by El Comercio Group, sells 734 000 daily copies, an amount that surpasses the sales of Spain's *El País* or Argentina's *Clarín*.<sup>60</sup>

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<sup>54</sup> See Huamán Flores, Fernando/ Becerra-Gómez, Claudia (2014): Debate sobre la concentración de medios en el Perú: el caso de la fusión del Grupo El Comercio con el Grupo Epensa. Lima, p. 5. See Reporters Without Borders (2019). See Freedom House (2015).

<sup>55</sup> See Media Ownership Monitor (2016b): Concentration.

<sup>56</sup> See Media Ownership Monitor (2016c): Media companies.

<sup>57</sup> See *ibid*.

<sup>58</sup> See Empresa Editora El Comercio (2012): Contra todo pronóstico: prensa peruana rompe las tendencias. Lima: El Comercio, p.47.

<sup>59</sup> See Centro Regional para el Fomento del Libro en América Latina y el Caribe (2012): El libro en cifras. Boletín estadístico del libro en Iberoamérica, Bogotá: UNESCO, p. 12.

<sup>60</sup> See Mineo, Liz (2014): Best-Selling Newspaper. p. 38.

On the other hand, print media has the highest level of concentration of the four sectors. In 2012 the newspaper industry was mainly dominated by three conglomerates. El Comercio controlled 49 percent of the national sale of newspapers, while the share of Epena and La República were 29 and 17 percent respectively.<sup>61</sup> However, this picture changed the following year when El Comercio acquired 54 percent of Epena's shares. As a result of this transaction, El Comercio would handle 77,86 percent of newspaper market.<sup>62</sup>

In the case of radio, it remains relevant to the Peruvian audience. It is the media with the second highest penetration rate in the country with 91 percent.<sup>63</sup> Radio stands out because it is considered valuable concerning news. A study in 2017 found that people think it is the most trustworthy, pluralistic and neutral media.<sup>64</sup> The radio market is controlled by three conglomerates: RPP Group, CRP Medios y Entretenimiento and Corporación Universal. They handle 18 of 28 licensed frequencies in Lima, the country's capital.<sup>65</sup>

Television is the media with the highest consumption in Peru. A recent study highlighted that Peruvians spend about 10 hours a week watching free-to-air national television, three and eight hours more than radio and newspapers respectively.<sup>66</sup> Three channels concentrate a significant part of the television audience: América Television, Latina and ATV. Their broadcasting represents half of people who watch free-to-air.<sup>67</sup> Of particular interest is the case of America, which demonstrate the degree of media concentration. The channel with largest audience in Peru is mostly owned by El Comercio Group and to a lesser extent by La República Group.<sup>68</sup>

Digital media has experienced a development due to the increase in internet access in this decade. In 2016 the penetration of this service reached 66.5 percent of Peruvian household,

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<sup>61</sup> See Fernández Baca, Jorge (2014) Estudio de la estructura del mercado de la prensa escrita en el Perú. Lima: Centro de Investigación Universidad del Pacífico, p. 18.

<sup>62</sup> See La República (2013): El 78% del mercado de diarios quedaría en una sola mano con la compra de Epena por El Comercio.

<sup>63</sup> See Consejo Consultivo de Radio y Televisión (2017): Estudio Cuantitativo. Consumo Televisivo y Radial 2017, p.2.

<sup>64</sup> See *ibid.*, p.6.

<sup>65</sup> See Ministerio de Transporte y Comunicaciones (2019): Registro nacional de frecuencias.

<sup>66</sup> See Rojas Andía, Karen (2019): Ipsos: El 55% del tiempo de consumo aún ocurre en medios tradicionales.

<sup>67</sup> See Media Monitor Ownership (2016d): Television.

<sup>68</sup> See Media Monitor Ownership (2016a): América Tv.

compared to 19.8 percent in 2012.<sup>69</sup> Like the other industries, the online news market is highly concentrated. El Comercio Group owns 17 digital portals that generate a monthly web audience of 62.5 million visitors.<sup>70</sup>

Political Constitution of Peru has an article prohibiting media concentration. Article 61 explains that the State guarantees free competition and is opposed to the establishment of monopolies. With respect to the media, it states the following:

“Press, radio, television and other means of social expression and communication; and, in general, companies, goods and services related to freedom of expression and communication, may not be the object of exclusivity, monopoly or hoarding, directly or indirectly, by the State or individuals”.<sup>71</sup>

Besides this article, the Congress enacted in 2004 the Radio and Television Law, which established limits on media ownership based on the number of frequencies. If a conglomerate owns more than 20 percent of radios frequencies it is considered concentration, while in television this figure must exceed 30 percent.<sup>72</sup> Print media, by contrast, do not have any specific regulation on the maximum number of newspapers or the market share that an owner can have.

### **3.3.2 Journalism culture**

Although there are no previous studies on this topic in Peru, it is possible to partly assess its journalism culture based on journalism indices and media research. Both can provide insights into the “ideas and practice by which journalists legitimate their role in society”.<sup>73</sup> In the case of indices, they can evidence the relation between reporters and authorities, while media research is significant to examine the market orientation.

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<sup>69</sup> See Organismo Supervisor de Inversión Privada en Telecomunicaciones (2017): Los servicios de telecomunicaciones en los hogares peruanos. Encuesta residencial de Servicios de Telecomunicaciones (ERESTEL) 2016, p.4.

<sup>70</sup> See Media Monitor Ownership (2016b): Concentration.

<sup>71</sup> See Congreso de la República (2019): Constitución Política del Perú 1993. Lima: Edición Congreso de la República, p. 41.

<sup>72</sup> See El Peruano (2004): Ley de Radio y Televisión, p. 272519.

<sup>73</sup> Hanitzsch, Thomas (2007): Deconstructing journalism culture toward a universal theory, p. 369.

According to Hanitzsch, the concept of journalism culture is divided into three constituents: institutional roles, epistemologies and ethical ideologies.<sup>74</sup> In this case, the analysis will be limited to the institutional roles. This refers to journalism's "normative responsibilities and functional contributions to society".<sup>75</sup> Institutional roles are classified into three dimensions: interventionism, power distance and market orientation.<sup>76</sup> Each of these has two opposite poles that reveal a lesser or greater presence of certain factors.

Interventionism refers to the mission and values that journalists reflect in their work.<sup>77</sup> Based on this they can be classified into two types: the objective, impartial and disinterested transmitter of news or the socially committed reporter. In Peru, these two tendencies are present depending on the media. On press, radio and television media perceived themselves within the first mentioned approach.<sup>78</sup> However, the situation is different in digital media. Investigative journalism projects are covering issues they are committed to, especially those related to the environment.<sup>79</sup>

Power distance reflects the adherence of journalists to the government.<sup>80</sup> On the one hand there is journalism that is loyal to the regime, on the other hand there is journalism that challenges it. Peru's journalists have an adversary role because they report and expose cases of corruption in the government<sup>81</sup>, fulfilling its "watchdog" function. Due to this role, journalists and their media frequently are threatened and sued by politicians.<sup>82</sup>

Finally, market orientation refers to the "social focus that guides news production".<sup>83</sup> When this dimension is high, it means that journalism emphasizes on what the audience wants and ratings. On the contrary, it is low when public interest is the priority behind the news. In Peru, there is a tendency to high market orientation. Since the nineties, the *chicha* press has

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<sup>74</sup> See *ibid.*, p. 371.

<sup>75</sup> *Ibid*

<sup>76</sup> See *ibid.*

<sup>77</sup> See *ibid.*, p. 372.

<sup>78</sup> See Grupo El Comercio (2017): Principios rectores, p. 48. See Canal N (2016): Manual de estilo, p. 3. See Sociedad Nacional de Radio y Televisión (2019): Código de Ética.

<sup>79</sup> See Willer, Hildegard/ Takahashi, Bruno (2018), p. 148.

<sup>80</sup> See *ibid.*, p. 373.

<sup>81</sup> See Reporters Without Borders (2019).

<sup>82</sup> See Freedom House (2015).

<sup>83</sup> Hanitzsch(2007), p. 374.

prioritized showbiz news and talk shows.<sup>84</sup> For example, spaces where the market orientation was low has shifted to the other pole. Cultural news about literature or theater have been replaced by showbiz and gossip.<sup>85</sup>

### 3.3.3 Science reporting in Peruvian media

Science topics are currently covered in Peru in press, radio, television and online. Some of the initiatives and shows reporting on these issues were founded over the past five years. Mostly, these projects come from digital media.

In print media, *El Comercio* is the only newspaper that has a daily section dedicated to science. It was published in 1981 with the collaboration of science popularizer Tomás Unger.<sup>86</sup> However, the efforts of the newspaper to report on this topic dates to the beginning of the last century. By then Óscar Miró Quesada de la Guerra —known as Racso—wrote regularly articles about science.<sup>87</sup><sup>88</sup> *El Comercio* also covers these issues in its supplement *El Dominical*. Apart from these publications, the newspaper *La República* has the supplement *Domingo* where occasionally appear reports on innovation and technology.

Regarding the radio, the figure of the medical oncologist Elmer Huerta stands out for his dedication in covering health issues. Since 2007 he has two shows on Radio Programas del Perú (RPP) focused on this area: *Salud on RPP* and *Cuidando tu Salud*.<sup>89</sup> His involvement in the dissemination of these topics is not limited to this country. His programs are aired in Latin America and the United States.

Peruvian free-to-air television currently has only one science show. Channel IPe, which is run by the state, broadcasts *Ciencia en Esencia* since 2017.<sup>90</sup> The show, which already has

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<sup>84</sup> See Alonso, Paul (2016): *Peruvian infotainment: from Fujimori's media dictatorship to democracy's satire*, p. 212.

<sup>85</sup> See Atarama-Rojas, Tomás/ Rivera Ahumada, Karold (2017): *La banalización del periodismo cultural. Show mediático y contenidos culturales en la prensa escrita peruana*, pp. 100-101.

<sup>86</sup> See Ortiz (2011).

<sup>87</sup> See Unger, Tomás (2014): *La ciencia es para todos*.

<sup>88</sup> Even Albert Einstein congratulated him for the dissemination of his physics theories. This letter from 1939 proves it: <http://2.blogs.elcomercio.pe/huellasdigitales/wp-content/uploads/sites/137/2014/11/f120312CARTA-EINSTEIN.jpg>.

<sup>89</sup> See Comisión para la Promoción del Perú para la Exportación y el Turismo (2017): *Elmer Huerta*.

<sup>90</sup> See Instituto Nacional de Radio y Televisión del Perú (2017): *Ciencia en esencia*.

five seasons, reports on science and technology from an educational approach and includes interviews with national researchers.

Science journalism reporting has grown especially on digital media. The contribution of three online portals has been fundamental: SciDev.Net, N+1 and Mongabay Latam. Even though they are foreign initiatives, these organizations have journalist in Peru that reports on local science news. Two of them were founded in the last five years. In 2016 the portal specialized in science and technology N+1 and the environmental journalism platform Monagabay Latam were launched. Apart from these initiatives, the website of *El Comercio* has digital section for scientific issues and hosts science blogs.

This growth has also been stimulated by investigative journalism projects on the internet that have focused on environmental topics.<sup>91</sup> The portals Convoca and Ojo Público, both founded in 2014, are an example of this tendency. They have done extensive reports on the impact of mining and deforestation in the Peruvian rainforest. Some journalists who cover environmental topics on these platforms left their jobs in mainstream media due to the lack of support for its reporting.<sup>92</sup>

Science reporting in this country is also present on YouTube. In this platform, it is worth noting the case of the channel La Manzana Escéptica, hosted by the psychologist Víctor García-Belaunde. In each video, researchers from different fields explain scientific topics or question popular beliefs during an interview.

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<sup>91</sup> See Willer/ Takahashi, (2018), p. 149.

<sup>92</sup> See *ibid.*

## **Chapter 4: Methodology**

### **4.1 Research questions and hypotheses**

In order to understand science journalism reporting in Peru, three research questions have been developed. These are necessary to describe the strengths, challenges and opportunities in the production of science news in this country. The answers to these questions provide an insight into the tendencies that shape this specialization in the Peruvian case.

**Research question 1:** What is the status quo of science journalism in Peru?

**Hypothesis 1:** Science journalism in Peru has developed in the last five years, but still has weakness in comparison to other Latin American countries.

**Research question 2:** What are the strengths and challenges of science journalism reporting in Peru?

**Hypothesis 2:** There are more challenges than strengths in science journalism in Peru. Among the challenges are financial constraints and limited interaction between scientists and journalists.

**Research question 3:** How can science journalism reporting in Peru be improved in the future?

**Hypothesis 3:** The development of online science newsletters or news feeds in Peru could improve the reporting in the future.

### **4.2 Research approach**

#### **4.2.1 Qualitative content analysis**

In this research, a qualitative approach has been chosen to evaluate science journalism reporting in Peru. The main reason for selecting this approach is the chance of interpreting the perception of individuals who have knowledge on this topic. Qualitative methods, in comparison to quantitative, tends to explore subjects of study in their everyday context,



instead of reducing them to numerical values.<sup>170</sup> They allow a complex recount of their interactions and behaviour in a certain social setting.

Qualitative content analysis has been selected from several ways to analyze data. It interprets the manifest content of a text, but also the implicit ideas and themes.<sup>171</sup> Therefore, researchers are able to describe what lies between the lines. One of the strengths of this methodology is the interpretation process: the material is evaluated through a step by step analysis based on categories from theoretical research.<sup>172</sup>

Mayring has developed a model for qualitative content analysis that includes three forms of interpretation: summary, explication and structuring.<sup>173</sup> The summary consists on the reduction of the original text by reducing it into core aspects. The explication seeks a greater depth of understanding of the data according to additional information such as personal details about the interviewees. The structuring aims to select and assess relevant text components based on a given category system.

The content of the interviews has been analyzed following the summary, which involves three steps<sup>174</sup>. First, paraphrasing means to write in other words relevant sentences. Then comes the generalization whose function is to derive key ideas from the sentences of the previous step. Finally, repeated premises are discarded, and the remaining ones are grouped in the reduction.

#### **4.2.2 Interview guideline and category system**

Based on the research questions, an interview guideline for both journalists and scientists has been elaborated. The type of interview selected for this study is semi-standardized one, which is characterized by its flexibility during the dialogue. The order of the questions established on

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<sup>170</sup> See Flick, Uwe (2014): An introduction of qualitative research. Los Angeles: Sage, p.15.

<sup>171</sup> See *ibid.*, p.370.

<sup>172</sup> See Mayring, Philipp (2000): Qualitative content analysis, pp. 3-4.

<sup>173</sup> See Mayring, Philipp (2015): Qualitative Inhaltsanalyse: Grundlagen und Techniken. Weinheim and Basel: Beltz Verlag, p.67.

<sup>174</sup> See *ibid.*, p. 71.

the guideline should be followed, but there is certain freedom to include additional questions or digress spontaneously when the interviewer considers it appropriate.<sup>175</sup>

Flick emphasizes that the point of view of individuals tends to be expressed better in semi-standardized interviews than in standardized ones.<sup>176</sup> This can be reflected in the way the perception of the interviewee is deepened during the conversation. On the other hand, the possibility of deviating from the predetermined order of the questions can be helpful when participants refer to an angle, which the research had not previously considered.<sup>177</sup>

The interview guideline is divided into three categories, which derived from the research questions. The first one intends to describe the status quo of this specialization in Peru and its situation in a Latin American context. The following one focuses on the factors that support and limit science journalism reporting in this country, while the last one suggests future perspectives on this specialization. To analyze these categories the guideline includes fifteen questions that can be found in Appendix 1. It is worth noting that the guideline has been slightly modified in the case of some scientists. The term *science journalism reporting* is replaced by *science news production* because they may not be familiar with the first expression.

### **4.2.3 Sample selection**

Interview partners have been selected in the sample according to determined characteristics that made them relevant for this research. Subsequently, they have been classified in the following two groups: journalists and scientists.

To choose the journalists the first criterion has been to select one from each media that specializes or has a science section. In total, three of them cover this condition. Additionally, a staff writer who writes about technology and innovation in a media that does not meet the previous requirement has been included. In the case of freelancers, it is considered that their work has been published in newspapers, magazines or journals.

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<sup>175</sup> See Berg, Bruce L. (2009): *Qualitative research methods for the social science*, p. 109.

<sup>176</sup> See Flick (2014), p. 207.

<sup>177</sup> See Berg (2009), p. 109.

The participation of scientists in this research is essential because they are the main source in this specialization. Interviewees in this group were required to have a bachelor on nature, social or human science. It has also been considered that they have experience working or collaborating with mass media. Some of them have a blog or a podcast from which they report about science to a broader audience.

The number of relevant interviewees might be limited because science journalism is not popular specialization in Peru. For the purpose of this research, ten interviews were established as a representative amount. However, the final sample includes twelve interviews, which were conducted in second half of March 2019. All of them were carried out in-person, except one that was done via Skype because this person was preparing for a field research. The sample contemplates that half of it is composed by journalists and the other half by scientists. Of the total number of interviewees, six are men and six are women. A presentation of experts who collaborated in this study is presented in Appendix 2.

## Chapter 5: Presentation of results

This chapter shows the results of qualitative analysis of the twelve interviews about science journalism in Peru. First, a selection of answers from scientists and journalists to the survey questions is presented. This description is divided in three subchapters corresponding to the categories shown in Appendix 1. Then, the results are compared with the theoretical part. The aim of this task is to relate and explain the answers given by the interviewees with the literature.

### 5.1 Description of results

#### 5.1.1 Status quo of science journalism in Peru

Regarding the main tasks of science journalism, four tendencies can be observed. First, all interviewees mention the reporting on the latest advances in science to a general public. Some of them highlight a certain aspect of this task: an emphasis should be placed on the reporting of scientific findings made by Peruvian researchers. This fact is fundamental in this country because the population does not know the work of local scientists, even though they have been recognized abroad, as chemist Myra Flores states: “There is a Peruvian researcher who made a method for tuberculosis that is now applied all over the world. [...] She is from Cuzco and they are not aware of that. Why not also talk about that kind of thing?”<sup>1</sup>

A second task regarded as important for most of the interviewees —seven out of twelve— is the education of the public in science. Both journalists and scientists consider that Peruvians lack in science literacy. They do not handle basic scientific concepts and have a wrong impression about some of the advances, as geologist Patricio Valderrama explains: “People think they can look at the sky and see the Peruvian satellite standing there. People think they can see the traffic of Javier Prado street from Peru-SAT”.<sup>2</sup> Interviewees agree that it is necessary to explain how science works: its theories, methods and impact. Based on this knowledge, people are “going to be able to identify a pseudoscience and they're not going to be deceived”, points out psychologist Víctor García-Belaunde.<sup>3</sup>

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<sup>1</sup> Appendix 7, p. 139.

<sup>2</sup> Appendix 8, p. 152.

<sup>3</sup> Appendix 9, p. 154.

Mobilizing the public opinion, especially decision-makers, is considered by four interviewees as a main task. This is essential in this country because, according to journalist Zoraida Portillo, politicians and authorities “are always left out when these issues are discussed”.<sup>4</sup> Science journalism is seen as a channel —sometimes the only one— through which decision-makers can be informed of scientific advances that contribute to the development of the country and promote policies that support research.<sup>5</sup>

Showing the influence or benefits of science in everyday lives is seen by three interviewees as significant task. The aim is to explain the population that science is present in many aspects of their daily activities. Biologist David Castro thinks this specialization in Peru should show how scientific advances improves “the quality of life of people, especially those who have many needs here in the country”.<sup>6</sup>

Apart from these tasks, others are mentioned sporadically during the interviews. Within this group are the communication of risks, scrutinizing findings, being the connection between the scientists and the public and translating the complexity of science into a comprehensible language. The latter represents a special case because it is formulated as a main concern when explaining science.

Concerning the most reported science journalism topics in Peru, it becomes clear the relevance of health, which is mentioned by ten of the interviewees.<sup>7</sup> Bruno Ortiz, editor of science section of newspaper *El Comercio*, explains that the target audience of the print version —whose age is forty-five or older and have a high socioeconomic status— are interested in information about diseases such as Alzheimer, diabetes or cancer because they have the resources to pay for treatments.<sup>8</sup>

Environmental and ecology topics are considered most reported in Peru, according to half of the interviewees. They believed that the main reason behind this coverage are the several problems that the country faces in this respect. The impact of mining on the environment, the

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<sup>4</sup> Appendix 15, p. 190.

<sup>5</sup> Interviewee Modesto Montoya jokingly suggested that there should be a science journalist as a congressman to discuss these issues.

<sup>6</sup> Appendix 4, 124.

<sup>7</sup> It is important to mention that five interviewees referred to the work of Dr. Elmer Huerta in this field.

<sup>8</sup> Appendix 11, p. 165.

deforestation in the Amazon and the damage caused by climate change are some of issues addressed during the interviews. In the opinion of journalists Barbara Fraser and Hildegard Willer, the increasing relevance of these topics for Peruvian science journalism is evidenced by the work of investigative portals such as Convoca and Ojo Público.

Technology is identified by five interviewees as one of the most reported topics in the country. Among its areas, nanotechnology and artificial intelligence are mentioned. However, specific issues such the previous ones are not so covered in comparison to the reporting on electronic devices, according to Portillo.<sup>9</sup> Valderrama adds that doing a review of the last mobile phone is more reported because that interest everybody.<sup>10</sup>

Astronomy and natural phenomena are two topics that are most reported in Peruvian media: both are listed four times during the interviews. In the case of astronomy, there are two reasons why this discipline draws the attention of the public. First, when the news has an apocalyptic angle such as a meteorite approaching the Earth. “The user of the web in general, not only the user of *El Comercio* has an interest in knowing if we are going to die as a planet”, suggests Ortiz.<sup>11</sup> Second, events that do not happen often like the supermoon are covered because “these names so grandiloquent give them a halo of fear that attracts people”, explains this journalist.<sup>12</sup> Concerning natural phenomena, its relevance, according to interviewees, lies in the fact that Peru frequently is affected by earthquakes<sup>13</sup> and El Niño<sup>14</sup>, causing great misfortune. The public needs scientific information about these events to know the danger involved.

Surprisingly, along with scientific topics, pseudoscience news is regarded as one of the most reported in Peru and “is starting to grow”.<sup>15</sup> This opinion is shared by six of the interviewees. The pseudoscience topics that are mainly covered are related to health, such as antivaccination and homeopathy, or astrology. The impression of physicist Modesto Montoya is that pseudoscience videos in Peru are more popular than science ones.<sup>16</sup>

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<sup>9</sup> Appendix 15, p. 185.

<sup>10</sup> Appendix 8, p. 150.

<sup>11</sup> Appendix 11, p. 165.

<sup>12</sup> Appendix 11, p. 165.

<sup>13</sup> In 1970 an earthquake resulted in the death of 70000 people.

<sup>14</sup> A phenomenon responsible for the warming of water on the western coast of South America, which generates drastic climates changes.

<sup>15</sup> Appendix 11, p. 167.

<sup>16</sup> Appendix 6, p. 133.

One last note on this matter is a tendency that explains why some topics are more reported than others. According to Valderrama, the Peruvian public is more oriented to everyday and practical information. “Peruvians are not very interested, for example, in the discovery of a new genome or the Higgs boson. They are interested in knowing that heating your food in the microwave does not cause cancer, that telephone antennas are not carcinogenic”.<sup>17</sup>

In reference to the improvement of science journalism in Peru in the last five years, there are four contrasting opinions among the interviewees. The most extended perception—four out of twelve—is that it has been low and there is still much to be done. The emergence of online media reporting on science topics is credited as a factor for this improvement as Willer suggest. Another reason for this improvement is a greater awareness about “the existence of this specialization within journalism”, according to Portillo.<sup>18</sup> This happened as a result of COP20 conference, which was held in Peru in 2014. However, Portillo explains that it is still necessary to “talk to lecturers of the universities, of communication faculties and explain to them what science journalism is, what science communication means, because many do not know”.<sup>19</sup>

On the other hand, three interviewees consider that there have been some improvements in these five years. The argument to maintain this position is that the interest of the public in science has increased, explain Fraser and García-Belaunde. This interest has led to an increase in the presence of science in Peruvian media, observes Castro.

*El Comercio already has a daily page in the print version. It has also a science section on the website. [...] Channel 7 is also beginning to broadcast educational shows on science from other countries. In the radio are the always had a presence in health issues. Dr. Huerta has been in RPP for many years We have also seen the proliferation of online media about science such as N+1.*<sup>20</sup>

Castro highlights that due to this greater presence some scientific topics have become “more visible in recent years compared to what it was a decade or five years ago”.<sup>21</sup>

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<sup>17</sup> Appendix 8, p. 145.

<sup>18</sup> Appendix 15, p. 186.

<sup>19</sup> Appendix 15, p. 186.

<sup>20</sup> Appendix 4, p. 124-125.

<sup>21</sup> Appendix 4, p. 125.

Only two interviewees believe that this improvement has been considerable in the last five years. In the case of Valderrama, he sees a positive change in the coverage since El Niño in 2017. Before this event, Peruvian media make mistakes in the reporting of natural phenomena, for example informing about “a four-degree Richter earthquake. They're not degrees, they're not Richter”.<sup>22</sup> During El Niño, journalists approached him to understand the distinction between different natural disasters—for example a flood and a huaico<sup>23</sup>— and started to work with the term magnitude instead of degree. Valderrama considers this a great progress, which was later reinforced when an editor contacted him to train his journalists on natural disaster coverage.<sup>24</sup> For journalist Víctor Román, this improvement is related to the number of reporters and popularizers dedicated to science journalism.<sup>25</sup> Compared to five years ago it has increased to such an extent that it has been considered to form an association.



Figure 5.1: News headline from August 15, 2016 about an earthquake where the word degrees (grados in Spanish) appears. Source: Radio Programas del Perú (RPP).



Figure 5.2: News headline from May 26, 2019 about an earthquake where the word magnitude (magnitud in Spanish) appears. Source: Radio Programas del Perú (RPP).

<sup>22</sup> Appendix 8, p. 145.

<sup>23</sup> Quechua term that refers to a mudflow caused by strong rains.

<sup>24</sup> Appendix 8, p. 146.

<sup>25</sup> Appendix 14, p. 181.



A final group is composed of three interviewees who considered that science journalism in Peru remains the same as it was five years ago. One of them mentions that in this time span there “there has been a stabilization. The big leap occurred in the nineties”.<sup>26</sup> The other two point out that the absence of new media dedicated to this specialization evidences a lack of improvement.

About science journalism in Peru in the Latin American context, all journalists and scientists agree that it is not developed as in other countries, that it still in its infancy. The opinions of the interviewees differ a little when assessing Peru’s place in the region based on its improvement in this specialization.

Half of the interviewees mentions, at least more than once, that one of the following countries are above Peru regarding the development of science journalism: Argentina, Chile, Colombia and Mexico. In the case of Chile and Colombia, Castro and Flores stress the promotion of science popularization by governmental bodies that invest more money than CONCYTEC. Additionally, “CONCYTEC has very little money with respect to what other countries have”, states Montoya.<sup>27</sup> Castro and Ortiz consider that Colombia is characterized by its excellent science journalists and by the number of media that cover scientific topics, especially the newspaper *El Tiempo*.

Which countries are behind Peru in the development of science journalism? Castro thinks that this country surpasses Ecuador and Venezuela because “we don’t hear much about the dissemination of science in these countries”.<sup>28</sup> Román has the impression that Bolivia, Ecuador and Uruguay are behind Peru in this aspect since he could not remember science popularizers who come from these countries.<sup>29</sup>

A third point of view considers that Peru is in the last places in the region in terms of the development of science journalism. Two interviewees share this unfavorable opinion. Portillo comments that she realized this in a recent Latin American meeting of science journalists in Panama. “There it became very clear that in South America there is a division of countries. Ecuador, Bolivia and Peru are at the same level of science journalism: almost zero.”<sup>30</sup>

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<sup>26</sup> Appendix 6, p. 134.

<sup>27</sup> Appendix 6, p. 135.

<sup>28</sup> Appendix 4, p. 125.

<sup>29</sup> Appendix 14, p. 181.

<sup>30</sup> Appendix 15, p. 186.

### 5.1.2 Strengths and challenges in science journalism reporting

In reference to the factors that support the reporting of science journalism in Peru, there is a variety of answers where no strong tendencies are found. Two interviewees point out that the geographical and ecological diversity of the country—which is one the most biologically diverse in the world<sup>31</sup>—represents an advantage. “With such a rough geography, and if we see it in the light of climate change, you have enormous possibilities of covering different topics that are not just environmental issues”, explains journalist Zoraida Portillo.<sup>32</sup>

Social media is also considered by three interviewees as a supporting factor. For geologist Patricio Valderrama these have allowed scientists to express their opinion to a wider audience.<sup>33</sup> For example, his Twitter account “has become a reference in the subject of prevention and phenomena of nature”.<sup>34</sup> In his opinion, social media are generating a positive effects in the Peruvian case. These spaces have encouraged scientists to transcend the academic circle and have an impact on the public. Their participation in these spaces facilitates the dissemination of scientific information, such as biologist David Castro explains: “Nowadays it's quite easy to go deeper into a subject and get the same source that wrote the article to explain to you and go beyond what the paper says”.<sup>35</sup>

For two interviewees, the curiosity or the interest of the person reporting scientific topics is perceived as a supporting factor. Journalist Bruno Ortiz thinks that curiosity can partly compensate the lack of training in science journalism that exists in Peru. “While curiosity is a key aspect to journalism, being more curious about science journalism will lead you to understand the issues”.<sup>36</sup> Journalist Milagros Berríos believes that interest is fundamental in reporting. This factor works especially when one is interested “as a reader, as a public to know a little more about these subjects”.<sup>37</sup>

In the opinion of physicist Modesto Montoya, the implementation of a specific law has collaborated in the reporting of science journalism in Peru. The supreme decree N.º119-2017-

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<sup>31</sup> Programa de las Naciones Unidas para el Desarrollo (PNUD) (2010): América Latina y el Caribe: una superpotencia de biodiversidad, p.4.

<sup>32</sup> Appendix 15, p. 186.

<sup>33</sup> Appendix 8, p. 146.

<sup>34</sup> Appendix 8, p. 153.

<sup>35</sup> Appendix 4, p. 146.

<sup>36</sup> Appendix 11, p. 167.

<sup>37</sup> Appendix 13, p. 177.

EF states that lecturers in public universities will receive a bonus of 3.504 soles —around 1000 dollars— to conduct research.<sup>38</sup> According to Montoya this increase “has motivated scientists to carry out research”.<sup>39</sup>

Regarding the sources to find science news, seven interviewees mention the journals, especially *Nature* and *Science*. However, just one interviewee mentions having a subscription to these two journals. On the other hand, science magazines —*Skeptic* and *Technology Review*— are referred two times.

Four interviewees reply that agencies, universities and research centers are a source in this case. Some of them emphasize on the websites of these institutions. One case to highlight within this group is CONCYTEC, the governmental body in charge of the field of science, technology and innovation. On its website, it is possible to find scientific projects that have won funds, which represents an alternative when searching for science news. “CONCYTEC has a communications office and has the database of all the researchers in Peru. It would be easy to call CONCYTEC: “Look, you're going to see this phenomenon. Recommend me to a scientist who can tell me about this”, explains chemist Myra Flores.<sup>40</sup>

Three different types of sources for a science story are mentioned three times by interviewees. The first are newsletters, news feeds or online digests. Ortiz comments that the science department is subscribed to EurekaAlerts! since five years ago: however, it was not a newspaper initiative.<sup>41</sup> Journalist Barbara Fraser states that she gets notifications through this same service and reads daily four digest.<sup>42</sup> A second source are conferences, where scientists can present a new research project or the journalist can interview them. Third, comes the news that is published in Spanish language newspapers such as Spain’s *El País* or Colombia’s *El Tiempo*. On this latter case, two interviewees indicate that media often just reproduce their publications.

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<sup>38</sup> El Peruano (2017): Decreto Supremo Ley N.º 119-2017-EF, p. 23.

<sup>39</sup> Appendix 6, p. 135.

<sup>40</sup> Appendix 7, p. 140.

<sup>41</sup> Appendix 11, p. 167.

<sup>42</sup> Appendix 10, p. 162.

Apart from these sources, others are mentioned during the interviews. These include science blogs, Facebook<sup>43</sup>, news agencies, NatGeo, friends or keeping track of scientists that one has already worked with.

In reference to how reachable sources are, papers are considered by three interviewees to be not accessible. This is mainly due to the high price of these publications, even for the media with more resources in Peru. Valderrama explains that this constrains leads to reproduce cable news or news from other newspapers.<sup>44</sup> This copy and paste dynamic, which avoids reading the paper, can have a serious consequence on science journalism reporting. Valderrama remembers a case that illustrates his problem:

*I think a couple of years ago, a news said that sausages were carcinogenic—which is not true—and was shared everywhere. Even a supermarket stopped selling these products. What happened? That news originally came out in The Intellectualist, which is a scientific online newspaper in which I have written several times, and it said that a recent study had concluded that if you eat kilos and kilos of ham, your risk of having cancer increases by 15 percent. They translated it and in the Spanish translation it appeared as ‘Sausages increase the risk of having cancer’. This is how it was published in Spain’s El País. Here in El Comercio it appeared as ‘Eating sausages gives cancer’.*<sup>45</sup>

This situation has worsened as a result of another factor. A few years ago, CONCYTEC provided a database with papers for everyone who registered in it. However, according to biologist Gisella Orjeda, who promoted this database as the former director of this institution, states that the access to it is now restricted.<sup>46</sup>

This inaccessibility can be partly overcome in two ways. The first one is to access the papers through platforms such as Sci-Hub, where they can be illegally downloaded for free. The second alternative is to ask the scientists to share the study. For Castro, this issue has become simpler because researchers have Twitter or Facebook accounts. “I have tried many times to

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<sup>43</sup> Interviewee Milagros Berríos recounts that she found a video about an innovation in this platform.

<sup>44</sup> Appendix 8, p. 148-149.

<sup>45</sup> Appendix 8, p. 148.

<sup>46</sup> Appendix 5, p. 131.

ask questions directly by direct message and they answer you”.<sup>47</sup> However, this option may be limited depending on the fame of the author, as Valderrama points out: “If it's Stephen Hawking and others, [...] they're not going to answer”.<sup>48</sup> According to psychologist Víctor García-Belaunde, in case the reporter could not obtain the paper, there are equivalent sources that are reachable on the internet.<sup>49</sup>

Regarding scientists, eight interviewees comment that they are reachable. However, four indicate that mostly apply to foreign scientists. One of the reasons for this perception lies in the idea that these researchers are aware of the relevance of dissemination their work. “In the United States and Russia, the scientist understands that divulging is important”, comments journalist Victor Román.<sup>50</sup> This also depends on the journalists being able to speak English in order to interview them. However, this situation changes with respect to national researchers. In the opinion of Portillo, “the Peruvian scientists is not very accustomed to talking to the press about his research. He is very suspicious”.<sup>51</sup> This feature makes them more difficult to reach, but this problem is exacerbated by the role of research centers in Peru.

Two interviewees highlight the obstacles that these institutions represent in contacting scientists who work there. Ortiz recounts an experience that evidences the impossibility of accessing these sources. “For example, here you call university X. ‘I need to contact a researcher’. ‘Look, I just got to university and it turns out that the spokesperson isn't there.’ ‘But won't there be another specialist?’ ‘No.’ ‘When does the spokesperson come back?’ ‘In two weeks.’”.<sup>52</sup> This case reflects the lack of specialized communicators in these institutions who can collaborate with journalists. Flores comments that this problem occurs because communicators “are already on the field [...], but nobody taught them to approach these topics from the science side and they have to learn for themselves”.<sup>53</sup> A similar situation can be found in government agencies and departments. In the case of journalist Hildegard Willer,

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<sup>47</sup> Appendix 4, p. 126.

<sup>48</sup> Appendix 8, p. 149.

<sup>49</sup> Appendix 9, p. 156.

<sup>50</sup> Appendix 14, p. 183.

<sup>51</sup> Appendix 15, p. 187.

<sup>52</sup> Appendix 11, p. 168.

<sup>53</sup> Appendix 15, p. 187.

it took her thousands of calls and WhatsApp messages to get an authorization of the Ministry of Health for a doctor to make a statement.<sup>54</sup>

The situation is different with foreign institutions for several reasons, states Ortiz. First, scientists and press offices from foreign countries answer the same day or the day after. For example, his colleague wrote to a company that produces artificial meat. “We emailed it. They answered us within three hours. ‘At the moment we are not giving interviews, but we have this information available’”, recounts Ortiz<sup>55</sup> Second, there is more information available to the visitor on their websites and finding it is not complicated. Third, journalists can find in the press releases the contact information of the scientist or the institution.

Another source that is considered problematic in its accessibility are scientific data from governmental agencies. Three interviewees mention this fact, and two of them had experiences dealing with this constraint. Obtaining information through their portals is difficult because is not often easily located. In that case, the journalist must ask the agency for the data. However, this procedure does not guarantee that the information will be obtained, as Berríos comments: “There are times in which I have not been given anything. Others have left me waiting, but in the end, they have given them to me. And in other cases, there is a lack of figures”.<sup>56</sup>

Concerning the collaboration between journalists and scientists in Peru, half of the interviewees considers it complicated. In the case of scientists, the main reason behind this answer is that they do not like how journalists approach science. Orjeda indicates that “journalists do not understand anything. We tell them one thing and they take it to fantasy”.<sup>57</sup> For Castro, the perception is that journalists often report on science “in a very superficial way, very simplified, very banal. The most banal part of the article is the one they magnify”.<sup>58</sup> Chemist Myra Flores explains that there is a conflict between the journalists who wants an entertaining story and some scientists who speak in a very technical way.<sup>59</sup> Portillo points

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<sup>54</sup> Appendix 12, p. 173.

<sup>55</sup> Appendix 11, p. 168.

<sup>56</sup> Appendix 13, p. 182.

<sup>57</sup> Appendix 5, p. 131.

<sup>58</sup> Appendix 4, p. 127.

<sup>59</sup> Appendix 7, p. 141.

out that another reason why scientists regard as complicated their relationship with journalists is because reporters often do not prepare for interviews.<sup>60</sup>

From the side of journalists, their criticism is directed at the scientists' lack of knowledge about how media work. Based on his experience, Ortiz believes that scientists do not know to deal with breaking stories. "They are not used to it, sometimes you need to get something for tomorrow or the day after tomorrow and they say 'Great, next week we will talk'".<sup>61</sup> According to Portillo, one of the problems lies in the perception of scientists, who believe that journalists are going to publish everything they have said.<sup>62</sup> This latter leads scientists to feel they have been misquoted or deceived when they read the news and prefer not to collaborate with the journalists again. In this process, scientists "go from being an almost inaccessible source to being a fairly accessible source and then become inaccessible again because of these problems", describes Portillo.<sup>63</sup> Three interviewees refer that the attitude of some scientists who tend to look down on journalists can be another factor for this complicated relationship. For example, when scientists "tend to simplify things they assume or believe that they are lowering their level so to speak", explains Castro.<sup>64</sup> However, it seems that this situation is changing because younger researchers are more interested on collaborate with journalists, according to Castro and Fraser.

The other half of the interviewees mentions that the relationship between journalists and scientists is good, in spite of the problems that can occur during or after the reporting. Fraser comments that "scientists are happy to have journalists writing about their work".<sup>65</sup> Some of them even invited her to the field research. For Román and Berríos this good relationship is reflected in the fact that researchers are always willing to resolve their doubts or repeat something they have not understood.

A special case is the collaboration between scientists from governmental agencies and journalists. According to Valderrama, this tends to be better depending on the popularity of

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<sup>60</sup> Appendix 15, p. 188.

<sup>61</sup> Appendix 11, p. 167.

<sup>62</sup> Appendix 15, p.187.

<sup>63</sup> Appendix 15, p. 187.

<sup>64</sup> Appendix 5, p. 127.

<sup>65</sup> Appendix 10, p. 163.

the reporter or the media for which they work. “You go, as a journalist, to Senamhi.<sup>66</sup> and ask for an interview. They send you to the meteorologist on duty, who is probably a junior. He's just as scared or more scared than you are. [...] Since the boy is just beginning, he looks for complicated words”.<sup>67</sup> In this case the relationship is not the best because the interview is a disaster. However, if one is a recognized journalist or works in a mainstream media, the interviewee may be the director of the institution and the interview will be more fluid.

Among the main concerns when explaining science, the understanding of scientific topics and language by a lay audience is considered by seven interviewees. In the case of scientists, this concern arises because they “are trained to speak in difficult terms because our world is full of complex words”, explains Valderrama.<sup>68</sup> However, explaining a complex issue in a simple way can involve a risk. For Castro, there is a fear of simplifying too much and generate a misunderstanding in the reader. “It is a risk that always frightens me: to what extent to simplify a story but not lose its essence and rigor”.<sup>69</sup> The prevalence of one of these factors over the other can be detrimental as Castro explains:

*If you make it very rigorous, very technical finally it can be a good article. But if nobody reads it, it does not fulfill its objective that is to communicate and to transmit a knowledge. If you make it very simple you can gain a wider audience, but few will grasp the final essence of the study that has been carried out”.<sup>70</sup>*

This interviewee perceives that another concern related to the simplification process is to “use analogies that I'm often afraid people will take it too literally. That can lead to confusion instead of better explaining a subject”.<sup>71</sup> For journalists, their general concern is that the story can be understood by an average reader.

Seven interviewees admit that one of their concerns are the sources. It is stressed the aim to find the most suitable source for one to be informed about a scientific issue. “I want to inform myself and I search for the right person to come and explain it to me”, comments García-

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<sup>66</sup> Governmental agency responsible for providing weather, hydrology and meteorology reports.

<sup>67</sup> Appendix 8, p. 147.

<sup>68</sup> Appendix 8, p. 146.

<sup>69</sup> Appendix 4, p. 127.

<sup>70</sup> Appendix 4, p. 127.

<sup>71</sup> Appendix 4, p. 127.



Belaunde.<sup>72</sup> In this way, he can obtain a deeper knowledge of the subject and “help others to understand the subject”.<sup>73</sup> For Portillo, a concern is to present diversity of sources. “We don’t just have to accept what a scientist told us. We always have to contrast other sources”.<sup>74</sup> Berríos share this point of view and indicates that “the mistake that many journalists make is that we are left with only one source, with what the scientist says”.<sup>75</sup> Four experts mentioned that reading the paper or interviewing the author of the research is a concern.

Another concern for five interviewees is that the topic draws the attention of the reader or audience. Fraser states that “it is not enough to have research; you need to be sure that is going to hold your reader interest”.<sup>76</sup> Interest can be achieved by surprising the reader. “In the press, that within the first two paragraphs there is something the reader can relate to”, Román comments.<sup>77</sup> To hook the attention of readers seems complicated because there is a contradiction between journalism and science, according to Willer. “Science doesn't look for a story and maybe in journalism we look too much for a story”.<sup>78</sup>

Reporting on a scientific advance that is relevant to the reader is a concern for four interviewees. Willer thinks that this should be considered because “lot of people, at least when I was in university, had the impression that there was a lot of research that they didn't know if anyone was interested in”.<sup>79</sup> In the opinion of Portillo, it is essential to understand why a topic should be addressed.<sup>80</sup>

Regarding how the economic factor influences science journalism reporting in Peru, seven interviewees mention that this represents a limitation if field research is to be done. Sometimes research is conduct outside Lima, the country’s capital so it is necessary for journalists to travel for few days or even a week. However, Peruvian media do not have budget for expenses. “That kind of investigations where you spend a week, two weeks in the community don't even try it. No media finances that”, warns Willer.<sup>81</sup> Ortiz indicates that if

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<sup>72</sup> Appendix 9, p. 160.

<sup>73</sup> Appendix 9, p. 160.

<sup>74</sup> Appendix 15, p. 188.

<sup>75</sup> Appendix 13, p. 180.

<sup>76</sup> Appendix 10, p. 163.

<sup>77</sup> Appendix 14, p. 183.

<sup>78</sup> Appendix 12, p. 174.

<sup>79</sup> Appendix 12, p. 174.

<sup>80</sup> Appendix 15, p. 188.

<sup>81</sup> Appendix 12, p. 174.

he asked for travel expenses the editor in chief would tell him: “Great. Do not do it or just make a phone call”.<sup>82</sup>

A research on calf cloning in Chachapoyas, a city more than one thousand kilometers from Lima, mentioned by Berríos and Ortiz evidences this limitation. Berríos recounts that she had coordinated the arrangements to travel and cover the story, but “when the newspaper was going to buy the tickets for us, they told us: ‘We can't afford it’”.<sup>83</sup> A different situation occurred in the media of Ortiz. A journalist from another section traveled there during his vacation and reported on the case, but he paid all his expenses.<sup>84</sup>

The economic factor influences when it is considered that reporting science is not profitable in Peru, an aspect that is commented by three interviewees. For García-Belaunde, science journalism has a small audience, which makes it unattractive for media.<sup>85</sup> This represents a disadvantage to science news in comparison with others. This situation is reflected in the experience of Valderrama: “I have had several interviews cancelled. I was waiting for the journalist, who was on his way, and a reality girl broke a nail and they went to cover that and they didn't come to interview me anymore”.<sup>86</sup> Freelance reporters are especially limited by this problem, suggests Castro. “It's quite complicated because it's very difficult to write a report of 2000 words, and that a media is interested in buying it”.<sup>87</sup>

If a journalist wants to study a specialization in science journalism, the economic factor is decisive. Since there are no such courses in Peru, journalists must travel and spend on this training. This is more complicated, according to Valderrama, if the journalist has “to move to a country to do a two-week course and come back”.<sup>88</sup> Fraser shares a similar opinion on this limitation: “I think it is harder to study and specialize, it is probably more difficult to do that because of cost”.<sup>89</sup>

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<sup>82</sup> Appendix 11, p. 168.

<sup>83</sup> Appendix 13, p. 178.

<sup>84</sup> Appendix 11, p. 168.

<sup>85</sup> Appendix 9, p. 158.

<sup>86</sup> Appendix 8, p. 149.

<sup>87</sup> Appendix 4, p. 128.

<sup>88</sup> Appendix 8, p. 145.

<sup>89</sup> Appendix 10, p. 161.

Two interviewees comment that the economic factor influences because with more resources it would be possible to tell stories in a more engaging way. Flores confirms this idea based on her experience in a science television show as part of the research team. Once she wanted to explain a scientific issue with animations; however, the suggestion was discarded because the cost was very high.<sup>90</sup> Román thinks that with more resources, media could develop narrative stories that would hook more public.<sup>91</sup>

This lack of economic support opens the possibility that other institutions may pay journalists to cover a research that they are interested to make public. “There are people in these big corporations who pay, if not with money, it could be with products or travel so that their news appears in the media. And not only that they appear, but that they appear well, so that good propaganda can be made for them”.<sup>92</sup> In this way, a science journalist becomes a marketing tool for industries. An anecdote from Portillo examines this concern in depth. She worked for a research institution that often paid for the travel expenses of journalists because it was aware that media did not have a budget for a field trip. Once foreign reporters talked to her about this issue: “We cannot accept that the institution pay us or we will only accept that it pay us the hotel”. They also express that the payment “does not mean that I am going to publish what you want. I'm going to look for my own sources”, recounts Portillo.<sup>93</sup>

Among other factors that restrict science journalism reporting in Peru, educational, cultural and organizational issues are mentioned by the interviewees. Half of the interviewees considers the lack of specialization on science journalism or science communication in Peru a limiting factor. This affects both journalists and scientists. In the case of the latter, this is fundamental because they are not taught how to disseminate science to a lay audience. “No matter how willing the researcher may be to transmit his knowledge to a journalist, if I don't take this science communication course it won't be easy to explain to this journalist what his work consists of”, explains Castro.<sup>94</sup> On the other hand, this lack of specialization affects journalists since they do not have “knowledge of sources, but also knowledge of slang”, states

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<sup>90</sup> Appendix 7, p. 141.

<sup>91</sup> Appendix 14, p. 183.

<sup>92</sup> Appendix 15, p. 189.

<sup>93</sup> Appendix 15, p. 189.

<sup>94</sup> Appendix 4, p. 128.

Ortiz.<sup>95</sup> This problem becomes more complicated for journalists considering that media are not interested in this specialization. “It was next to impossible for journalists to specialize and in certain field it was difficult for them to get their bosses to be interested in these topics. I think the same is true for science journalism, even worse so”, comments Fraser.<sup>96</sup>

Another limiting factor identified by three interviewees is that science news is published in other sections. They are portrayed in “international, crazy world or in sections such as miscellaneous”, describes Ortiz.<sup>97</sup> The same impression has Berríos, who states that science news is published “the local section, in the international section, in society”.<sup>98</sup> The fact that science news is published on another page forces other stories to be discarded, and stories that are finally published have to share the page with others.

Science illiteracy is seen as a limiting factor for three interviewees. Flores considers that Peru’s “low cultural level in science”<sup>99</sup> represents a constraint. According to Flores and Montoya, the lack of interest in science is a consequence of the fact that Peruvians do not understand these issues. García-Belaunde thinks that science illiteracy is reinforced because “there is still no idea in Peru that science is going to take us forward”.<sup>100</sup>

The ignorance of editors about scientific issues is regarded as a limiting factor for three interviewees. Editors believe “this kind of news isn't going to attract people for reading”, states Orjeda.<sup>101</sup> For Portillo, the editor pays little attention to these issues and thus minimizes them.<sup>102</sup> On the other hand, they do not consider that science topics are complex and need more time. This aspect is discussed by Valderrama who comments that writing a science story “takes two weeks or three weeks for three thousand characters”.<sup>103</sup>

A limiting factor related to the previous one is the language of the sources, which is mentioned by three interviewees. “You have to consult several sources, many of those

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<sup>95</sup> Appendix 11, p. 169.

<sup>96</sup> Appendix 10, p. 162.

<sup>97</sup> Appendix 11, p. 169.

<sup>98</sup> Appendix 13, p. 176.

<sup>99</sup> Appendix 7, p. 142.

<sup>100</sup> Appendix 9, p. 155.

<sup>101</sup> Appendix 5, p. 125.

<sup>102</sup> Appendix 15, p. 190.

<sup>103</sup> Appendix 8, p. 144.

sources are in a foreign language, mainly English”, describes Valderrama.<sup>104</sup> Journalists need to translate them, and this task causes science journalism reporting take longer. They must guarantee that they have already understood the study and be careful of the technical words.

The lack of experts on certain fields is another limiting factor which is mentioned by two interviewees. If the journalist wants to work on a health news in Peru, it will not be difficult to find an expert. However, if the journalist wants to write about “a type of binary star, or a new material, you're not going to have many sources”, explains Román. This problem is aggravated, according to Valderrama, because it is more complicated that one of these experts wants to talk to a journalist.<sup>105</sup> This limitation has three consequences on reporting. First, it reduces the number of topics that can be covered. Second, the lack of experts leads journalists to search for another scientists who is not specialized in the subject, especially popular ones. Flores describes the case of Modesto Montoya: “I've seen that journalists called him; they still think that the scientist is like a genius who knows everything. Earthquake, Modesto Montoya. Biology, Modesto Montoya. Botany, Modesto Montoya”.<sup>106</sup> However, there is a greater risk which is contacting the wrong source –for example a seer— in the absence of a specialist in the field, comments Valderrama.<sup>107</sup>

The limited scientific research in Peru is a constraining factor in the opinion of two interviewees. “There is little science journalism because there is also little scientific production”, explains Willer.<sup>108</sup> This factor is reinforced by the lack of technological industry in this country. Román states that “in innovation we are still in our infancy”<sup>109</sup>, which can reduce science news. Willer comments that she has colleagues in Germany who often write about virtual reality.<sup>110</sup>

The lack of an organization of people interested in science journalism or science communication is regarded as another limiting factor. This problem prevents Peru to be part of the World Federation of Science Journalists, points out Portillo.<sup>111</sup> On the other hand,

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<sup>104</sup> Appendix 8, p. 150.

<sup>105</sup> Appendix 8, p. 150.

<sup>106</sup> Appendix 7, p. 142.

<sup>107</sup> Appendix 8, p. 150.

<sup>108</sup> Appendix 12, p. 172.

<sup>109</sup> Appendix 14, p. 182.

<sup>110</sup> Appendix 12, p. 175.

<sup>111</sup> Appendix 15, p. 191.

García-Belaunde thinks that this fact prevents the development of a media coalition that can expose pseudoscience cases.<sup>112</sup>

A final limiting factor considered by one interviewee is self-censorship from journalists who cover these issues. This self-censorship is not caused by a single reason, but is a sum of several, explains Portillo.<sup>113</sup> First, the reporter censors himself because he does not have a scientific culture to understand these issues. Second, the lack of specialization in science journalism only reinforces this feeling. Finally, the lack of interest from the editor, who may reject the story, convinces the reporter to censor himself.

### **5.1.3 Future perspectives in science journalism reporting**

Regarding the factors that could enhance science journalism reporting in Peru in the future, it can be observed that training is a central issue for most interviewees. Eight of them mention the need to implement courses at universities for both journalists and scientists. In the case of scientists, this training can help them to interact with media and master a way to explain to research easily. “When I've started to get a little involved in journalism, all those courses I've taken, you realize that this is a bubble in which scientists live”, affirms biologist David Castro.<sup>114</sup> For journalists, Castro thinks that the training would promote the learning of basic science concepts so that they can better understand them when talking with a researcher.<sup>115</sup> In the case of reporters, journalist Milagros Berríos attended some talks of the Gabriel García Márquez Fellowship about health and considers training helpful. “You talk about health subjects, how to report on them, you share experiences with colleagues, you meet sources, you see different angles to deal with a story”.<sup>116</sup> For journalist Barbara Fraser, the implementation of these courses at a university can have a positive impact on media. This factor would create awareness and raise interest in media directors.<sup>117</sup> According to

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<sup>112</sup> Appendix 9, p. 160.

<sup>113</sup> Appendix 15, p. 189.

<sup>114</sup> Appendix 4, p. 127.

<sup>115</sup> Appendix 4, p. 128.

<sup>116</sup> Appendix 13, p. 179.

<sup>117</sup> Appendix 10, p. 164.

interviewee Castro and Flores, CONCYTEC is working on this initiative. On the other hand, three interviewees consider that media should invest in science training of journalists.

An alternative in terms of training suggested by three interviewees are online courses in science journalism in Spanish. More than one institution offers this, such as SciDev.Net, the Knight Center for Journalism or The Open Notebook<sup>118</sup>. On these websites, people interested in science journalism can improve their skills or learn how to report on scientific issues. “Providing these resources in Spanish, the faster and the greater the improvement will be”, suggests Fraser.<sup>119</sup>

Promoting spaces for science journalism on free-to-air television is perceived by four interviewees as an enhancing factor. This initiative would make it possible to cover a wider range of scientific research, especially national ones. “That does not end up making my work much simpler, but it expands the spectrum”, comments journalist Víctor Román. In the opinion of psychologist Víctor García-Belaunde, television shows on scientific topics should not be only be aimed at children, but also at an adult audience.<sup>120</sup>

For three interviewees, the creation of an association of people interested in science journalism or science communication represents an enhancing factor. One of the main functions of this group would be to inform and warn about “biased, false or perhaps pseudoscience-linked information that is made public”, explains journalist Bruno Ortiz.<sup>121</sup> García-Belaunde emphasizes that this initiative would be important in order to report pseudoscience news such as the alien mummies that were presented at the Congress because, in that case, “there has not been a complete interest, there are many people for whom the subject has gone unnoticed”.<sup>122</sup> For Ortiz, this association could promote the creation of spaces for the coverage of scientific topics.<sup>123</sup> Another purpose would be that the members of the group can trained other who are interested in these issues. According to Ortiz and Román, the creation of this organization is in process.

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<sup>118</sup> Coincidentally, the Spanish version of this website was launched during field research.

<sup>119</sup> Appendix 10, p. 164.

<sup>120</sup> Appendix 9, p. 159.

<sup>121</sup> Appendix 11, p. 170.

<sup>122</sup> Appendix 9, p. 160.

<sup>123</sup> Appendix 11, p. 170.



## Proyecto de ley quiere declarar de interés histórico supuestas momias humanoides

El pasado lunes se realizó en el Congreso una mesa de trabajo sobre dicho proyecto. Para los entes oficiales, se trata de una investigación ilegal

Figure 5.3: “Bill wants to declare of historical interest supposed humanoid mummies”. News headline from November 11, 2018 about alien mummies. Source: El Comercio.

The role of CONCYTEC in improving science journalism in Peru is essential for former director Gisella Orjeda. This state body should promote a strong policy for science popularization in order to generate an interest on science in the population. It should research the situation of this specialization in the country to know its limitations and propose policy for its development.<sup>124</sup> At the same time, it should examine what is being done in other countries of the region and evaluate what initiatives could be adapted to the Peruvian reality. CONCYTEC could organize contests to award print media that publish science stories.<sup>125</sup> The initiative to arrange an event to bring together scientists and journalists, suggested by Flores<sup>126</sup>, could be in charge of this institution. For geologist Patricio Valderrama, CONCYTEC could improve collaboration with the press if it set up “a board of scientists to explain science”.<sup>127</sup>

Make the politicians understand the relevance of science journalism is regarded as an enhancing factor by two interviewees. In the Peruvian context, this is crucial, in the opinion of physicist Modesto Montoya, because “environmental problems in Madre de Dios, in the mines, in the rainforest are going to increase dramatically because we have not known how to give importance to science”.<sup>128</sup> The specialization can be improved if politicians realize that it “can play a key role in the development of society”, according to journalist Zoraida Portillo.<sup>129</sup>

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<sup>124</sup> Appendix 5, p. 132.

<sup>125</sup> Appendix 5, p. 132.

<sup>126</sup> Appendix 7, p. 143.

<sup>127</sup> Appendix 8, p. 148.

<sup>128</sup> Appendix 6, p. 137.

<sup>129</sup> Appendix 15, p. 190.



Developing an awareness among media and editors about the value of science journalism is mentioned by two interviewees as an enhancing factor. Media should encourage “encourage journalists on their staff to specialize”, points out Fraser.<sup>130</sup> In the case of editors, they need to understand that science stories often take longer time than other topics, maintains Valderrama.<sup>131</sup>

Organizing science slam<sup>132</sup> is seen by two interviewees as an enhancing factor, even though Orjeda considers them “small local efforts”.<sup>133</sup> These events can be beneficial in two ways. First, they encourage scientists to leave their academic circle to disseminate their research and interact with a different audience. “It’s super cool because it’s done by the same students, the young researchers”, express journalist Hildegard Willer.<sup>134</sup> Second, they are a source for journalists who are searching for a story.

Taking advantage of a certain context to report on scientific topics is regarded by two interviewees as enhancing factor. In the Peruvian case, this means that it is preferable to publish science news when, for example, natural disasters occur because they can receive greater coverage. “You have to choose the right moment: rains, huacos. In those moments, I’m interviewed everywhere”, admits Valderrama.<sup>135</sup> Berríos has a similar impression about this consideration based on what happened during El Niño. “You could talk about the lack of water, you could talk about how to purify it for people”.<sup>136</sup>

In the opinion of Portillo, a better collaboration between journalists and press offices of research centers is another factor that can enhance the reporting of science journalism in Peru.<sup>137</sup> This would make it easier to obtain information about the research and to contact the scientists who worked on it.

García-Belaunde suggests an interesting way to make science journalism reporting more attractive. It involves using pseudoscience news as bait to later explain a scientific issue. For this interviewee, “you can present these stories as if they were real at first by talking about

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<sup>130</sup> Appendix 10, p. 163.

<sup>131</sup> Appendix 8, p. 150.

<sup>132</sup> An event where scientists present their research in a limited time to a lay audience.

<sup>133</sup> Appendix 5, p. 132.

<sup>134</sup> Appendix 12, p. 175.

<sup>135</sup> Appendix 8, p. 149.

<sup>136</sup> Appendix 13, p. 180.

<sup>137</sup> Appendix 15, p. 184.

mummies and extraterrestrial life and then deny it. You capture attention with a pseudoscience, like a magician captures attention with a trick. And then you explain how you did the trick”.<sup>138</sup>

For Valderrama, the tweets of scientists could improve the reporting of science journalism in Peru, if media gives them a space. He states that it would be great “taking Twitter to a weekly column”.<sup>139</sup>

Concerning topics of science journalism that could be improved in Peru, three tendencies could be observed. Four interviewees mention environmental and ecology issues. Despite their current relevance, a more in-depth analysis of these issues in the media is needed. “They only stay in the surface, in the news of the day without further investigating what is happening”, comments Portillo.<sup>140</sup> On the other hand, there is still a lot of research to be done on the biological diversity of the country. Flores thinks that in the rainforest there are “a lot of different birds, plants that I'm sure aren't even finished classifying”.<sup>141</sup>

For three interviewees, tropical diseases and epidemiological topics could be improved. According to Flores, Peru has “a lot of potential even in tropical diseases”.<sup>142</sup> These issues should be more reported because they represent a problem in different parts of the country.

Two interviewees reply that natural phenomena such as El Niño or earthquakes is a topic that could be improved in Peru. For Flores, it is important to emphasize these issues because “not everyone suffers from the phenomenon of El Niño. Not everyone is going to have the interest to study it”.<sup>143</sup> In the Peruvian case, an efficient risk communication is required because sometimes seers try to take advantage of misfortune, as happened during El Niño in 2017.<sup>144</sup>

Science journalism in Peru should also focus on informing about the work of national scientists that have surprising findings, according to Valderrama.<sup>145</sup> He mentions a case about the innovation of a Peruvian engineer against anemia. “This is important, but it only

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<sup>138</sup> Appendix 9, p. 154.

<sup>139</sup> Appendix 8, p. 146.

<sup>140</sup> Appendix 15, p. 185.

<sup>141</sup> Appendix 7, p. 140.

<sup>142</sup> Appendix 7, p. 143.

<sup>143</sup> Appendix 7, p. 143.

<sup>144</sup> Appendix 8, p. 150.

<sup>145</sup> Appendix 8, p. 151.

comes out in a few media outlets”.<sup>146</sup> Valderrama considers that the task is to put “the spotlights on the right people”.<sup>147</sup> For Berríos, it is necessary to emphasize reporting on discoveries made outside Lima.<sup>148</sup>

Another topic that could be improved is space science, especially the Peruvian satellite, Peru-SAT. Valderrama believes that Peruvians “have wasted the opportunity to teach and explain to people what types of satellites there are, what Peru-SAT does and doesn't do”.<sup>149</sup> As a result, people have misconceptions about how the satellite works, even politicians do not know and said that it was useless. In this context, reporting on this issue is necessary to avoid further misunderstandings.

Apart from these topics, others are mentioned during the interviews. These includes disciplines such as health, climatology, agriculture, chemistry, computer science, mathematics and aquatic resources.

Six interviewees state that science journalism in Peru will develop in the next years; however, two of them think that this growth will not be fast. Flores believes that is going to be fundamental the science communication course that CONCYTEC will launch because in five years will be journalists and communicator with greater scientific knowledge.<sup>150</sup> For Valderrama, this development will cause a distinction between science journalism and technology journalism. “The news of the new cell phone is next to the news of the microwave and cancer. We have to separate things. That will happen, it's inevitable”.<sup>151</sup> The creation of the association of science journalists and communicators is regarded as relevant for interviewee Ortiz for the development in the next five years.<sup>152</sup>

On the other hand, three interviewees expressed skepticism about this development. For Orjeda, no development will happen if CONCYTEC does not have a clear vision of this issue.<sup>153</sup> The lack of interest of the media in scientific subjects could avoid this development,

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<sup>146</sup> Appendix 8, p. 152.

<sup>147</sup> Appendix 8, p. 152.

<sup>148</sup> Appendix 13, p. 180.

<sup>149</sup> Appendix 8, p. 152.

<sup>150</sup> Appendix 7, p. 144.

<sup>151</sup> Appendix 8, p. 152.

<sup>152</sup> Appendix 11, p. 170.

<sup>153</sup> Appendix 5, p. 132.

according to Berríos.<sup>154</sup> In the opinion of Portillo, the development depends on the interest of universities on science journalism. However, she believes that in the next five years Peru has “plenty of room to develop”.<sup>155</sup>

## **5.2 Discussion of results**

Concerning science journalism tasks, an emphasis is placed on reporting on the latest advances in science made by Peruvian researchers because they are seldom portrayed in media. This situation evidences two observations about science journalism reporting in Peru. First, the tendency to cover science news from developed countries. Second, the relevance of reporting on local issues, as opposed to this tendency. By reporting on the discoveries made in the country, science journalism would be fulfilling its function of being the link researchers and a population.

The promotion of science literacy is regarded as a main goal for this specialization in Peru. The low scientific culture of Peruvians is seen as worrying considering that pseudoscience is a constant threat because it is mentioned as one of most reported topics in the country. In this context, science journalists in this country should strive in two of its tasks: the duty of giving scientific advice to the audience and the gatekeeper function in the newsroom.

According to the interviewees, health is one of the most reported science journalism topic in Peru. This result reflects what Badenschier and Wormer state in their study on science news: health issues are the most popular worldwide. Ortiz's observation that his audience wants to know about treatments for diabetes or cancer evidences that the usability factor is decisive on the greater coverage in Peruvian media on this topic. It is considered a priority to provide information to prevent diseases. This relevance of health may also be related to the poor sanitary situation in this country partly due to tropical diseases or anemia.

After health, environmental issues are the topic most mentioned by the interviewees. This result shows that these fields are the most relevant in the region because their issues affect several countries. In the case of Peru, climate change and its impact on this diversity promotes

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<sup>154</sup> Appendix 13, p. 180.

<sup>155</sup> Appendix 15, p.191.

the coverage of environmental stories in a certain way, due to the popularity and awareness on the subject in recent years.

The popularity of a discipline such as astronomy in Peruvian media can be explained based on the news values point out by Galtung and Ruge. A story with an apocalyptic angle such as meteorite approaching Earth is covered due to the negativity value. On the other hand, events like the supermoon are reported due to the unexpectedness value, because they do not happen often. The astonishment factor also influences a greater coverage of these stories.

Valderrama's remark about Peruvian public interest on everyday and practical information provides an interesting fact. It reflects a characteristics of science journalism coverage in this country. This orientation could explain why a discipline like physics is mentioned once during the interviews.

The improvement of science journalism in Peru is regarded as low or moderate by most of interviewees. Even though the emergence of online media reporting on science is a considered as a factor for the development of this specialization, its scope could be limited by one circumstance. The contributions of this initiatives are limited because digital media do not reach a wider audience than traditional media. Newspapers and radio have still a strong readership and audience and maintain their impact on the market.

In reference to the development of science journalism in the Latin American context, the perception is that Peru is not developed as other countries in the region. This result is in line with the research on appropriation of science in which Peru appeared in the group where there no strategies to support this specialization. On the other hand, most of the interviewees perceive that Chile and Colombia are two of the countries that most support science journalism in the region. This impression is also consistent with the above-mentioned study.

About sources, it should be noted that the journals and magazines mentioned by the interviewees come from First World Countries. This fact could be an indication of the tendency to report on progress in developed countries. In addition, journals and magazines are mostly mentioned by scientists.

Certain factors that limit science journalism reporting in Latin America are also found in Peru. For example, the lack of interaction between scientists from this region and media in

comparison with their North American counterparts. During the interviews, Peruvian journalists describe the problems they have to deal when contacting local scientists. Conversely, their experience with researchers from foreign countries has been mostly positive. Journalists indicate that these scientists are willing to collaborate because they understand the relevance of disseminating their work.

The lack of courses on this specialization in Peru reflects that this issue could still be considered a problem in Latin America. The opinion of the interviewees reflects the seriousness of this problem. Journalists and scientists have the impression that it limits the possibility of communicating with each other and therefore informing properly about this topic. However, this restriction influences a third party. Communicators in the press offices of research centers are also affected by this circumstance to the point of being considered as an obstacle.

The disinterest of media on science journalism in Latin America is discussed at different times by the interviewees. This situation is evidenced mainly when journalists and scientists state that science news is ignored because it is not attractive or not profitable and does not generate a lot of rating. These circumstances mean that science journalism is at disadvantage compared to other areas. In the same way, the indifference of media to specialize their journalists reflects this tendency. Journalists will probably have to do it without the support of the media.

Interviewees mentioned that one of the main economic problems is doing a field research. This is consistent with a limitation mentioned in the literature, the lack of resources in the Latin American media to cover science news. The case of calf cloning research reflects this constraint. The importance of the economic aspect excludes any reporting that includes traveling and spending days outside the capital. The only alternative left to journalists in this situation is to report on these topics while paying their own expenses.

One of the problems addressed by interviewees is the little scientific production in Peru. This perception coincides with the figures with figures indicating that this region represents only a small percentage of the world's researchers. If there is less scientific research, the journalist will have fewer alternatives to choose a topic. However, in the Peruvian case, there is a factor

that can change this tendency. The law that gives a bonus to scientists for conducting research can partly ease this problem.

Regarding the implementation of specialization courses, the particular circumstances of the country must be considered. In the case of journalists, the emphasis should be on learning basic concepts to improve the approach to scientific issues. Studying with researchers could help journalists to broaden the range of their sources. In this way, the problem of always consulting the same experts could be partially avoided. For scientists, it is essential that the course help them understand the elements behind the production of a news and how to deal with media. The training could stress the teaching of skills to disseminate their work through social media. Research center communicators need strategies to improve their role as intermediaries.

Although their impact may be smaller compared to other initiatives, science slams can promote science journalism reporting at the local level. These events are an alternative to value the work of Peruvian researchers in the face of the tendency to report on advances from First World countries. However, these initiatives are even more important for scientists living outside Lima, probably one of the few ways they can disseminate their research.

## **Chapter 6: Conclusions**

Based on the qualitative analysis of interviews with journalists and scientists, concluding remarks about science journalism reporting in Peru can be drawn. They answer the three research questions and are compared to the hypotheses presented in the Methodology chapter. Next, suggested topics for future research are mentioned.

### **6.1 Concluding remarks**

The results to the first research question —what is the status quo of science journalism in Peru?— show that the development of this specialization in the last five years is perceived mostly as low or moderate. However, it has been low in comparison to other Latin American countries. These remarks are in line with the first hypothesis, which states that “science journalism in Peru has developed in the last five years, but still has weakness in comparison to other Latin American countries”.

One of the reasons for the improvement of this specialization in this country is the emergence of online media reporting on science topics. Specialized portals such N+1 and Mongabay Latam and investigate journalism projects such Convoca and Ojo Público evidences this fact. This situation has resulted in scientific issues becoming more visible than five years ago. The development of science journalism in Peru can be related to the greater interest that exists in this field and the increase of reporters dedicated to it. However, this specialization has not yet become widespread in communication faculties and does not have many spaces in Peruvian mainstream media, especially in free-to-air television. In the Latin American context, all interviewees agree that science journalism in Peru is not developed as other countries. First, Peru does not have science popularization programs like those in Chile or Colombia. Second, the coverage of this scientific topics in Argentina, Chile or Colombia is considered better than Peru.

The results to the second research question —what are the strengths and challenges of science journalism reporting in Peru?— reflects that there many challenges that shape the practice of this specialization, while the strengths are few. Educational and economic limitations are considered the most important. These remarks are partly in line with the hypothesis, which



states that “there are more challenges than strengths in science journalism in Peru. Among the challenges are financial constraints and limited interaction between scientists and journalists”.

Among the strengths, it is important to highlight the biological and geographical diversity of the country. This factor allows the journalist to choose from a wide range of topics and has become relevant in the context of climate change. Social media supports science journalism reporting because through them researchers can disseminate scientific information to a wider audience and transcend their academic circle. The reporter’s interest in scientific issues is regarded as a strength since it may compensate for the lack of training. A last supporting factor is the implementation of a law that promotes scientific research in Peru.

Concerning challenges, one of the most relevant is the lack of training for journalists and scientists to properly report on science. There are still no courses in science journalism or science communication in the country. Faced with this limitation, they must travel abroad to study; however, they could not because it is expensive. Precisely another limitation considered as important are the economic challenges. First, the lack of media interest in science journalism because it is not profitable. Second, it represents a constraint to research field, especially if the journalist must travel outside the capital of the country, because Peruvian media do not finance it. The collaboration between scientists and journalists represents a key challenge in Peru. Scientists do not like the way journalists approach science. On the other hand, criticism from journalists is directed at scientists’ lack of knowledge about how media works. The collaboration between journalists and research centers or governmental agencies is regarded as a challenge, due to the latter hinder the contact with their scientists.

The results to the third research question —how can science journalism reporting in Peru be improved in the future?— demonstrate that there are several alternatives for the development of this aspect. Educational and organizational initiatives are suggested to promote an improvement in the next five years. These remarks contradict the third hypothesis, which states that “the development of online science newsletters or news feeds in Peru could improve the reporting in the future”.

The development of courses in this specialization is required to train journalists and scientists and thus improve the collaboration between them. The creation of an association of

journalists and disseminators is essential in the fight against pseudoscience, but it can also be helpful because its members could train people interested in this field. It is worth noting that these two initiatives are in a process of implementation, according to interviewees. The role of CONCYTEC is fundamental in the promotion of this specialization. This governmental body needs to develop a better plan for science popularization, based on research on this issue and other experiences in Latin American countries. Additionally, its contribution could be essential if it manages to create a board of scientists that can have frequent contact with the media or promotes camp to bring closer researchers and reporters. At a local level, science slams could improve science journalism reporting outside Peru's capital Lima. A final initiative is the promotion of science popularization in free-to-air television.

## **6.2 Future research**

During the interviews, journalists and scientists mentioned some aspects of this specialization in Peru that should be considered for future research. A first issue that should be explored is the role of research centers and their press offices in science journalism reporting. Regarded as an obstacle, it is fundamental to analyze the work of their communicators and the problems they face. Understanding these factors could give an insight about how to improve their function of being the link between journalists and researchers.

The observation of journalist Bruno Ortiz about the readers of the newspaper El Comercio suggest an aspect that should be considered. It would be an interesting idea to conduct a study on the public that consumes science news in Peru. Based on this information, media could explore new ways to approach and tell science stories.

The perception that young scientists are more accessible to collaborating than the older ones raises some issues that could be studied. First, establish whether there is any relationship between the age of scientists and their willingness to interact with the media. Second, it would represent an opportunity to analyze the practices of scientists when disseminating news. Examining the dissemination of their work on blogs or social networks would help deepen the understanding of science journalism in this country.

Another issue that could be analyzed in the growth of science journalism in digital media in this country. A study of the different online portals would help to explain the reason behind this tendency. A subject to examine would be news selection process when the team is conformed by journalists from different countries. On the other hand, the case of investigative journalism projects such Convoca and Ojo Público offers a possibility to research the coverage of environmental and health topics.

Finally, as mentioned in the introduction, science journalism is a subject that has not been thoroughly researched in Peru. There are still plenty and diverse areas of this specialization that can be address. This study may be a first step.

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## Appendixes

1. Interview guideline and categories .....	81
2. List of interviewees .....	82
3. Summarizing content analysis .....	83
4. Interviewee David Castro .....	124
5. Interviewee Gisella Orjeda .....	130
6. Interviewee Modesto Montoya.....	133
7. Interviewee Myra Flores.....	139
8. Interviewee Patricio Valderrama .....	145
9. Interviewee Víctor García-Belaunde .....	154
10. Interviewee Barbara Fraser.....	161
11. Interviewee Bruno Ortiz .....	165
12. Interviewee Hildegard Willer .....	171
13. Interviewee Milagros Berríos .....	176
14. Interviewee Víctor Román.....	181
15. Interviewee Zoraida Portillo.....	185

## Appendix 1: Interview guideline and categories

Category	Questions
<b>A. Status quo of science journalism (Research Question 1)</b>	1. What are the main tasks of science journalism in Peru?
	2. Which-topics of science journalism are the most reported in Peru?
	3. How has science journalism in Peru improved in the last five years?
	4. How developed is science journalism in Peru compared to other Latin American countries?
<b>B. Strengths and challenges in the science journalism reporting (Research Question 2)</b>	5. Which factors support the reporting <sup>1</sup> of science journalism in Peru?
	6. Which sources do you use to find local and international science stories?
	7. How reachable are these sources when it comes to communicate science?
	8. How does the collaboration work between journalists and scientists in Peru?
	9. What are your main concerns when it comes to explaining science?
	10. How do financial factors influence science journalism reporting in Peru?
	11. Which other factors restrict science journalism reporting in Peru?
<b>C. Future perspectives in science journalism reporting (Research Question 3)</b>	12. Which factors do you think could enhance the reporting of science journalism in Peru in the future?
	13. Which field of science journalism could be improved in Peru?
	14. How do you evaluate the development of science journalism in Peru in the next five years?
	15. Is there anything else you would like to add that you have not yet mentioned?

<sup>1</sup> The term *science journalism reporting* is replaced by *science news production* because they may not be familiar with the first expression.

## Appendix 2: List of interviewees

### Scientists

Name	
David Castro	Biologist, writer on science blog <i>Expresión Genética</i> in the website of <i>El Comercio</i> .
Gisella Orjeda	Biologist, former director of National Council for Science, Technology and Innovation (CONCYTEC), director of INAIGEM.
Modesto Montoya	Physicist, former President of Peruvian Institute of Nuclear Energy and Peruvian Society of Physics.
Myra Flores	Chemist, specialist of Direction of Science, Technology and Technological Innovation Policies and Programs on CONCYTEC
Patricio Valderrama	Geologist, host on Terramotus, science podcast
Víctor García-Belaunde	Psychologist, host on La Manzana Escéptica, science YouTube channel

### Journalists

Name	
Barbara Fraser	Science journalist/freelancer for journals <i>Nature</i> and <i>Science</i>
Bruno Ortiz	Science Department Editor in the newspaper <i>El Comercio</i>
Hildegard Willer	Journalist, lecturer on environmental journalism.
Milagros Berríos	Staff writer in the newspaper <i>La República</i>
Víctor Román	Editor in N+1, science journalism online portal
Zoraida Portillo	Correspondent in Peru for the science organization SciDev.Net

## Summarizing content analysis

### Category A: Status quo of science journalism

#### 1) What are the main tasks of science journalism in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro.	124	P1: Educate the population because, compared to other countries, the level of scientific culture is low.	Educating a population illiterate in science.	Reporting on latest advancements in science
	124	P2: Explain the last advancements in science.	Report on the latest advancements in science.	The education of the public in science
	124	P3: Explain how these advancements benefit the life of the most deprived population.	Show the benefits of science in everyday lives.	Mobilizing the public opinion
	124	P4: Generate an informed public so decision-makers understand the importance of science.	Science literacy to influence decision-makers.	Show the benefits of science in everyday lives
Gisella Orjeda.	130	P1: Main functions of science journalism are the same worldwide.	Peru is no different from other countries in terms of the tasks of science journalism	Scrutinizing findings. Being the link between the scientists and the public
	130	P2: Report interesting things to the general public and decision-makers.	Report on the attractive advancements to all publics.	Translating the complexity of science
	130	P3: People need to know how science has to do with their lives	Show the influence of science in everyday lives.	
	130	P3: Decision-makers need to know the last research in science.	Decision-makers need to be informed about science.	
	130	P4: The abundance of science news educates people.	Educate the population in science.	
Modesto Montoya	133	P1: Journalists must visit the laboratories in Peru.	Report on the last science advancements in the country.	



	133	P2: Journalist must visit laboratories that do research on global warming.	Report about environmental issues.
	133	P3: For the general public, it is needed educational journalism.	Science journalism should educate population.
Myra Flores.	139	P1: Educate citizens because the country does not have science culture.	Educating a population who lack in science literacy.
	139	P2: Value the little science that is done in Peru.	Report on the science advancements in the country.
	139	P3: Report on disciplines that are specific in Peru.	Report on local findings.
Patricio Valderrama	145	P1: People needs to know how to be prepare for a disaster.	Risk communication.
	147	P2: Science journalist is the nexus between scientists and the public.	Bringing science to a lay audience
	147	P3: Read a paper and simplify it	Translating the complexity of science.
	152	P4: Inform about scientists and their advances.	Reporting on researchers and advancements
V́ctor Garća-Belaunde	154	P1: Inform the public about scientific theories.	Educate on how science, in general works.
	154	P2: Explain the latest discovery or technology.	Report on the latest advancements in science.
	154	P3: An opportunity for scientists to explain the research.	To make scientists visible.
Barbara Fraser.	161	P1: A combination of informative and investigative journalism.	Report, but also investigate on scientific issues.
Bruno Ortiz.	164	P1: Contribute to people's scientific literacy.	Helping people become more literate in science
	164	P2: Make the people understand basic scientific concepts.	Educate on how science, in general, works.

Hildegard Willer	171	P1: Make digestible what scientists say.	Translating scientific language into something simple
	171	P2: Investigate like other fields in journalism.	Scrutinize scientific findings.
Milagros Berríos	176	P1: To provide the population with scientific information that impacts their lives.	Show the benefits of science development in everyday lives.
	176	P2: Inform about the latest news in the scientific field.	Report on the latest advancements in science.
Víctor Román	181	P1: Generate critical thinking about science.	Educate on how science, in general, works.
	181	P2: Explain the complexity of science and its nuances.	Simplifying the complexity of science.
	181	P3: To inform about science findings.	To inform about science findings.
	181	P4: Ask our authorities to promote science and technology.	Promotion of science by decision-makers.
Zoraida Portillo	185	P1: Communicate what is done in science research.	Report on the latest advancements in science.
	185	P2: Serve as bridge between scientists and a wider audience.	Bringing science to a lay audience.
	185	P3: Inform decision makers of solutions for development from science	Influence decision-makers to promote science.

## 2) Which topics of science journalism are the most reported in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	124	P1: The most covered are health.	Health issues are the most reported.	Health
	124	P2: Pseudoscience is quite covered: news against vaccinations or Western medicine.	Pseudoscience is often covered.	Environmental and ecology
	124	P3: Environmental issues related to mining activity.	Environmental issues are portrayed.	Technology
Gisella Orjeda	130	P1: There is no popular science topic in Peru.	No scientific discipline is too interesting for Peruvian media.	Astronomy
	130	P2: Dr. Huerta makes a lot of medical science popularization.	Health issues are often reported.	Natural phenomena
Modesto Montoya	133	P1: RPP presents health issues every day.	Health issues are frequently reported.	Pseudoscience
	133	P2: Most of the videos Peruvians watch are pseudoscience.	Pseudoscience is often portrayed.	
Myra Flores	139	P1: Everything related to astronomy.	Astronomy topics are often reported.	
	139	P2: Natural disaster or an earthquake are covered.	Natural phenomena are often covered.	
	139	P3: Nanotechnology is very trendy now.	Nanotechnology is often covered.	
	139	P4: Ecology is very trendy now due to conservation issues.	Ecology is often covered.	
Patricio Valderrama	145	P1: Health sciences and earth sciences are covered a lot.	Health and nature science are most covered.	
	145	P2: Peruvians are interested in knowing topics related to cancer.	Health issues are often covered.	
	145	P3: Peruvians are interested in knowing on natural phenomena that affect them.	Sciences that study earthquakes and rains are often covered.	

V́ctor Garća-Belaunde	154	P1: Technological topics, especially medical ones, are very popular.	Health topics are often reported.
	154	P2: People want to be happy, any therapy that offer happiness is popular.	Psychological topics are often reported.
	154	P3: Pseudoscience is also a popular topic.	Pseudoscience is often reported.
	154	P4: People believe in homeopathy or alien mummies.	Pseudoscience topics are popular among the population.
Barbara Fraser	161	P1: Probably health journalism is the most consumed.	Health issues are the most reported.
	161	P2: Ecology and biology are also widely consumed.	Natural world topics are often reported.
	161	P3: There is also some astronomy in media.	Astronomy is occasionally reported.
	161	P4: There is a lot of repeating health myths in media.	Pseudoscience is often reported.
Bruno Ortiz	165	P1: Health issues attract a lot on paper and online.	Health issues are preferred by the public.
	165	P2: People are interested in how diseases can be diagnosed and treated.	Health issues are often reported due to usability.
	165	P3: Astronomy issues attracts a lot of attention on paper but more on the web.	Astronomy issues are preferred by the public.
	165	P4: Apocalyptic news about the space are popular.	Astronomy issues related to the end of the Earth are often reported.
	165	P5: Phenomena such as supermoon attracts people.	Astronomy issues that are strange are often reported.
	167	P6: Pseudoscience information is starting to grow.	Pseudoscience topics are often reported.
Hildegard Willer	171	P1: Truly important change are the ones related to climate change.	Climate change issues are often reported.
	171	P2: Everything related to natural phenomena such El Niño.	Natural phenomena are often reported

	171	P3: Biodiversity is also a big issue.	Biodiversity issues are often reported.
	171	P4: Seismology is a permanent topic in the country.	Information about earthquake is frequently reported.
	171	P5: I also see health journalism.	Health issues are often reported.
Milagros Berríos	176	P1: People are interested in technology in general.	Technological advancements are often reported.
	176	P2: Artificial intelligence pleases the public.	Technological advancements are preferred by the audience.
	176	P3: The subject of neuroscience had an impact.	Neuroscience is a topic that interest the public.
Víctor Román	181	P1: Physics and astronomy are very popular.	Physics and astronomy are often reported.
	181	P2: Almost everybody reads about astronomy.	Astronomy issues are attractive for the audience.
	181	P3: Technology draws a lot of attention.	Technological advancements are often reported.
Zoraida Portillo	185	P1: Undoubtedly, the environment.	Environmental issues are often reported.
	185	P2: Topics like climate change and natural disasters.	Environmental issues are often reported.
	185	P3: New technologies are also quite covered.	Technological advancements are often reported.
	185	P4: Health issues are a constant.	Health issues are frequently reported.
	185	P5: There also topics that fall into pseudoscience.	Pseudoscience are often reported.

### 3) How has science journalism in Peru improved in the last five years?

Interviewee	Page	Paraphrasing	Generalization	Reduction
Davis Castro	124	P1: Presence of science in media has increased.	Science is portrayed more frequently.	The improvement has been low  The improvement has been moderate  The improvement has been considerable  Remains the same
	124	P2: El Comercio has a daily science page in print and a science section online.	A print media covers daily scientific topics.	
	125	P2: A state channel broadcasts foreign educational shows on science.	State is trying to promote science popularization through television.	
	125	P3: There is a proliferation of online media about science.	Science journalism has improved due to new projects in Internet.	
	125	P4: Journalistic research portals are focusing on health issues or the effects of mining in the environment.	Investigate science journalism is growing in the internet.	
	125	P5: Science has become more visible in recent years compared to it was five years ago.	The development of science journalism is reflected in increased popularity.	
Gisella Orjeda	130	P1: Just a little, but there is a lot to improve.	The improvement has been small.	
Modesto Montoya	134	P1: In the last five years there has been a stabilization.	The improvement has been maintained over the last five years.	
Myra Flores	139	P1: No improvement at all since I come back to the country two years ago.	There has been no improvement.	
	139	P2: Surprise because a state channel has a scientific perspective.	State is trying to promote science popularization through television.	
	139	P3: Considering that maybe there is a small improvement.	Probably there is a small improvement.	
Patricio Valderrama	145	P1: In the last five years there has been a lot.	There has been a considerable improvement.	

	145	P2: Before El Niño, people talked about Richter degree. They're not degrees, neither Richter.	Journalists made mistake in past when reporting on earthquakes.
	146	P3: Journalists told me they had been misinforming for years.	Journalist realized that they made mistakes.
	146	P4: An editor-in-chief asked to train journalists.	An editor wanted to improve the science knowledge of employees.
	146	P5: Media stopped using degree or Richter.	Science literacy has improved in media.
	149	P6: We had a peak at COP20.	COP20 was fundamental for the improvement of science journalism.
Víctor García-Belaunde	155	P1: Interest in science has been growing.	Interest in science may have contributed to the development of science journalism
Barbara Fraser	161	P1: The interest on science topics reflects some improvements.	Interest in science has contributed to the development of science journalism
	161	P2: There are some improvements, but there is not a lot.	Improvements are not considerable enough.
Bruno Ortiz	165	P1: Newspapers dedicate occasionally one page a week to science, some don't have space for it.	There have been no improvements in print media.
	166	P2: There is no program dedicated to science in free-to-air television.	There have been no improvements in television.
Hildegard Willer	172	P1: It has increased but it still very low.	The improvement has been small.
	172	P2: Journalistic research portals are reporting on environmental issues.	Investigate science journalism is growing in the internet.
	172	P3: Ojo Público organized a meeting on science journalism.	A meeting on science journalism reflects that there is a greater interest.

Milagros Berríos	176	P1: Situation of science journalism is the same.	There has been no improvement.
	176	P2: There are no specialized portals on science.	Lack of specialized portals reflects no improvements.
Victor Román	181	P1: There is more people working on this specialization than before.	This specialization has become more popular in media.
	181	P2: There has been a boom in the recent years.	There has been considerable improvement.
Zoraida Portillo	186	P1: It is difficult to talk about an improvement.	Probably there has been no improvement.
	186	P2: More people know about the existence of this specialization.	The specialization is more recognized for lay audience.
	186	P3: During COP20, there were training for journalists and environmental issues were covered by media.	COP20 was fundamental for the improvement of science journalism.



**4) How developed is science journalism in Peru compared to other Latin American countries?**

<b>Interviewee</b>	<b>Page</b>	<b>Paraphrasing</b>	<b>Generalization</b>	<b>Reduction</b>
David Castro	125	P1: Science journalism is still at an early age, there is a very incipient science journalism.	Peru is not developed as other countries in the region.	Peru is not developed as other countries in the region  Chile, Colombia, Mexico and Argentina are more developed than Peru  Peru is more developed than Venezuela and Ecuador or Bolivia  Peru is in the last places regarding science journalism
	125	P2: It cannot be compared with what is done in Argentina.	Argentina is more developed than Peru.	
	125	P3: Chile has a strong journalism and an institution that promotes scientific culture.	Chile is more developed than Peru.	
	125	P3: Colombia and Mexico have good science journalists.	Colombia and Mexico are more developed than Peru.	
	125	P4: Peru is not at the same level as Ecuador or Venezuela.	Peru is not in the last place when it comes to science journalism.	
Gisella Orjeda	130	P1: There is no one who is dedicated to disseminating science in Peru as in Chile or Argentina.	Argentina and Chile are more developed.	
	130	P2: Peru is completely behind in science journalism.	Peru is not developed as other countries in the region.	
Modesto Montoya	134	P1: In science Peru is behind other countries.	Lack of scientific production reflects a poor science journalism in the region.	
Myra Flores	140	P1: Science journalism in Peru is still in its infancy.	Peru is not developed as other countries in the region.	
	140	P2: Chile has program dedicated exclusively to the dissemination of science.	Chile is more developed than Peru.	
	140	P3: Colombia has a science popularization program paid by the government.	Colombia is more developed than Peru.	
	140	P4: A university in Mexico offers a diploma on science dissemination.	Mexico is more developed than Peru.	

Patricio Valderrama	146	P1: Science journalism in Peru is still in its infancy.	Peru is not developed as other countries in the region.
	146	P2: Chile and Mexico have stronger science journalism media.	Chile and Mexico are more developed than Peru.
Víctor García-Belaunde	155	P1: There is more dissemination in Chile, Argentina and Uruguay.	Chile, Argentina and Uruguay are more developed than Peru.
Barbara Fraser	161	P1: There is more science journalism in Argentina, Mexico and Chile.	Argentina, Mexico and Chile are more developed than Peru.
Bruno Ortiz	166	P1: Science journalism in Peru is not very developed.	Peru is not developed as other countries in the region.
	166	P2: In Argentina there exclusively scientific shows in radio.	Argentina is more developed than Peru.
	166	P3: Chile has science shows in radio and free-to-air television.	Chile is more developed than Peru.
	166	P4: Colombia has newspapers and radio programs that dedicate space to science.	Colombia is more developed than Peru.
Hildegard Willer	172	P1: Development of science journalism in Peru is little compared to other Latin American countries.	Peru is not developed as other countries in the region.
Milagros Berríos	176	P1: There is lack of science journalism compared to other Latin American countries.	Peru is not developed as other countries in the region.
	176	P2: In Peru there is not a media specialized in science.	Lack of specialized media shows the situation of Peru in Latin America.
Victor Román	181	P1: Science journalism in Peru is not so developed yet.	Peru is not developed as other countries in the region.
	181	P2: Argentina is the most developed country in Latin America.	Argentina is more developed than Peru.
	181	P3: After Argentina, comes Colombia and Mexico.	Colombia and Mexico are more developed than Peru.

	181	P4: Bolivia, Ecuador, Uruguay and Chile do not have scientific disseminator.	Peru is not in the last place when it comes to science journalism.	
Zoraida Portillo	186	P1: Ecuador, Bolivia and Peru are at the same level of science journalism: almost zero.	Science journalism in Peru has a small development in the Latin America context.	
	186	P2: Colombia is years away from us, they have promoted science journalism in the last five years.	Colombia is more developed than Peru.	
	186	P3: Peru still far behind in science journalism.	Peru is not developed as other countries in the region.	

## Category B: Strengths and challenges in the science journalism reporting

### 5) Which factors support the reporting of science journalism in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	125	P1: Social media have facilitated the interaction with researchers.	Social media have improved the interaction with scientists.	Ecological and geographical diversity
	125	P2: Advances in digital platforms helps in the development of a story.	Online resources help to better explain scientific stories.	
Modesto Montoya	135	P1: A law was proposed to support scientists who conduct research.	There is a motivation to do research, a main source in science journalism.	Social media for scientists  The curiosity of interviewees
	135	P2: This increase has motivated scientists to carry out studies.	The more scientific research, the more scientific journalism.	
Myra Flores	140	P1: Peru has a diverse geography and biodiversity.	There are a variety of topics that can be chosen by the science journalist.	The implementation of a law
	140	P2: Peru has 20 of 24 climates of the world.	A greater variety of topics compared to other countries in the region.	
Patricio Valderrama	146	P1: Social media has allowed some scientists to express their opinion.	Social networks have brought the opinion of some scientists closer.	
Bruno Ortiz	167	P1: Curiosity is fundamental in science journalism when do you don't have specialized training.	Curiosity is support factor in Peru due to a lack of specialized training.	
	167	P2: Science journalism is a fertile ground because very few are currently dealing with it.	Lack of specialists as a positive factor because there are topics that are not covered yet.	
Milagros Berríos	177	P1: Science and technology are fields that I like.	That these fields interest you very much.	

	177	P2: Desire to know more about science issues.	Curiosity to know more.	
V́ctor Román	182	P1: Scientists understand that the dissemination of work is important.	Predisposition of Peruvian scientists supports science journalism reporting.	
	182	P2: Social media allows to space for science journalism.	Social media contributes to the emergence of science journalism projects.	
Zoraida Portillo	186	P1: Peru's geography gives it an advantage.	There are a variety of topics that can be chosen by the science journalist.	
	186	P2: Peru's geographical location in South America.	A greater variety of topics compared to other countries in the region.	

6) Which sources do you use to find local and international science stories?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	120	P1: A platform called Feedly that alerts every time a website publishes something.	Feedly.	Journals or science magazines  State agencies, universities and research centers
	120	P2: US and European science blogs.	US and European blogs.	
	120	P3: Websites of scientific journals such as Nature or Science.	Journals such as Nature or Science.	
	120	P4: MIT has also a magazine called Technology Review.	MIT magazine Technology Review.	
Gisella Orjeda	131	P1: I pay my own access to Science or Nature.	Science or Nature.	Newsletters, news feeds or online digests
Modesto Montoya	135	P1: US journals like Science	Journals	Conferences  News from other newspapers
	135	P2: International agency like NASA.	NASA.	
	135	P3: Websites of international laboratories.	Website of international laboratories.	
Myra Flores	140	P1: Website of CONCYTEC where you can find projects that have won funds.	Website of CONCYTEC.	Facebook  Science blogs  News agencies
	140	P2: Noted journals: Science and Nature.	Journals such as Nature or Science.	
	140	P3: Portals of the top universities.	Website of top universities	
	141	P4: Other newspapers in Spanish such as El Mundo.	Other newspapers in Spanish	
Patricio Valderrama	148	P1: Local media use international news.	International media.	Keeping track of scientists
	148	P2: El Comercio publishes stories from El País.	El País.	
V́ctor García-Belaunde	156	P1: Wikipedia is a good source for a general search about a topic.	Wikipedia.	Keeping track of scientists
	156	P2: Nature journal and Skeptic magazine.	Publications like Nature and Skeptic.	
	157	P3: Attend a conference and contact a speaker that interest me.	Conferences.	

	157	P4: Sometimes I know people who has a doctorate or a interesting research.	Someone I meet by chance.
Barbara Fraser	162	P1: At least four online digests of science, environmental and health stories.	Online digests of science topics.
	162	P2: The EurekaAlerts! Notifications.	EurekaAlerts!
	162	P3: Keep track of scientists I've already worked with.	Keep track of scientists.
	162	P4: Attend a science conference.	Conferences.
Bruno Ortiz	167	P1: Subscription to specialized pages such as EurekaAlert!	Specialized pages such as EurekaAlert!
	167	P2: News from news agencies.	News agencies.
	167	P3: Subscription to newsletters.	Newsletters.
	167	P4: News from other newspapers.	News from other newspapers.
Hildegard Willer	173	P1: A friend of mine who is doctor put in contact with other doctors.	A friend of mine.
Milagros Berríos	177	P1: Found on case watching a Facebook video.	Facebook
	177	P2: Attend a conference, where a researcher mentions an interesting fact.	Conferences.
	177	P3: A source informs you about an event.	Same source.
Víctor Román	182	P1: Journals such as Science or Nature.	Nature or Science.
	182	P2: Television channels such as Nat Geo.	Nat Geo.
	182	P3: Institutions such as International Potato Center or universities.	Research institutions or universities.
	182	P4: Technological community, people who make innovation.	People who make innovation.
Zoraida Portillo	187	P1: International journals where studies scientifically validated are published.	Journals.
	187	P2: Scientific research institutions.	Research institutions.

**7) How reachable are these sources when it comes to communicate science?**

<b>Interviewee</b>	<b>Page</b>	<b>Paraphrasing</b>	<b>Generalization</b>	<b>Reduction</b>
David Castro	126	P1: Currently they are quite accessible.	Sources in science journalism are more reachable than before.	Papers are not accessible
	126	P2: Platforms such as Sci-Hub allows you to download papers for free.	Papers are reachable due to platforms where you download them for free.	Papers are partly accessible
	126	P3: Most scientists have Twitter or Facebook accounts.	Social media has brought scientists closer.	Scientists are reachable, especially from foreign countries
	126	P4: You can write to ask them and they will answer.	Scientists are willing to absolve your questions.	
	126	P5: I have done it for two or three articles.	This experience has become frequent.	Research institutions in Peru are an obstacle
Gisella Orjeda	131	P1: They are not accessible.	Sources in science journalism are not reachable.	Scientific data from governmental agencies is problematic
	131	P2: The database of papers that CONCYTEC bought is now restricted.	Currently the access to papers is limited.	
Modesto Montoya	135	P1: Within Peru the sources are very small.	Sources are difficult to reach due to small quantity.	
	136	P2: Journalist can visit the institutions depending the topics.	Institutions are accessible sources for science journalists.	
Myra Flores	141	P1: I suppose that in Peru no media has subscription to journals.	Research in journals are not reachable for Peruvian media.	
Patricio Valderrama	147	P1: Doing a consultation in EsSalud is going to be hard.	State sources are difficult to reach in Peru.	
	148	P2: Papers are not quite accessible; one must pay 30 dollars for them.	Papers are difficult to obtain due to their high cost.	
	148	P3: The alternative you have is to download them from Sci-Hub.	Papers are reachable due to platforms where you download them for free.	



	149	P4: If you write to the author, accessibility will depend on the fame of the author.	The level of fame of the author influences the accessibility.
	149	P5: CONCYTEC had a database where anyone who registered could access papers.	Currently access to papers is limited for science journalism.
	149	P6: For El Comercio or RPP is almost impossible to access to papers.	Even for powerful media in Peru, papers are not reachable.
V́ctor Garća-Belaunde	150	P1: There online versions and alerts, that show you the introduction of studies.	Researches are partly reachable through online services.
	150	P2: Internet has several alternatives to stay informed.	Equivalent sources are reachable in internet.
	150	P3: Internet has sources that are free and accessible.	Other sources in Internet can fill the gap of not accessible research.
	151	P4: I write and call researchers for my YouTube channel and we coordinate the interview.	Researchers in Peru are reachable.
Barbara Fraser	162	P1: Scientists are willing to talk about their research.	Scientists are reachable to journalists when it comes to communicate their findings.
Bruno Ortiz	167	P1: They are very accessible, except for scientists.	Scientists are not reachable to journalists.
	167	P2: It is easy to contact scientists from US or Europe by e-mail.	Scientists living abroad are reachable.
	167	P3: Foreign universities have more information available to visitor.	Scientific information from foreign university is reachable.
	167	P4: In the press release you can find all information about the researcher.	The contact information in the press releases contributes to be reachable.
	168	P5: Scientists from foreign universities or the press unit answer you the same day or the day after.	In foreign countries, science communication is efficient.

	168	P6: My colleague wrote to a company that produces artificial meat; they answer him within three hours.	In foreign countries, science communication is quick.
	168	P7: In Peru, the spokesperson of an institution is not always available.	Spokesperson are difficult to reach in Peru.
Hildegard Willer	173	P1: Public information from institutions related to science is bad.	Access to public information is an obstacle.
	173	P2: Had to make a lot of calls for a doctor to be authorized by a state institution.	State sources are difficult to reach.
	173	P3: There was no possibility of interviewing an official.	Officials of state institutions are not reachable.
Milagros Berríos	177	P1: Scientists are accessible in most cases.	Scientists are reachable to journalists.
	177	P2: There were some time complications with a nuclear engineer who works in US, but he was accessible.	Scientists who lived abroad are reachable despite difficulties.
	181	P3: Getting figures from government is not so easy because their system is not friendly.	Figures from the government are difficult to reach.
	181	P4: Many times, some institutions haven't given me anything.	Figures from government institutions are often not reachable
	181	P5: Other times, institutions gave me information after a long wait.	Science communication in the government institutions is no efficient.
	181	P6: In some institutions there is a lack of figures.	Information is not reachable because it does not exist.
V́ctor Román	183	P1: They are accessible when you have English knowledge.	Reach of sources depends on level of English.
	183	P2: In US and Russia, scientists understand that dissemination is important, so they take their time with journalists.	Foreign scientists are reachable.

Zoraida Portillo	187	P1: Peruvian scientists are not accustomed to talking to the press.	Scientists are difficult to reach for media.	
	187	P2: Scientific research institutions are forbidden to journalists.	Scientific research institutions are not reachable for journalists.	
	187	P3: Institutional and communication offices are the first obstacle to talk to the scientists.	Scientists are difficult to reach due to communication offices.	
	187	P4: In other countries scientists are willing to talk with journalists.	Scientists living abroad are reachable.	

### 8) How does the collaboration work between journalists and scientists in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	127	P1: There is still a bad relation between journalists and scientists.	The collaboration suffers from some problems.	<p>The relationship between journalists and scientists is complicated</p> <ol style="list-style-type: none"> <li>1. Journalist do not understand anything</li> <li>2. Reporting in a superficial way</li> <li>3. Reporters do not prepare</li> <li>4. Scientists do not know how media work</li> <li>5. Scientists believe that journalists are going to published everything they have said</li> <li>6. Attitude of some scientists</li> </ol> <p>The relationship between journalists and scientists is good, in spite of some problems.</p>
	127	P2: Scientists did not like how journalism approach science.	Scientists consider the approach to science by journalists to be incorrect.	
	127	P3: Journalists often cover science in a superficial, simplified, banal way.	Scientists consider that journalists do not know how to report on science.	
	127	P4: Scientists explain their findings using technical words to maintain their status.	Scientists believe that they lower their level when interacting with journalists.	
	127	P5: Younger scientists are explaining their studies more than older scientists.	The collaboration with younger scientists can be more fruitful.	
	127	P6: Journalists should directly search for the original sources.	Journalists often do not contact the author of the research.	
	127	P7: Journalists just look for mediatic scientists, even though there are more suitable ones for some topics.	Journalists do not have many scientists as their contacts.	
Gisella Orjeda	131	P1: Scientists are afraid of journalists.	Scientists do not want to collaborate with journalists.	
	131	P2: Journalists do not understand science; they take it to fantasy.	Journalists do not understand neither report correctly on science.	
Modesto Montoya	136	P1: Renowned journalists and shows have their contacts for each discipline.	There is some communication between journalists and scientists.	
	136	P2: Scientists did not want to talk to journalists because it was to get down their level.	Scientists believed that they lower their level when interacting with journalists.	

Myra Flores	141	P1: It is complicated on both sides.	Journalists and scientists have problems to collaborate each other.
	141	P2: Journalists want something attractive.	Journalists need always an interesting story
	141	P3: Some scientists express in a very technical, boring way.	Scientists do not know how to express in a simple way.
	141	P4: The interaction is difficult.	The collaboration is not the best one.
Patricio Valderrama	147	P1: Collaboration is harsh because research is state-run.	The relation between state researchers and journalists is difficult.
	147	P2: Small media journalists are assisted by specialists without much training.	Small media tend to receive less collaboration from institutions.
	147	P3: The specialist without training is going to explain you in complicated words.	The collaboration is going to be a failure.
	147	P4: If you are a renowned journalist, the head of the institution will give you detailed information.	Popular media and journalists tend to receive more collaboration from institutions.
V́ctor Garća-Belaunde	157	P1: Many scientists have attitude of modesty and they do not want to appear on media.	Apparently, scientists do not like media.
	157	P2: Sometimes a scientist who wanted to come to my videoblog did not want to later.	Probably scientists are afraid of unexpected repercussion.
Barbara Fraser	163	P1: It is been good mostly.	Collaboration with scientists is good.
	163	P2: I go to field with scientists.	Collaboration is good to the point that they welcome to going to the field.
	163	P3: Scientists are happy that journalists write about their findings	Scientists are willing to share their findings with journalists

Bruno Ortiz	168	P1: Scientists do not know how to deal with journalists when it comes to breaking stories.	This lack of preparation prevents scientists from being contacted by journalists
	168	P2: There is a lack of culture of communicating their studies by scientists.	This lack of culture affects the collaboration with the journalists.
Hildegard Willer	173	P1: According to personal experience generally fine.	Collaboration with scientists is good.
	174	P2: Scientists consider that journalists simplify everything and then they misunderstand.	Scientists consider that journalists do not know how to report on science.
	174	P3: Scientists are upset by the way journalists present the news.	Scientists do not want to collaborate later with the journalists.
Milagros Berríos	178	P1: It has been positive experience.	Collaboration with scientists is good
	178	P2: Scientists understand that journalists are going to ask something if they do not understand.	Scientists are patient with journalists when they tried to understand something.
	178	P3: Perception of mistrust from the media when it comes to exposing their research.	Scientists have some suspicions about collaborating with journalists.
	178	P4: Scientists ask to give them the article or to repeat what they said.	Scientists tend to think that they are going to be misinterpreted.
Victor Román	182	P1: Scientists were willing to answer my questions.	Collaboration with scientists is good.
	182	P2: If journalists made a mistake, scientists will be probably upset but they have patience.	Scientists will collaborate despite of mistake by journalists.
Zoraida Portillo	187	P1: Scientists are suspicious and fearful about how they are going to be quoted.	Scientists tend to think that they are going to be misinterpreted

187	P2: Scientists do not know how media work.	This lack of knowledge affects the collaboration with journalists.
187	P3: Scientists think that journalists are going to publish everything they have said.	Collaboration with scientists is good at this point.
187	P4: When scientists read the news article, they felt misquoted or deceived because they do not see everything they said.	Collaboration with scientists have been broken at this point.
187	P5: A scientist did not want to give interviews because media made him look like a cretin.	The collaboration of journalists and scientists is affected by the image of the latter presented in the media.
188	P6: Journalists do not prepare for the interview.	This lack of preparation affects the interaction with scientists during the interview.
188	P7: Some scientists see journalists over their shoulders.	Scientists consider journalists inferior.

9) What are your main concerns when it comes to explaining science?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	127	P1: Fear of simplifying too much and generate a misunderstanding in the reader.	Simplify too much to the point where the article is confusing.	The understanding scientific topics and language by a lay audience  Draw the attention of the reader or audience  Reporting on a scientific advance that is relevant  Search for the most suitable source
	127	P2: Concern that people will take analogies literally.	The reader does not correctly understand an analogy.	
	127	P3: Simplifying a story without losing its rigor.	Achieving a balance between rigor and simplification.	
	127	P4: If the story is too technical, it maybe does not fulfill its objective to communicate.	Few will understand a story if it focuses too much on the technical.	
	127-128	P5: If the science story is very simple, few readers will grasp the essence of the study.	If a story is very simplified, few will understand the value of finding.	
	128	P6: Search for the original source of the research.	Look for the scientists.	
Modesto Montoya	133	P1: Report on topics that hold the attention of the public.	That the story is attractive to interest the public.	
Myra Flores	141	P1: Journalists do not consult the paper.	Do not search for the main source.	
Patricio Valderrama	146	P1: Scientists are trained to speak in complex terms.	Tendency to use complicated terms because of the profession.	
	147	P2: My wife, who is a communicator, helped me by checking the text for my podcast.	Support from a person who can help simplify the language.	
	147	P3: She sometimes says she does not understand, that I should look for a simpler word.	Use complicated terms because of the profession.	
	148	P4: No one bothered to read the article.	Do not look for the main source,	
	150	P5: Explain an interesting side of a story.	Draw the attention of the reader.	
Víctor García-Belaunde	160	P1: Inform me with the most suitable expert.	Understand the topic with a person who knows it very well.	



	160	P2: Explain something complex in an easy way so the public understand.	Try to help others understand the topic.
Barbara Fraser	163	P1: That the text is understandable to a person without science background.	Lay audience can understand the story.
	163	P2: It is not enough to research; the story should hold the reader interest.	Research must be accompanied by a story in order to generate interest.
Bruno Ortiz	170	P1: Journalists should explain the science development so that people can adopt them in a better way.	Public can understand the impact of technology in their lives.
Hildegard Willer	172	P1: Search for the scientist.	Do not search for the main source.
	174	P1: Journalism always looks for a story, science no.	An interesting story is fundamental for science journalists.
	174	P2: Journalists have a different space and reader than scientists.	Explain the discovery in a simple way and in less space.
	174	P3: The science story should be interesting and rigorous at the same time.	Achieving a balance between rigor and attractiveness.
Milagros Berríos	174	P4: The finding must be something relevant for society.	The greater the relevance of the discovery, the greater the public interest.
	179	P1: How to approach the story and make it interesting.	That the story is attractive to interest the public.
Víctor Román	180	P2: Scientists should not be your only source.	Search for different sources.
	182	P1: That there is something that reader can relate to.	Something close to your experience can increase interest.
	182	P2: Reader should understand.	Reader should understand.
	182	P3: Information the reader is receiving is important.	Information might have an impact on the reader.
	183	P4: Trying to surprise the reader.	Surprise is a factor to hook the reader.
Zoraida Portillo	188	P1: Communicate in simple language, so people can understand.	Simplify complexity for the public to understand.

	188	P2: Explain why that topic has been covered.	Explain the relevance or impact to the public.	
	188	P3: Present a diversity of sources.	Plurality in science journalism.	
	188	P4: That they are authorized sources.	Search for the most suitable experts for the topic.	
	188	P5: If the information is helping the public.	To know if the story has had the desired impact.	

### 10) How do financial factors influence science journalism reporting in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	128	P1: If you are a freelancer, it is difficult that a media wants to buy a science report.	Freelance science journalism is not profitable.	Limits field research
	128	P2: If you want to research a lagoon, you have to go to the lagoon or the laboratory in another city.	Research on science requires to travel to another place outside Lima.	Science journalism is not profitable
Gisella Orjeda	131	P1: Editors believes that this kind of news is not going to attract people.	Science is not profitable.	Hinder the possibility to study outside a specialization
Modesto Montoya	135	P1: CONCYTEC has very little money compared to similar institutions in other countries.	There is no enough money to support or promote this specialization.	Hinder telling more narrative stories
	136	P2: Media is not interested in the promotion of science.	Science dissemination does not receive financial support..	
Myra Flores	141	P1: Good production needs money.	Money is necessary for a good product.	Institutions may pay to journalists to cover research
	141	P2: There was a lot of expectation on this science show, but the budget was short.	Despite expectations, the lack of resources affected the final product.	
	141	P3: Wish to explain science with animation, but the cost was very high.	Lack of resources prevented interesting explanation of a scientific topic	
	142	P4: Youtubers make interesting things with a low budget.	Despite the lack of resources, it is possible to make attractive products.	
Patricio Valderrama	145	P1: There are course in other countries, but it is difficult to move.	Studying abroad is expensive.	
	149	P2: Several times journalists have cancelled an interview to report on a reality show girl.	Science news is at a disadvantage compared to ones that is more profitable.	

	149	P3: Nobody gives money to an analysis of the last epidemic of dengue.	No one is going to support fieldwork in Peru.
	150	P4: No one sponsors the podcast and it takes me a long time to do it.	No money making podcast.
V́ctor Garća-Belaunde	157	P1: A pseudoscience show would have more audience than a science or skepticism show.	Science news are not profitable than pseudoscience.
	158	P2: Science journalism has a small audience.	Due to the small audience, science news does not generate much profit.
	158	P2: Science is not a topic that generates a lot of rating.	Science news are unattractive thus not profitable.
Barbara Fraser	163	P1: Fieldwork expenses are always an issue.	Fieldwork expenses.
	163	P2: Specialization is difficult because of cost of doing.	High cost of specialization.
Bruno Ortiz	168	P1: If I ask for expenses for a fieldwork, the editor will tell me not to do that report or to call the researcher.	Fieldwork is not supported due to the costs it generates.
	168	P2: Last time a reporter went on a field trip, but he had to pay his own expenses.	That the journalist should pay for the fieldwork plays against science journalism reporting.
Hildegard Willer	174	P1: Journalists need to travel a lot and spend time in the field.	Fieldwork represents a significant investment of time and money.
	174	P2: Media will not fund a report that takes two weeks.	Investment in time discourages economic support from the media.
Milagros Berrios	178	P1: If the research was in Lima, there was no problem.	The economic factor has no impact if the reporting is in Lima.
	178	P2: Once there was research in Chachapoyas, but travel expenses frustrated the trip.	Fieldwork expenses limit the reporting of science journalism.

	178	P3: Everything was ready for the trip but in finally they told us they couldn't afford the trip.	Although everything was prepared, the economic factor was more relevant.	
Víctor Román	183	P1: With more resources, journalists could make more engaging stories.	More attractive stories depend on more resources.	
Zoraida Portillo	188	P1: Big companies pay journalists to report on their products.	Economic factors may bias the reporting of science journalism.	
	188	P2: Media do not have budget for fieldwork.	Fieldwork in science journalism is restricted.	
	188	P3: Some organizations pay the expenses of journalists.	Lack of resources in media causes an institution to pay journalists' expenses.	
	188	P4: The international press who came to an event did not want to receive the full amount of expenses.	Economic factors can generate a conflict of interest when an organization pays for the expenses.	

### 11) Which other factors restrict science journalism reporting in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	128	P1: Universities do not have a course of science communication for scientists.	Scientists do not learn how to communicate science to a wider public.	Lack of specialization Science news published in other sections
	128	P2: Scientists are not taught how to divulge science.	Scientists have trouble communicating science easily.	
Gisella Orjeda	131	P1: Newspapers, television and radio editors do not find interesting science stories.	Science stories are not considered newsworthy.	Ignorance of editor about science topics Language of sources Lack of experts in certain fields
	131	P2: Publishing science news is not going to attract people.	Science news are going to lower the readership/the audience.	
	131	P3: Ignorance of newspapers editors.	Newspapers editors does not understand the relevance of science.	
Modesto Montoya	133	P1: Peruvians are at primary level with respect to scientific knowledge.	Scientific illiteracy as an obstacle.	Little scientific production Lack of technological industry
	136	P2: Lack of interest of the population.	If people do not consume science journalism, media considers it unnecessary.	
Myra Flores	142	P1: The low cultural level in science of the population.	Scientific illiteracy as an obstacle.	Self-censorship
	142	P3: The same scientists are interview about different topics.	In certain topics there is a lack of researchers.	
	144	P2: The lack of a person who knows about the topic and can check the article.	A colleague with expertise who can check the text.	
Patricio Valderrama	145	P1: In Peru there is no specialization or short course on science journalism.	No specialization course in Peru.	
	150	P2: Sources are in English; you need to translate them.	Journalists need to spend more time working in the story.	
	150	P3: Writing science stories takes more time.	More time to write a story.	

	150	P4: There are not many specialists on certain fields.	Certain topics are going to be difficult to report due to lack of sources.
	150	P5: Finding an expert in these fields where there are few is even more difficult.	Suitable sources in very particular fields are unreachable.
V́ctor Garća-Belaunde	155	P1: There is still no idea in Peru that science is going to take us forward.	Science illiteracy hinders giving relevance to science.
	159	P2: Science news are sometimes in the culture section	Science news is minimized and included in another section.
Barbara Fraser	161	P1: Countries that have more scientific research, has more science journalism.	Scientific journalism is little because scientific production is limited.
	162	P2: Science journalists should be able to speak and read English.	Speaking and reading English.
	162	P3: It is harder to get media interested in specialization.	Media is not interested in specialized their journalists in science.
	163	P4: There is a lack of specialization of journalists.	Lack of specialization of journalists.
	163	P5: There is some fieldwork in rough locations that is complicated due to physical effort.	Rough locations can limit science journalism reporting.
Bruno Ortiz	169	P1: CONCYTEC do not have the rank of ministry.	The government body in charge of science popularization depends on other ministry.
	169	P2: Lack of knowledge and the dynamics of science journalism.	Problems in the approach of a science story.
	169	P3: Journalists are not formally trained in this specialization.	Lack of training avoid the practice of good science journalism.
	169	P4: Science news are sometimes in the international or miscellaneous section.	Science news is minimized and included in another section.

Hildegard Willer	172	P1: There is little science journalism because there is also little scientific production.	Scientific journalism is little because scientific production is limited.
	172	P2: Journalists who do not know English.	Not knowing English is an obstacle for searching sources.
	175	P3: In Peru there is no high-tech industry.	Lack of technology industry limits a source for science stories.
Milagros Berrios	176	P1: Sometimes science news is published in the local or international section.	Science news is minimized and included in another section.
	178	P1: Breaking news has a priority when it comes to coverage.	Science news are left behind when breaking news happen.
	178	P2: Science topics are complex and need more time to do.	Takes more time to develop a science feature.
Victor Román	182	P1: Innovation is still in its infancy.	Less innovation, less range of topics to cover.
	183	P2: Lack of specialized scientists in Peru.	Certain topics are going to be difficult to report due to lack of sources.
Zoraida Portillo	187	P1: Journalists do not receive a training in science journalism.	Lack of training avoids a correct science journalism.
	189	P2: Editors give little importance to the topic.	Editors minimize reporting science news.
	189	P3: Self-censorship because journalists do not know how to cover science and their editors are not interested in it.	Both factors lead to a situation of total restriction of science journalism reporting.
	189	P4: There is no level of organization within people who are interested in these topics.	Lack of organization prevents Peru to be part of World Federation of Science Journalists.



### Category C: Future perspectives in science journalism reporting

#### 12) Which factors do you think could enhance the reporting of science journalism in Peru in the future?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	128	P1: CONCYTEC is promoting a course of science communication for scientists and journalists.	This course will help both to have a better treatment of topics.	Implementation of courses for journalists and scientists
Gisella Orjeda	131	P1: CONCYTEC should have a strong policy for science popularization.	Government body must put more effort in supporting dissemination.	Online science journalism courses
	131	P2: Conyctec could organize contests to award print media that publish science stories.	Prizes to Encourage better science journalism.	More space in free-to-air television
	131-132	P3: CONCYTEC should research the situation of science popularization in the country.	Based on this evidence, develop policies to improve.	Creation of an association of journalists and popularizers
	132	P4: President of CONCYTEC should do a benchmarking of science journalism in other countries.	Adapt what is done well in other countries to the Peruvian context.	The role of CONCYTEC
	132	P5: Organizing science slam in Huaraz.	Science slam can make it easier to search for stories about science.	Make politicians understand the relevance of science journalism.
Modesto Montoya	137	P1: The main factor is the interest of the population on science.	The more interest on science, the more science journalism production.	
	137	P2: Make the politicians understand the importance of science journalism.	Convincing politicians of the importance of this specialization.	
Myra Flores	143	P1: Scientists should have a course of science communication.	A course to help scientists to explain their research easily.	
	143	P2: A course in communication faculties to train journalists to learn basic science topics.	A course to help journalists to better understand science.	

	143	P3: Organize a science camp to bring together scientists and journalists.	Bringing the both together can improve collaboration between them.	Developing awareness among media and editors about this specialization.
	143	P4: A show in free-to-air television.	New spaces in television.	
Patricio Valderrama	146	P1: That the tweets of the scientists were published with a greater length on a newspaper.	New spaces in print media for scientists.	Organizing science slam  Better collaboration between journalists and press offices of research centers
	149	P2: Science journalists should take advantage of when science is trendy to report on it.	Report especially when science is in trend.	
	148	P3: CONCYTEC could have a group of scientists to explain science.	A group of scientists that explain science.	
	151	P4: Media should train journalists.	Media must invest in science training of journalists.	
	151	P5: Editors need to know that science stories take more time than other topics.	Editors should understand the production of science stories.	
	151	P6: Add a little more science to journalist training.	Include some science course in the education of journalists.	
V́ctor Garća-Belaunde	154	P1: Hold the attention of the public with pseudoscience and then explain why it is a lie.	Use pseudoscience as an excuse to explain science.	
	158	P2: Present better products to generate interest in the public.	Better science journalism products.	
	159	P3: State should invest more in science show.	Government must encourage science dissemination.	
	159	P4: Create science dissemination content for adults.	Science journalism can benefit if it exploits this niche.	
	159	P5: More people are able to study a scientific career.	These people will have interest on science issues.	
	160	P6: Media coalition to deal with pseudoscience cases in the media.	A coalition to report and expose pseudoscience.	

Barbara Fraser	163	P1: Media directors understand the relevance of communicating science.	Enhancing of reporting depends on the importance given to science journalism by the media.
	163	P2: Improve science education through science journalism.	If public becomes more scientifically literate, they will ask for more information on scientific subjects.
	163	P3: Media encourage journalists to specialize.	Media must invest in science training of journalists.
	164	P4: Universities start to offer some specialization in science.	Specialization in universities.
	164	P5: Knight Center and The Open Notebook offer online course in science.	Journalists can train themselves online in science.
Bruno Ortiz	169	P1: National media, preferably free-to-air, encourage more space for science.	New spaces in television will encourage more reporting.
	169	P2: Science journalists should be open to contribution from non-specialists.	Previously reviewed collaborations can increase production of science stories.
	170	P3: A group of people who are interested in science communication are getting organized.	Improve networking within people who are interested on these topics.
	170	P4: Members of the group could help train people interested in the topic.	Training for people for non-specialist who want to contribute.
	170	P5: The group can press for more spaces where science is discussed.	Promote the creation of spaces in media.
Hildegard Willer	175	P1: Accessibility and promotion of scientific institutions.	Scientific institutions need to support a better science communication.
	175	P2: Organizing science slam.	Science slam can make it easier to search for stories about science.
	175	P3: A specialization course for journalists.	A course to help journalists to better understand science.

	175	P4: Website such as The Open Notebook that has article about this topic.	Online resources for journalists to train themselves.
Milagros Berríos	181	P1: Stories about science should have a more literary approach.	Literary approach can increase the interest of the public.
	181	P2: Use more audiovisual elements.	Audiovisual elements make a scientific story easier.
	181	P3: It would be good if the media were interested in specializing their journalists.	Media invest in training in science journalism.
	181	P4: Take an advantage from a situation related to science to talk about these topics.	Report especially when science is in trend.
Victor Román	183	P1: Give science more space in television.	New spaces in television will encourage more reporting.
	183	P2: The guild of science journalists will help to fight pseudoscience.	Science journalism reporting will be more important than pseudoscience.
	184	P3: A couple of faculties should teach a specialization.	A course to help journalists to better understand and communicate science.
Zoraida Portillo	190	P1: Training for journalists should be improved.	A course in professional curricula to specialized in science journalism.
	190	P2: Raise awareness about science communication with scientists.	To make scientists understand the importance of science communication.
	190	P3: Better collaboration between journalists and offices of institutional image.	Scientists could be easier to reach for an interview.
	190	P4: Make politicians understand that science journalism is fundamental to society.	Make politicians understand the relevance of science.
	191	P5: There are online practice such as SciDev guide for scientists and journalist.	Online resources for both to train themselves.

### 13) Which fields of science journalism could be improved in Peru?

Interviewee	Page	Paraphrasing	Generalization	Reduction
David Castro	129	P1: Health issues is always a priority.	Because of their importance, health issues.	Environmental and ecology  Tropical diseases and epidemiological topics
	129	P2: Biodiversity, conservation, environmental issues are going to benefit a lot because all points to mining.	Biodiversity, conservation and environmental.	
Gisella Orjeda	132	P1: People want to know about the research done in Peruvian natural resources.	Research in Peruvian natural resources.	Natural phenomena  Work of Peruvian researchers
	132	P2: There would be a natural demand.	Curiosity on this topic could help the improvement this field.	
Modesto Montoya	137	P1: Environmental topics.	Environmental.	Space science, Peruvian satellite  Agriculture  Computer science  Mathematics
Myra Flores	143	P1: Agriculture gives the possibility to talk about chemistry, biology.	Agriculture.	
	143	P2: Environmental issues because of mining.	Environmental issues.	
	143	P3: Research of specific phenomena in our country such El Niño.	Research on phenomena that affects the country.	
Patricio Valderrama	143	P4: Peru has a lot of potential on tropical diseases.	Tropical diseases.	
	151	P1: Peru-SAT, the Peruvian satellite, was a wasted opportunity to explain space topics.	Peru satellite and space topics.	
	152	P2: Peruvians think that one can look to the sky and see the satellite.	Peruvian satellite topic needs to be improved.	
	152	P3: There are incredible Peruvian talents that have surprising findings.	Science journalism should focus more on right scientists.	
	152	P4: Media do not portray these fantastic scientists.	It is fundamental to report on these scientists.	
	152	P5: Natural sciences that is what affects Peruvian most.	Natural science.	

Víctor García-Belaunde	159	P1: Advances generated by scientists in different fields.	Advances in different fields.
Bruno Ortiz	169	P1: Tropical diseases that are present in many parts of Peru.	Tropical diseases because they are an issue in Peru.
	169	P2: Issues related to computer science.	Computer science.
Hildegard Willer	175	P1: Sustainable agriculture and climatology will develop.	Sustainable agriculture and climatology.
Milagros Berríos	179	P1: There is not much reporting about basic science such as mathematics.	Basic science such as mathematics.
	179	P2: Show a national panorama not focus only in Lima.	Report on findings outside Lima.
Víctor Román	184	P1: Biology due to Peruvian biological wealth.	Biology because Peru offers a great diversity in this field.
	184	P2: Computer science should be promoted.	Computer science.
Zoraida Portillo	190	P1: All topics, especially the ones that are not mainstream.	Fields that are not frequently portrayed in the media.
	190	P2: Everything that has to do with aquatic resources.	Aquatic resources.
	190	P3: In health, epidemiological topics.	Epidemiological topics.

**14) How do you evaluate the development of science journalism in Peru in the next five years?**

<b>Interviewee</b>	<b>Page</b>	<b>Paraphrasing</b>	<b>Generalization</b>	<b>Reduction</b>
David Castro	129	P1: Science journalism will be not only in print media, but it will have programs in television.	Science journalism will have a space in television.	Science journalism in Peru will develop in the next five years.
	129	P2: Larger and popular tabloids will report rigorously on science.	More science journalism in newspapers that do not report on it.	
Gisella Orjeda	132	P1: No development if CONCYTEC does not have a clear of vision of this issue.	No development if government body does not change its policy.	Skepticism about this development.
Modesto Montoya	137	P1: It is going to develop but slow because there is no interest from the state.	Slow development due to lack of interest from the state.	
Myra Flores	144	P1: It will improve with the diploma on science communication that CONCYTEC will launch.	There is going to be an improvement with the possibility of specialization.	
	144	P2: Communicators of government institutions are willing to participate in this diploma.	In the next years journalists will increase their knowledge about scientific issues.	
Patricio Valderrama	152	P1: Science journalism is going to grow.	There is going to be a development.	
	152	P2: Science and technology journalism are going to separate from each other.	Distinction between science and technology journalism.	
Víctor García-Belaunde	160	P1: Science journalism has to increase.	There is going to be a development.	
Barbara Fraser	164	P1: It will improve because people are more aware of issues like climate change.	Awareness of science issues will develop science journalism.	
	164	P2: There will be more demand and more production.	Science journalism will develop due to an increase on content.	
	164	P3: I do not if it will grow fast.	Probably the development will be slow.	

Bruno Ortiz	170	P1: There is a hope it will improve with the creation of guild of journalists.	Probably there is going to be a development.	
Milagros Berríos	180	P1: No improvement at all without specialization.	There will be no development if no specialization is established.	
	180	P2: No improvement if media do not focus more on.	Media's disinterest in science will limit development	
Víctor Román	184	P1: Optimistic about the development of science journalism.	There is going to be a development.	
	184	P2: Technological development is leading us to an improvement.	Innovation is fundamental in this development.	
Zoraida Portillo	190	P1: The improvement depends on the people who are interested on the topic.	There is going to be an improvement.	
	191	P2: Universities should give importance to these issues.	Development depends on the interest of universities.	
	191	P3: In the next few years there is plenty of space to develop.	There is great possibility of improvement.	



## **Appendix 4: Interviewee David Castro**

**Interviewer: My first question is: what do you think are the main tasks or functions of science journalism in Peru?**

I think that the main function that science journalism should have here in Peru is to educate because unlike other countries, compare it with the United States or Europe, the level of scientific culture of the population is quite low. If you as a science journalist show the latest advances in science without explaining the background, people will never find you interesting. First, we educate. Then, we show what it is, what a scientific advance consists of and we explain what it is for. Also, in Peru, science journalism would be important to show how the advance of technology can somehow benefit the quality of life of people, especially those who have many needs here in the country. People who suffer from malnutrition, anemia who do not have access to drinking water, basic health services, medicines. So there are alternatives that are being developed, but people don't know about them. For example, there is a case of researchers who have begun to develop cookies against anemia based on the resources of the area. But there are things that we do not know and we don't encourage them either. The third thing is to generate an informed public opinion. If there is no investment in these technological and scientific advances, it is because the decision-makers do not give it the importance that science has for the development of the country. Congressmen and decision-makers finally act based on people's pressure. If people put pressure on an issue, then politicians go and support that issue. If we have a population that is aware of the importance of science, then it can generate that decision-makers also contribute more or invest more in this type of advances or research.

**Interviewer: What do you think are the most popular fields of science in Peru? The topics that are most covered**

The most covered are health. Health is the first topic that is covered the most, and pseudoscience is also quite covered. For example, news that goes against vaccinations, against Western medicine. There is also a lot of alternative medicine that often has no scientific basis. Secondly, the environmental issue related to mining activity, reports on the effects of mining, both informal and legal in the river basin, on crops and on people's health. These are the main points where the news is focused in relation to science.

**Interviewer: How do you think science journalism has improved in the last five years in Peru?**

In the last five years what I have seen most first is more presence of science in the media. *El Comercio* already has a daily page in the printed version about science. It also has a science section on the website. It has its Twitter account where it shares news related to science and technology. Second is that more national science-related television shows have begun to appear. At one point there was Mad Science, which was later called Experimentores, in charge of Ricardo Moran and Channel 7 through its platform IPE. Channel 7 has begun to

bet on shows such as Umbrales and is also beginning to broadcast educational shows on science from other countries. In the radio are the always had a presence in health issues. Dr. Huerta has been in RPP for many years. We have also seen the proliferation of online media about science such as N+1. Journalistic research pages that are focusing a lot on science, mining and health issues such as Ojo Público, which has done several reports on HIV, the cost of medicines, the effects of mining in the Amazon among others. Since has become much more visible in recent years compared to what it was a decade or five years ago.

**Interviewer: How developed is science journalism in Peru compared to other Latin American countries?**

Well, let's say we're still at an early stage. We have a very incipient science journalism. Very few people do it properly. But if I have seen, there have been some journalists who are beginning to develop their own contents, their own reports related to science. I've seen so much in *El Comercio* through *El Dominical* that it's a Sunday supplement. *El Dominical* focuses mostly on what is science, philosophy and culture. There are very good articles about science journalism because they take a topic for each week and develop it from a philosophical and cultural scientific point of view. But it doesn't compare to what's in Argentina. Argentina has a very strong science journalism in *Clarín*. There is a very strong agricultural journalism in Argentina. In Chile it also has a scientific journalism and apart from that it has an institution that promotes a scientific culture in the country. Colombia also, *El Tiempo* has good science journalists. Mexico also. We are just beginning, but we are no longer like Ecuador or Venezuela, where we don't hear much about the dissemination of science in these countries.

**Interviewer: What factors do you think support the writing of a story from the moment you find it to the moment you write it?**

What I've realized in the last few years, since I started writing about science on *El Comercio*'s personal blog more than ten years ago, is that people are very attracted to you telling them stories. Don't just explain the scientific advance, but the background. So I develop that so that it catches their attention and from there I put a little bit of what the scientific study is about. In my last years I've learned to tell a little more stories, to make history a little more literary, to have a plot, a common thread that will lead you to develop that. Before I focused more on the study, what it consisted of and explain the concepts. Now you have to give it all a background and the impact it can have on your day-to-day life. Nowadays, digital media has helped me a lot. There are many things that can be explained through images, very elaborate and explanatory infographics that allow you to save several paragraphs with an image or a video that helps you complement the idea. Even memes are fashionable, making memes with a scientific character also without realizing it helps you to explain a subject. All the advances that the digital platforms have had help you a lot in the development of the news, of the stories. In press, infographics are also used a lot to complement a journalistic report.

**Interviewer: What sources do you frequently use to find both local and international news?**

What I do to select a topic and write on the blog is simple. I use a platform that is Feedly. Feedly is a channel where you follow RCS sources. In Feedly you subscribe to different pages. I subscribe both to US science blogs mainly and from Europe and the websites of the different scientific journals: *Nature*, *Science* and the whole range within them. Every day I review Feedly and see first the title of the article. If it catches my attention, I go to the abstract. When I go to the abstract and see that I find it interesting and that it is related to something that directly involves the country, I read it and from there I write the article. That's my main tool.

**Interviewer: Is Feedly only to find international sources or also national?**

It is an application where you put a web page and every time the web page publishes something you are alerted. It is like an email where all new generated content is loaded. Don't you know? This application, I follow these pages. These are blogs and science pages. Here I also have journals: *Nature*, *Science*. And science pages. Every time a new scientific article comes out, it appears here and you read it. The first thing that catches your attention is the title.

**Interviewer: In Feedly do you have a page from Peru?**

Only *El Comercio* and N+1. What I try to do is... First, I see some article that catches my attention. Then I see if it has been approached in a local media. At least, first in Spanish. If they have made a good approach, they usually do it very well in the Spanish or Mexican pages or in *El País*. They approach the subject very well. MIT also has a magazine that is the *Technology Review*, which also publishes very good Spanish-language articles. I don't focus so much on writing about them, I just share the news. I focus on that which has not been commented on or where very little or a very superficial approach has been taken. So, I select from the seven articles I read each day, and you choose two or three. And of those three you keep one to make a more elaborate note. That's the flow I make to write an article

**Interviewer: In your opinion, how accessible are these sources?**

Today they are quite accessible. Accessing a scientific article used to be extremely complicated. Nowadays, through platforms like Sci-Hub, you put the link of an article and you can download it freely. And not only that, most scientists and authors of articles have Twitter accounts. For example, I have tried many times to ask questions directly by direct message and they answer you. For two or three articles I have done it. In those cases, they were Peruvian authors. The research was not done in Peru, but it is related to the country. One investigated Chagas disease: how the guinea pig transmitted Chagas in a population of Arequipa. The people who raised guinea pigs were more likely to suffer from Chagas disease than others. The author of this article works in the United States. The only way to contact

him was to google him. I found his email and most of them have their Facebook and Twitter already published. You contact him very quickly and ask him to absolve you of your questions. They can arrange a Skype interview. Nowadays it's quite easy to go deeper into a subject and get the same source that wrote the article to explain to you and go beyond what the paper says.

**Interviewer: How does collaboration between journalists and scientists work in Peru?**

There is still a kind of divorce. It also happened to me when I was still a researcher many years ago. I didn't like the way journalists often approach scientific subjects. For us, they often do it in a very superficial way, very simplified, very banal. The most banal part of the article is the one they magnify. Sometimes they tend to be a bit sensationalist. But when I've started to get a little involved in journalistic writing, all those courses I've taken, you realize that this is a bubble in which scientists live. They try to explain as technically as possible in order to gain or maintain a status. And when they tend to simplify things they assume or believe that they are lowering their level so to speak. So that's what happens in older scientists, let's say. In the younger ones you can already see that there is a certain openness, a certain tendency to explain their research with social networks or with blogs that are free. They can do it through Twitter or they do it through articles in blogs. They are already beginning to disseminate their work. What is missing now is simply for the journalist to search directly for the original source of the article. It is missing that the journalist, as well as in economic matters, knows the expert in such a subject, searches for it and knocks on the door and asks. That's a bit missing in the subject of science. In science we mainly look for those who are better known. For example, if you want a doctor to talk about a specific topic—and medicine is a very broad topic—you always look for Dr. Huerta, even though there are many researchers who also know the subject and maybe in greater depth because it is their specialized field. On cancer, they go to Huerta. But in the subject of cardiology sometimes they also go to Huerta although... What the journalist lacks is a little research on who are the experts in each subject and where to get them in the country, as they do for issues of politics, economy. They look for I don't know where but they find it and suddenly many people don't know it, but it turns out to be the most suitable to give their opinion on the subject.

**Interviewer: What are your main concerns when writing an article?**

One of the main concerns is the quite complicated balance between simplifying a lot and the reader misunderstands what you are trying to communicate. That by making it easier to understand you use analogies that I'm often afraid people will take it too literally. That can lead to confusion instead of better explaining a subject. It's a risk that always frightens me: to what extent to simplify a story but not lose its essence and rigor. That's always going to be a rather difficult balance to manage. If you make it very rigorous, very technical finally it can be a good article. But if nobody reads it, it does not fulfill its objective that is to communicate and to transmit a knowledge. If you make it very simple you can gain a wider audience, but

few will grasp the final essence of the study that has been carried out. That balance is the one that always causes concern. How to achieve that balance? That's with practice.

**Interviewer: How do economic factors influence science journalism reporting in Peru?**

I think that if you already work in a media outlet and it's part of your job to do that kind of reporting, it's quite simple. Because part of your job is going to be calling, arranging interviews and writing the story. If you're a freelancer, it's quite complicated because it's very difficult to write a report of 2000 words, and that a media is interested in buying it. What it takes to write a science report is greater than what it would take to write a crime, political or economic report. You need to do field research. Go out, find out and ask the questions. Many times, the researcher is not as accessible as if you have him in other areas. Maybe, for example, if you want to research bioremediation of the lagoon, you must go to the lagoon or go into the Amazon or go to a laboratory located in another city. On the other hand, in economic and political matters, you always have experts on the subject at hand, unlike sciences where you should go out to the countryside to look for them sometimes.

**Interviewer: Do you think there are other factors that restrict the practice of science journalism?**

Yes, I think that there is also something that I always complain about and criticize is the universities that train future scientists and researchers. All the universities - San Marcos, Cayetano, Villarreal, La Agraria -that train scientists do not have within their curricula a science communication course. No matter how willing the researcher may be to transmit his knowledge to a journalist, if a researcher don't take this science communication course it won't be easy to explain to this journalist what his work consists of. The journalist is not going to understand it well either. Finally, there is going to be a story that will bother the researcher because it doesn't reflect what he wanted to say, as well as the journalist because when he does it so complicated, he doesn't write a good story. Unfortunately, no one is taught how to divulge or make the explanation of their work simpler so that they can have a larger audience and more people know about it.

**Interviewer: And apart from this precision, do you think there is any other factor that could help this reporting in science journalism in Peru?**

Yes, I believe that CONCYTEC<sup>1</sup> has set to work on it, organizing science fairs and promoting, for example, a diploma course in science communication. This will help researchers to become more interested in disseminating their results. Not only their own but also the results of their field, of their area for a wider audience. And it will help journalists to have greater capacity of basic knowledge of science to be able to capture the message and explain it in the best way.

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<sup>1</sup> The governmental body in charge of the field of science, technology and innovation.

**Interviewer: Which fields of science do you think could benefit most from these factors?**

Without a doubt, the subject of health, the subject of health is always going to be the priority and fundamental. The second issue that is going to benefit a lot is the topic of biodiversity, of ecosystems, its conservation because finally everything points to mining. Everything that refers to the environmental issue and the biodiversity that the country has is where it will benefit most if scientific journalism develops in Peru.

**Interviewer: Finally, how do you evaluate the development of science journalism in Peru over the next five years?**

I hope that in five years there will be more media not only in the press, but also a half-hour or an hour program about science on Canal N or RPP. There should also be a science sequence within the programs. You already have a three-hour program on Canal N or RPP from 6 to 9 in the morning, but there must be a space dedicated to scientific topics. I see that in five years there could be that. And that more print media such as *La República* and others for a larger audience such as *Trome* or *Ojo* have more sections that talk about scientific issues in a much more rigorous way.

**Interviewer: There's something else you'd like to add about science journalism in Peru.**

If it occurs to me, I'll send you an email and explain what I had in mind.

## Appendix 5: Interviewee Gisella Orjeda

**Interviewer: What do you think are the main functions of science journalism in Peru?**

I believe that the main functions of science journalism are the same in all parts of the world. To report interesting and new things to various audiences, to the general public but also to decision-makers. Why to the general public? So that they know that science has to do with their lives, with every aspect of their lives. And to the decision-makers so that they know in a simple way what is happening in the scientific world.

**Interviewer: For example, in Peru, is fighting against pseudoscience also a function?**

That is implicit in the first point. If there's a lot of science news that's going to educate people.

**Interviewer: In the Peru, what do you think are the most popular science topics?**

Currently, there is no popular science topic in Peru. There is really no one who is dedicated to disseminating science in Peru. as if there is for example in Argentina, in Chile. I can think of Víctor García-Belaunde son, who has La Manzana Escéptica which is a YouTube show. For example, this man who had his page in *El Comercio* for a long time: Tomas Unger. Actually, he didn't divulge science, he divulged some, but a lot of technology. Then the Science page of *El Comercio* is mainly about technology. Bruno Ortiz works there. The effort that Claudia Cisneros made in her page, with Sophimania has remained on hold because she is doing her master's degree. But I don't know many others. Are there any others?

**Interviewer: I know in Peru the portal N+1**

Yeah, but it's not in Peru. It's Russian and they've opened a... But it's not a Peruvian portal. Because otherwise we also mention SciDev. There is SciDev and N+1 but they are not Peruvian initiatives. But there is an incidence here in Peru.

**Interviewer: How much science journalism has developed in the last five years in Peru?**

A little bit, but it's really a long way off. I have started with some blogs about the trip to Antarctica that we have done at INAGEIM<sup>1</sup> and that have been quite successful in truth. The portal of Científicos.pe. In Peru that's all. I can't find much more.

**Interviewer: In comparison with other Latin American countries, how developed is Peru?**

We are completely behind in science journalism. One of the main problems is that newspaper, television and radio editors don't find it interesting, they don't think it's newsworthy. But they think the horoscope is news. Dr. Huerta is someone who makes a lot of medical science popularization. Don't forget it.

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<sup>1</sup> Acronym in Spanish for National Research Institute on Glaciers and Mountain Ecosystems.

**Interviewer: And when producing a science news, how accessible are the sources?**

They are not accessible. After I bought a whole database of papers, CONCYTEC<sup>2</sup> restricted the access. There is no longer that access. For example, I pay for my own access to *Science* or *Nature*.

**Interviewer: In your opinion, how do you think the collaboration or interaction between the scientist and the journalist in Peru is?**

Zero. We are afraid of them. Journalists don't understand anything. We tell them one thing and they take it to fantasy.

**Interviewer: How do the economic factor influences when producing a science news?**

Well, that's the editors' excuse. That putting that this kind of news isn't going to attract people for reading and it's going to lower interest.

**Interviewer: Do you think there is any other factor that limits or restricts?**

Yes, the ignorance, the ignorance of the newspaper editors.

**Interviewer: What factors would benefit the production of science news in Peru?**

This has to start from the governing body. There has to be a policy for the popularization of science. We should do, for example, national contests in which the editor of a magazine or a newspaper wins something, for divulgation. The editor, the journalist, the newspaper. To really do something like that.

**Interviewer: What about specialization?**

I think so too. It's just that there isn't much demand for people who studied biology, physics or chemistry and suddenly decide that they no longer want to be a scientist and want to become a science journalist. But there has to be someone has to want to hire him and there's no such thing. This is something that has to be traced from CONCYTEC.

**Interviewer: How do you assess the development of science journalism in Peru over the next five years?**

As long as the current president of CONCYTEC continues without any vision, that development is not going to happen. Someone with a much greater vision has to come in.

**Interviewer: And in the case of CONCYTEC, what do you think its task should be to promote or benefit science journalism?**

In the first place, everything comes from the president of CONCYTEC, the vision has that person. Analyze the evidence of the situation, how we are in popularization, how we are in

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<sup>2</sup> The governmental body in charge of the field of science, technology and innovation.



pseudoscience, how we are in the newspapers in the question of popularization. But also how we are in researchers, how is the perception of science in people, etc. Based on this evidence, make a decision that has a vision. Then a benchmarking is done: what is done in other countries for dissemination. What kind of programs do we have to stimulate science journalists? What kind of dissemination activities, popularization? It is a renewal of science before the eyes of the public. As long as that doesn't exist, it's not going to happen.

**Interviewer: What scientific areas do you think do not receive enough coverage and perhaps it would be good to give greater support in the Peruvian case?**

None of them receive enough diffusion. Most of the research in Peru is into our natural resources and biotechnology. Logically it would be interesting for people to know about the research being done on our natural resources. I think there would be a natural demand. People are curious to know what material resources we have, how they work. Because they tell us about the richness of our biodiversity. That's why I think there's a natural curiosity, but media is more technology oriented.

**Interviewer: Finally, would you like to say something additional on the subject that I did not mention.**

I believe that scientific dissemination is fundamental, absolutely fundamental to the integral education of human beings. For the future of a society with citizen values. To eliminate superstition. For society to have more self-confidence. I believe that we have to work much more on the dissemination of science in different ways from civil society, from universities, etc. We have to bring scientists into contact with people. I continue to make my efforts. I don't know if you've heard of En Órbita.

**Interviewer: Yes, Víctor Román from N+1 told me.**

I am also organizing a science slam in Huaraz once a month. A science slam is the presentation of a scientist about his work in a bar. They are small local efforts.

**Interviewer: At the beginning of the conversation you told me that the blog -I have also seen it from La Mula- on the subject of Antarctica had a positive reaction. What was the positive reaction?**

Because of the number of people who have read it, the comments. I've even been called by Congress to make a presentation.

**Interviewer: In that case you consider that the Internet, social media can also...**

Yes, completely. My dream is to have time to have a YouTube channel, once I get this [brackets] out so I can talk. I often use Twitter to share *Nature* articles, explain a little. But these are minimal efforts. I have a few followers like 13 thousand, I'm going to reach 14 thousand followers. But there are 14 thousand followers in a country of 30 million.

## **Appendix 6: Interviewee Modesto Montoya**

**Interviewer: What do you think are the main tasks or functions of science journalism in Peru?**

I understand that journalists interested in science should visit the laboratories in Peru to show what is being done there. The problem is that there are few laboratories. Maybe that makes the job easier. ((laughs)). If we want to make a journalism of world interest, we would have to touch on topics with a global impact. Now global warming is of great concern. It would be necessary to visit the laboratories that have to do with snow and water, indicators of that warming. The other topic is the environment, but we should also visit the study groups that do research in this field. With regard to physics and chemistry, it is a little more complicated because there are no laboratories with high technologies. Then there will be no news on these topics. Here in Peru, the Peruvian market is interested in what is being done in the big laboratories: in CERN, NASA.

**Interviewer: Do you think that one of the tasks of science journalism in the Peruvian case is to educate the public, considering that the Peruvian reader does not have much knowledge of science?**

For the general public, it would not be science journalism, but education is needed, educational journalism. Peruvians does not have a good cultural level that allows it to make good decisions. For example, I always say that Peru is an ignorant country, lacking in science, has no knowledge and makes many mistakes in its daily life. For example, it consumes a lot of sugar, junk food, everything that science has already shown to do harm. That means he lacks knowledge. And how to take care of the environment. It is a population that is at a primary level with respect to scientific knowledge. There's also another issue: people don't seem to interest you very much. You have to report on topics that capture their attention. Unfortunately, those who attract attention are called pseudo-scientists, sensationalists. They say that they have seen extraterrestrials or that there are extraterrestrial mummies. People immediately think that these things have to be investigated because they may be true, because science does not deny anything until proven otherwise. But these groups do not allow this research, they are based on ignorance. They do not show evidence of their supposed discovery. Science is very simple, science is the one that can be demonstrated before everyone and everyone can observe and verify. If they have an extraordinary object, the object is presented, and everyone can check with a scientific method. Pseudoscience is rather based on versions that cannot be verified. But that is what attracts people. The science videos we watch in Peru, these sensationalists have millions (of views). And the videos that show how a plant works or something that should be of interest few people see them.

**Interviewer: In your opinion, which are the most popular or most covered scientific topics in Peru?**

What is consumed in Peru is the radio. The radio takes up topics that apparently interest people. RPP presents health issues, where Dr. Huerta speaks every day. There is also in the press, *El Comercio* makes great efforts with *El Dominical* to touch on diverse scientific

topics. But people hardly read these things. Regarding television, we already know. Peruvian television when it comes to culture is negative. It's all scandals, there's no interest in science. Channel 7 made an effort. I proposed a science show called Umbrales. Umbrales had three fields: science, musicology and archaeology. What attracted the most was musicology. ((laughs)). Science less. But it had its impact: we were talking about the origin of earthquakes, of minerals. That experience was very interesting. In the big media, are presented health issues and (inaudible).

**Interviewer: In your opinion, has there been any improvement in science journalism in Peru in the last five years?**

In the last five years there has been a stabilization. The big leap occurred in the nineties. I started doing science journalism because people ignored the work of scientists. And we scientists were despised, seen as weirdos. The Peruvian Institute of Nuclear Energy (IPEN) was run by soldiers who knew nothing about science. I was expelled from IPEN. In order to make known this discipline, out of this need I began to present to the population what nuclear science was and what it was for. Curiously, the media became interested in science in general. Since we lived practically in total darkness at that time, journalists and the media did not know what science was. But when they saw that I was doing this kind of work, they began to ask me about everything. There was an outbreak of cholera in Chimbote, people were dying of cholera, it's a health issue. Journalists came to me to find out what that was like. I told them: "But I'm a nuclear physicist". "Yes, but you are a scientist". Forced by circumstances, every time there was a problem I read about it. Even if it wasn't my field, I would give you an explanation. Then came Halley comet and they came to me. I would say to them, "But I am not an astronomer. Little by little I left them contacts of each specialty, to whom they had to consult. Now they don't call me, they know who to contact. Even in Fujimori's dictatorship as a psychosocial they made the statues of the Virgin cry. They called me to ask me how they did that. Then I made a statuette cry with a hygroscopic substance. It was the sensation, all the channels invited me to do that. That time was interesting because there was a total change. Then it diversified. Now journalists know who to call when there is an earthquake. But lately there has been a stabilization.

**Interviewer: Compared to other Latin American countries, how well developed is science journalism in Peru?**

It's science we're behind. When the gravitational waves were discovered, I was surfing that same day the Chilean CONCYTEC website and they were giving full information. Then I search the page of CONCYTEC<sup>1</sup> of Peru and there were only bureaucratic things. That gives you an idea. It seems that those responsible for science policy in Peru are still in their infancy. In Chile, there is a lot. I think that in the beginning we have been leaders in Peru with respect to the vulgarization of science. In 1992 we held an International Scientific Encounter and people from all over the world came. Peruvians and then came foreigners who came with their own means because nobody was paid anything. The Chileans realized that and took the

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<sup>1</sup> The governmental body in charge of the field of science, technology and innovation.

idea. The Chilean government invest to bring Nobel prizes and they do it in Congress. They do it with a lot of resources. Thirty years ago we proposed the Ministry of Science and Technology in Peru. So far we don't have that. But other countries like Chile and Colombia do. We were leaders in ideas, but our neighbors were leaders in action. (laughs). The reason for this is that in our country politicians and the government are not interested in science. They're not interested because the country depends -I say this harshly- on mineral resources, everything is concentrated on minerals. CONCYTEC has very little money with respect to what other countries have. It's a big problem. And politicians don't care. I even do exercises on Google. I'm looking for science and Sebastián Piñera. I get every time the president of Chile has pronounced the word science. Even a phrase that says "Without science and technology it's like moving forward blindfolded". But if you put science and president of Peru... I think he said something lately after we've been insisting. And the congressmen won't even talk. Politicians in Peru have their heads in another place.

**Interviewer: Do you think there are any factors that support in the Peruvian case the production of science news?**

If you talk about soccer or volleyball, they support you. But if you talk to him about science, no. We continue doing in Ceprecyt, which was founded in 1992, we look for funds for the courses. Here's an interesting detail that lately seems fine to me. When we proposed the Ministry of Science and Technology, we also proposed the career of the research scientist, which means that a research scientist was going to earn more than a scientist who is a university professor. They didn't accept the career, but Daniel Mora gave a law that allows paying 50 percent more to those who do research. But people were not prepared to do research, publications, theses. They were not prepared because Fujimori gave a law that was not necessary to make a thesis to be titled. But with this increase in state universities, it has motivated scientists to carry out research. So we give them a course every month on how to research or how to publish. That's how we get resources to spread the science.

**Interviewer: If there is a motivation to do research, that also helps science journalism because it feeds on this research.**

Because of their obligation to investigate, they are a little more interested in publishing. But they don't know where to start. It's a necessity because currently, according to the law, you can't be a university professor if you don't have a master's degree.

**Interviewer: In the Peruvian case, where do you look for local and international science stories?**

In the international ones there are many. U.S. journals on the Internet like *Science*. All developed countries have an agency like NASA. The laboratories, you enter their website and find a lot of information. If you think there is an interesting topic, you can visit the researchers. There are sources, however, within Peru it is very small.

**Interviewer: And how accessible are these sources?**

The sources are the researchers. You can go and visit them depending on the topics. If you want to know about seismology, visit the IGP<sup>2</sup>. If you want to know about nuclear physics, you go to IPEN and find out what they are doing.

**Interviewer: In your opinion, what do you think is the collaboration between the journalist and the scientist in Peru?**

Now there is quite a division of the discipline. There are few science journalists. I don't know who can be qualified... Renowned journalists, popular shows have their contacts for each discipline. If there is an earthquake RPP immediately calls the president of the IGP. They are always accessible.

**Interviewer: In your opinion, is there no longer this kind of mistrust on the part of the scientist that the journalist is going to misinterpret?**

At first, yes. When I was consulted for everyone, it was because the scientists didn't want to talk. They even considered that talking to journalists was to decrease their level. Now it has changed a bit. But sometimes there are little mistakes when they write the article. After the interview things come out that weren't original.

**Interviewer: How do you think the economic factor influences the production of science news in Peru?**

That is serious because the media is not interested. To get promotion for science is complicated. There have been shows... We started in 1992, as I tell you, and we were called from television to do extraordinary experiments, attractive, even with children. Channel 2 released a show. That's another curious thing: instead of creating something Peruvian, they paid Mad Science royalties. Paying abroad to do things in science, seems to me a little... It stopped airing; I don't see it anymore. It gives the impression that...

**Interviewer: That science doesn't sell.**

Exactly. Because the shows are canceled.

**Interviewer: Apart from the economic factor, do you think there is any other factor in the Peruvian case that limits the production of scientific news?**

Apart from the lack of resources, the lack of interest of the population.

**Interviewer: And the lack of education?**

That's the basis of everything. Peruvian education is almost non-existent. Because they don't teach you scientific curiosity. Many people believe that doing science is building complex laboratories. And they forget that science is understanding nature. They don't look at nature. When I'm going to teach a course, I asked to the audience these kinds of questions. What time does the moon rise and fall? No one has observed that. That was the first question my grandfather asked me to start my science education. I guessed and said, "At midnight." Every

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<sup>2</sup> Acronym in Spanish for Geophysical Institute of Peru.

time I ask you a question, first observe and then answer. Every day I got up to see how the moon was. The moon was growing and when it was full it was six o'clock in the afternoon. It was the first time I didn't sleep because (the moon) fell at six o'clock in the morning, just as the sun was rising. It was one of the many questions my grandfather asked me. It made me curious to understand nature, but they don't teach you that in school. No one tells you how to learn it. They don't teach you how to observe. Television -I mean Peruvian- television damage the brain because it broadcasts idiotic shows.

**Interviewer: What factors do you think would enhance or help the production of science news in Peru?**

The main factor is the interest that the population may have. That's what happens at school. If the school doesn't change, if the teaching is memorist, the school won't change. If people are interested, there will be sponsors, people who offer that service. The scientist is permanently communicating, permanently going to congresses, publishing articles. To write five pages of an article takes three months because one has to be precise. But when it's a communication with a journalist, it's simpler and less rigid. Some scientists are so caught up in their discipline that they speak in technical terms and they understand each other, but nobody understands them. It should be noted that people don't handle those terms.

**Interviewer: What scientific field do you think does not receive so much coverage in Peru and that should receive more?**

Peru needs to get out of its dependence on minerals. For this it is necessary that the young people begin to realize that by studying the materials at the microscopic and nanoscopic level they can learn to make elements for technological products. Just as developed countries have done: tape recorders, video cameras, television. These products come out of physical science laboratories. Young people should become aware and this is done with dissemination and education. Otherwise, we are wrong.

**Interviewer: In your opinion, how do you evaluate the development of science journalism in Peru in the coming years?**

I think it's going to increase slowly because there's no interest from the state. It is practically heroic works of journalists to show that science is interesting. I don't think it's going to develop very fast.

**Interviewer: Is there anything else you would like to add that you have not mentioned yet?**

We must aim to make politicians understand; it would be good to put a science journalist as a congressman. Our Congress is leading us to an increasingly complex situation. Everything that is discussed there is of no interest. And the worst thing is that we are in a period of corruption, of violence. It is important to point out that -as I said 20 or 30 years ago- street violence, street crime, the great environmental problems in Madre de Dios, in the mines, in the rainforest are going to increase dramatically because we have not known how to give importance to science. Since you don't give importance to science, your survival depends on

commodities. Even if we pollute, it allows me to survive. You destroy a river, an agricultural field because you need that material, you don't know how to do anything else. So that's dramatic and you need politicians to talk about it and change Peru. We, half joking and half serious, have put on the web: [partidodelaciencia.com](http://partidodelaciencia.com). You register there and you are our journalist.

**Interviewer: Now that we're talking about the environment, should it also be more widely covered?**

Of course. That's part of the science, the understanding of nature and where that's going to lead us. We destroy the environment in a merciless way. There we have an almost criminal, hopeless culture. In the bus you see that the one in front throws bottles into the street. That we also need: to understand that quality of life is future. One way or another, we have to be aware of this. A month ago, they found a dead whale with a pile of plastic in its stomach. But we don't attach importance to it.

## Appendix 7: Interviewee Myra Flores

**Interviewer: In your opinion, what do you think are the main functions or tasks of science journalism or science communication in Peru?**

What science journalism should do is educate citizens a little. The main objective should be to educate the population in science, because our country does not have a minimum science culture. When I've been to Spain, which also doesn't lead education in those Pisa exams, an average Spaniard has a much higher scientific culture than an average Peruvian, even a Peruvian who has gone to a good school. I believe that in the media it is almost non-existent. Maybe Channel 7 is saved. But there is no free-to-air media that does anything to popularize science. I believe that the main objective should be to provide a scientific culture, but also to value the little science that is done in Peru. Because in Peru little science is done, but it is done in some subjects. For example, about our crops quinoa, kiwicha, alpacas, vicuñas. There is also research in these fields that if we are not the same Peruvians who make known, no one else is going to disseminate it. We must also value them, even if it is 30 seconds in the free-to-air media. I think that's what's missing. For example, in Spain there is a show called *El Hormiguero*. It's funny because you can see a superstar and later there's a scientist. It's a program that reaches a lot of people. So they are putting scientific and technological pills in them and that's good because it's a massive program. Entertainment coexists well, science coexists well and I think it's excellent.

**Interviewer: In your opinion, what are the most popular scientific topics in Peru?**

Everything that is astronomy, when there is an eclipse. Or a natural disaster or an earthquake. Those kinds of natural phenomena are covered. But for example there is a Peruvian researcher who made a method for tuberculosis that is now applied all over the world and nobody covered it. In the world they know that it is a Peruvian who did that. They love us abroad and in Peru they are not aware of it. I just went to Cuzco, she's from Cuzco and they're not aware of that. Why not also talk about that kind of thing? I'm not unworthy of astronomy, I love astronomy, but you only sell what can draw people's attention. It's what I see as most popular. Nanotechnology is very much trendy, but I'm not sure if the media understands what it is. Everything that is nano or bio catches a little attention. Ecology is very trendy and I don't think it's bad because you have to take care of the environment.

**Interviewer: Has there been any improvement in science journalism in Peru in the last five years?**

I returned to Peru just two years ago. I haven't seen an improvement. Bruno Ortiz writes about science, Tomas Unger and from there I don't know. David Castro who is in *El Comercio*. He is a biologist and has done the same as me because he knows that there is a need for dissemination. We are born with that idea that is necessary to disseminate. It is the other side that worries me more, that the media itself does not yet value the importance of science. I wouldn't say that there has been... I was surprised that the IPE channel has a scientific perspective and I liked that. I know that IPE channel is in a different project than normal channels. I liked that. Seeing it this way there is a small improvement.



**Interviewer: Compared to other Latin American countries, how developed is this topic?**

We are still in our infancy. Chile has a program called Explora that is only dedicated to the dissemination of science. This year they are giving a million dollars to different universities to take care of the topic of dissemination. Colombia has an exclusive science dissemination program paid for entirely by CONACYT which is its CONCYTEC. As for the average countries, we are far behind. In Mexico, UNAM has a school for the dissemination of science; they are professionalizing it. Here in Peru there is not even a diploma in scientific writing or scientific dissemination. CONCYTEC<sup>1</sup> this year is making an effort to launch a first call for a diploma. If you want to do something you only have online courses or go to another country because here in Peru there is no offer. But it is also true that I don't know how much journalists are interested. In sport we are doing so badly or at least we are not so leaders and there are many sports journalists. I don't know why there isn't one in science.

**Interviewer: Is there any factor that supports the production of science news in Peru?**

If you want to be a little playful, we have a country that has a lot of gastronomy and they know us for that. Gastronomy is basically chemistry and biology. Explaining science through gastronomy would be a case in point. For example, how do you make ceviche? To make a ceviche, the ingredients, the proteins. You can use the potential that Peru has in food and use it as a theme. That's what comes to mind.

**Interviewer: Could you do the same with geography?**

Yes, I was thinking that we have a very diverse country. We have a lot of biodiversity. You don't have to go to the virgin jungle, just anywhere in the jungle and you're going to see a lot of different birds, plants that I'm sure aren't even finished classifying. We have a lot to explore. The point is that someone wants to go and do that job.

**Interviewer: When producing science news, what are the sources for local or international science news?**

Locally, the easiest thing is to see the CONCYTEC. It always calls for projects. It is the entity that gives more money in science in Peru. This call is made every six months. The journalist looks at the page, sees the projects they have won and makes a follow up. Because if these projects have won, they meet a minimum requirement. Some research is going to be very basic, others more applied, but I think there is a source of news and above all you are going to deal with people who know science. It is very common that sometimes people who don't know much about science come out, or there are a lot of people who know about pseudoscience. At world level there are the noted journals: *Science* and *Nature* that are the top. Obviously, what comes out there has to be commented. The top universities have their diffusion portals. I think it would be a good source of information because I believe that in Peru a lot of news is taken from other media. If a science journalist lowers the level of rigor of the scientific news, I think it's not bad. It is good to lower the level of rigor in the sense of reaching an intermediate between understandable and correct, because sometimes my fellow

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<sup>1</sup> The governmental body in charge of the field of science, technology and innovation.

scientists want to say as it is, but it is very difficult. You have to bring it down to a level that people can understand. The problem is that if you go to *El Mundo* or to these newspapers that make good news, they already have that component that has lowered the level. If you take that as an original source, it is already a secondary source. The best thing to do is to go to the sources closest to the primary source, which would be to consult the paper. I don't know if all the journalists, even the same scientists, if you put the paper from another area, will tell you: "What is this?" We don't all have the ability to understand all areas. But I think we take the news from another newspaper and turn it around like it's not the best.

**Interviewer: In your opinion, how accessible are the sources?**

It is a fact that they are paid but have a kind of summary that they publish. I've never worked as a science journalist, but I've been taking an online course. I asked how newspapers do it because sometimes the news appears the same day the article comes out. Large newspapers have subscriptions to these journals. They receive a press release in exchange of releasing it the day the magazine is published. I think this is one of the best sources because you have information lowered to a public level but that is first hand. I suppose that in Peru no media will have these subscriptions. I guess that's in *The New York Times*, *El Mundo*, big newspapers. I think that's the way to do journalism.

**Interviewer: In Peru, what do you think is the relationship or interaction between the journalist and the scientist?**

It's complicated on both sides. Journalists always want something very attractive, a photo, something that has video on it. There are scientists who don't know how to express themselves very well, their way of expressing themselves is very technical, a bit boring. But that doesn't mean he's a bad scientist. They don't train us to be communicators, they train us to be scientists. We should have a course of popularization of science or scientific communication. I think we should be obliged to do so. You don't graduate if you don't have that course approved. That interaction is difficult. There are some scientists who have a little more openness to journalists, there are others who don't give interviews at all.

**Interviewer: Do they do it for fear of being misrepresented?**

A little bit of everything. They think it's a waste of time. A little because, from experience, they say one thing and the journalist doesn't understand well, then the news ends up saying something else. I don't think we have personnel trained for this type of interview. There are some who interview well, but not just any journalist can easily interview a scientist.

**Interviewer: How do you think the economic factor influences the production of science news in Peru?**

Good productions always have more money invested. Just the experience I told you about IPE channel. I was part of the research team of the first season. There was a lot of expectation, but the budget was very short. In the end the product was quite modest compared to the initial expectation. I myself thought: "Look, we explained this with an animation". They told me: "But the cost was very high". Money is definitely going to be a constraint just like creativity.

It's easy to have full-time human resources that you outsource. That's what they told me: "You have to outsource the animations because IPE channel didn't have a person who could do this". Definitely that affects but you can do interesting things like youtubers of science that have a rather low budget. There are some that make good videos with enough imagination or enough man-hour. Impossible is not, is more commitment or really want to do it.

**Interviewer: What other factors do you think limit science news production in Peru?**

I think our low cultural level in science. Actually, ordinary people may not know that they are interested in a concept of science, something as simple as unplugging a pipe. It's as easy as going to YouTube there are a thousand ways you can do it at home. It's basic science. I did it the other day. We don't have a minimum culture.

**Interviewer: Is that minimum culture reflected in the media not betting because there's no interest?**

There's no public interest, it's real. Our minimum culture comes from our rather bad basic school education, but the media also contribute to that chain. There are fantastic shows at Deutsche Welle in Germany that are not complicated at all. They have a lot of science behind them and they are super entertaining. One of those programs here, one hour about solar energy. I think any citizen can learn while enjoying a good program. I think that our low level of science also influences that we don't even know where to search.

**Interviewer: What factors do you think would benefit or improve the production of science news in Peru?**

I definitely think that if you should do a type of study. Or it occurs to me in the faculties of communication to teach a science course where you invite experts in subjects or someone who is well informed, who knows about science topics. I believe that people who are being trained in science should be guided to know how to discriminate what type of publications to consult, what type of sources are reliable. In science usually I think they don't know and it's not their fault for not knowing because they haven't studied it.

**Interviewer: I think it's not that they don't know, but for lack of specialists they're also going to ask someone who isn't a specialist in the subject.**

For example, Dr. Modesto Montoya. Always what they criticize that he comes out everywhere talking about anything. I know him personally, I've seen that journalists called him, they still think that the scientist is like a genius who knows everything. Earthquake, Modesto Montoya. Biology, Modesto Montoya. Botany, Modesto Montoya. He himself says: "But if I don't go, nobody will go". Sometimes I've seen him try to call a colleague. Well, even in breaking news, journalists want a scientist to stop now. So it's complicated. That's important: they don't know how to identify. I understand that they don't have contacts, that's true. But CONCYTEC has a communications office and has the database of all the researchers in Peru. It would be easy to call CONCYTEC: "Look, you're going to see this phenomenon. Recommend me to a scientist who can tell me about this". But as far as I know,

no media calls us unless the president is going to make some controversial speech. That's where all the media go. In CONCYTEC we have the database and it is not difficult for CONCYTEC to give the contacts. But I don't know why it doesn't occur to them and they only call Modesto Montoya or Takahashi, who is in Senamhi<sup>2</sup>, because it is already visible. But it is rare because there are researchers for each topic. You have to go to the researcher who comes closest to what you want to ask.

**Interviewer: What factors would support production of science news in Peru?**

I believe that a course in universities, a single course to know what a paper is, which is a reference in science. The contact with researchers, I think that would benefit. I believe that scientists are not so closed to giving interviews. It would be good to set up a kind of camp for science journalists where you can bring together science people and communicators, where they can exchange ideas. That would be good because they are worlds, I wouldn't say opposites, but while science wants to be as rigorous as possible, sometimes communication looks for what sells.

**Interviewer: Obviously they are two different total languages**

I think both of you have to get to an intermediate because you have to communicate. Another factor that would benefit would be a television show.

**Interviewer: What topics or scientific fields do you think should be more widely disseminated in Peru?**

I think that Peru has a lot of potential. Agriculture, there you can talk about chemistry, biology. Although I'm not very much in favor of mining because it pollutes the environment a lot, but you can exploit just that environmental part. I think we should start doing that: agriculture, all genetic resources, also research on El Niño. We are a country that has, if I am not mistaken, 20 of the 24 climates in the world. We have a lot of things to study there. Something as simple as the El Niño. We already know that it will come and we wait until there is flood to worry about. Why don't you invest a little money before being cured later? I think that would even save us money. It's not going to earn us, but it's going to save us and not be spending the money on quality of life. I think that issues that directly concern us and we are directly affected because not everyone suffers from El Niño, not everyone is going to have the interest to study it. Agriculture, mining, we have a lot of potential even in tropical diseases. Tuberculosis, cysticercosis, leptospirosis that is done but more could be done if we had more support.

**Interviewer: In your opinion, how do you evaluate the development of science journalism in Peru over the next five years?**

I have hope, because I know a little the environment. As I told you at the beginning, I've been a science educator since I've been at the university. I've had enough years in this as an amateur, I'm not a professional. I've learned on the court and I know a lot of people. There is

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<sup>2</sup> Acronym in Spanish for Spanish acronym for National Meteorological and Hydrological Service of Peru.

more movement compared to my university years. Now there are many more small groups that disseminate science. There are quite a few maybe none of them are super massive but they are going to start generating disseminators in small areas. So I hope that one of them can develop a little more.

**Interviewer: Would it be good if they were all grouped together?**

I'm not sure. I thought about it at some point. When you have something so big each star wants to shine with its own light and it's fine. Each star is going to have a different audience. When you have a mega group it's complicated. What you should do is support each small group. Some of them will grow more. As I told you CONCYTEC is going to launch a diploma, is managing to launch a diploma for the dissemination of science. I hope that we have the first ten professionals trained in Peru, that there are not now and that this will generate a seed. Because I have come to discover as a result of this project is that there are many agencies such as the IGP<sup>3</sup>, Senamhi, whose own press people do not know how to cover science news. They need it, they are waiting for the opportunity of a diploma. They are already on the field and they are on the communication side, but nobody taught them to approach these topics from the science side and they have to learn for themselves. I think there is a potential. I have some hope that in the next few years the situation will begin to improve. I want to believe that this is going to start to improve.

**Interviewer: Finally, there's something important that you want to say that you haven't mentioned and that you can think of on this subject.**

It's always a criticism of journalists. That they always confuse such basic things and end up making a fool of themselves.

**Interviewer: Basic things like what?**

Confusing a bacterium with a virus. Probably for the average Peruvian it's not a difference, but in other countries they know the difference. Instead of saying transgenics they say generic. There is a long way between pharmacy generics and transgenics. I think that kind of thing needs a little more polishing. It's complicated, I won't deny it. I put myself in the shoes of a communicator who doesn't know about science and who doesn't have the contacts to have a science news checked before he publishes it. Because I know that the press needs to launch the news quickly. Maybe a little search in Google. When you write the sentence you will realize that generic and transgenic are different things. You have to know how to differentiate the sources, put a little more interest. In a note of a homicide it doesn't matter the information. All that matters is who died, what died, and that's it. But a piece of science would deserve a few more minutes of consideration.

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<sup>3</sup> Acronym in Spanish for Geophysical Institute of Peru.

## Appendix 8: Interviewee Patricio Valderrama

**Interviewer: What are the main functions of science journalism in the Peruvian case?**

(Science journalism) is very little. It has to be massified. I think that if we start counting science journalists in Peru there is none. A journalist with a scientific background. Journalists with knowledge of science, there are very few. There is Bruno Ortiz from *El Comercio*. There was the online portal Sophimania, which no longer exists and was directed by Claudia Cisneros. Scientific portals that spread science, I think there are very few. What science journalism lacks in Peru is to massify itself.

**Interviewer: Would the main function at this time be to spread or massify science in the average reader?**

Yes, even I, from my limiting scientific point of view, search for if I could study a master's degree or a short course in science journalism. The closest I could find was in Spain. There isn't one in Latin America, not in Argentina or Chile. And if there were, it's hard to move to a country to do a two-week course and come back. We have to massify it here, science journalism made in Peru.

**Interviewer: In the Peruvian case, what do you think are the most popular or recurrent scientific fields in the press?**

I believe that health sciences and earth sciences. Peruvians are not very interested, for example, in the discovery of a new genome or the Higgs boson. They are interested in knowing that heating your food in the microwave does not cause cancer, that telephone antennas are not carcinogenic. He is very interested in the fact that homeopathy is a lie, that ginseng does not cure everything it promises. That from the point of view of health. From the point of view of the natural sciences, that earthquakes are not predicted, that rains or the phenomena that affect us are predicted and if they are not predicted, they are not punishment for something. And then to be aware that at any moment we are going to have a disaster of great magnitude and how to be prepared for it. I'm telling you this based on my point of view. Maybe a computer scientist will tell you that people are interested in knowing if ATMs aren't going to steal your money.

**Interviewer: Do you think there has been any improvement in science journalism in Peru in the last five years?**

In the last five years there has been a lot, a lot. What caused it was the coastal El Niño phenomenon. Before that, media talked of a four-degree Richter earthquake. They're not degrees, they're not Richter. There were a lot of mistakes. El Niño happened and the journalist had to distinguish between what is a flood, a huaico<sup>1</sup> and a quebrada activation. So many things were happening simultaneously that journalists couldn't always say "huaico, huaico". I played a very active role -and I am very happy- in El Niño both at the government level as well as at the diffusion level. Many journalists, there must be a dozen of them, would sit next to me and say: "Explain to me what a huaico is. Is this photo a huaico?" "No, this is a flood". "Why a flood?"

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<sup>1</sup> Quechua term that refers to a mudflow caused by strong rains.

More than one has told me, "I've been misinforming". Then don't do it anymore, excellent. There has been a lot of progress in these five years. It's been a huge leap. I run the Rímac Seguros Disaster Monitoring and Prevention Center. I was contacted by RPP journalist Jesús Veliz. He talks about technology issues and said, "Explain to me, how does that app that warns you about earthquakes work?" I explained that there is an app that uses your phone's sensors as a seismograph and when all the sensors move at the same frequency, it issues an alert. It can be a earthquake like a goal from Peru. If we all jump at the same time, it will issue an alert. As a result of that conversation, the editor-in-chief called me and said, "Could we give all my editors and all my journalists training on the subject of earthquakes?" "Pleased to meet you". "How much it cost?" "Nothing". They came, we talked, and I explained to them why you don't say a nine-degree earthquake, why you don't use the Richter scale. It's not that RPP is an isolated media, RPP journalists talk to *El Comercio* and other media. They simply stopped using the word degrees. I found this interesting. If the journalist says it correctly, the public reads it correctly and interprets it correctly.

**Interviewer: Compared to other countries in the region, how developed is science journalism in Peru?**

We're still in our infancy, it's a long way off. To begin with, there is no such thing as science journalism in Peru. You are a journalist and learn about science or you are a scientist and you make an effort to become an educator like the case of Dr. Elmer Huerta. He is a scientist, a doctor who for years has been explaining his subject on the radio. He explains it to you with boxes and apples and he does it magnificently. I think he is the greatest exponent of science dissemination in Spanish. But in Chile, Mexico and Spain, there are superior things. You read a scientific editorial in *El País*. You read a scientific editorial in *Le Monde* on Wednesdays, and they deal with very complex subjects in a simple way. From how many cars we have running on Mars to the latest discoveries in physics or the Higgs boson. Here what comes a lot to boost are the social media. I was lucky that when the floods began in southern Peru, I was invited to a Sunday, to Cuarto Poder. On social media, people said, "Cool, we have a scientist on TV". Journalism is improving. It's a step being taken, but fortune tellers are still being interviewed or the horoscope is being given. Before it was more, in the nineties Rosita Chu, Zandrox or Agatha Liz gave you a horoscope. And Hayami was talking to your dead great-grandmother. You can no longer see that because people are no longer believing in this because there are other sources of information. What social media have done is that they have democratized knowledge. The equivalent would be for me to start shouting in the corner like an evangelical shepherd "earthquakes cannot predicted". Twitter is a horrible place, it's full of trolls that insult you, but there are also good things. Taking Twitter to print or a weekly column would be a big step.

**Interviewer: What factors do you think support the journalist or scientist when producing a science story?**

At that point, the one who has all the favor is the journalist. Scientists are trained to speak in difficult terms because our world is full of complex words. I could tell you a 'flow of polydisperse bigranular detritus' and I'm actually talking about a huaico. But the other sounds

like “how this guy knows”. The main function of the scientist is to write scientific articles, papers. In fact, it's a metric: you're as good a scientist as the number of articles you publish. You can't make a paper with simple language because they give it back to you. A paper that has taken you at least a year of research is very lazy to translate it into a simple language. Then you don't. That's where the science journalist comes in, reads the article and simplifies it. A journalist quite educated in science, without any master's degree, reads you an article about evolution, writes it to you nicely. My wife is a communicator and she was the one who initially translated my texts for me. 90 percent of the podcast is previously reviewed by her. I write the podcast, I write “Hi, I'm Patricio Valderrama. Welcome to Terramotus” and I write everything in a Google Docs and send her the link. She says to me: “I don't understand, I don't understand”. “How can you not understand? If it is so clear”. “But I don't understand, look for another word. For example, polidisperse flow. Can you say huaico?”. The science journalist is the nexus between the scientist, who is very closed in his discipline, and the population. A journalist who interviewed me told me: “I interviewed the director of the IGP<sup>2</sup>. What an imbecile!” “Why?” “You remember that there was an earthquake in the north, in Ecuador that everyone felt because it was very deep. "I had to talk about it, get out several tweets and the director of the IGP tells me that it was an earthquake almost imperceptible by the population. And yet, the people in Tumbes called me crying: Miss, there has been a horrible earthquake, we are scared. And the other one said to me: imperceptible. On the other hand, you explain to us why it moved, why it felt, why we shouldn't be afraid”. We scientists are able to explain without wanting to pass for super intelligent. Achieving this balance is very difficult, that's what science journalists are for. It is the nexus, the communication.

**Interviewer: What do you think is the collaboration between journalist and scientist in Peru?**

It's very harsh because first the research in Peru is state-run. The universities that have their research centers are small and are more of an educational type, not productive. For example, the laboratory to which I belonged in France even served governments. You had an erupting volcano and you hired the Blas Pascal University's map and volcano laboratory and they did the study. They had their team of scientists and their team of disseminators. The scientist never met with authority. They arrived, climbed the volcano, took samples and left to analyze the results. The communicators were the ones who came back and explained everything. Here, as a journalist, you go to Senamhi<sup>3</sup> and ask for an interview. They send you to the meteorologist on duty, who is probably a junior. He's just as scared or more scared than you are. “Please explain me the rains”. Since the boy is just beginning, he looks for complicated words and the interview ends up being a disaster. But if you're Beto Ortiz, you're going to interview Senamhi's director and the interview will be more fluid. For example, in the rainy season, I had your colleagues standing in line at the Rimac Monitoring Center. Journalists from Panamericana came in, then those from Latina, those from RPP. By the fifth I was tired, but they still had to be treated with kindness. That's not what the state does. The state is rough, it's hard. Try a consultation in Essalud and let's see how you do. That can be improved and there are entities

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<sup>2</sup> Acronym in Spanish for Geophysical Institute of Peru.

<sup>3</sup> Acronym in Spanish for Spanish acronym for National Meteorological and Hydrological Service of Peru.



that can improve them. CONCYTEC, which belongs to the state, can have a board of scientists to explain science. And the other option is for you to have a journalist who understands science and asks you the right questions.

**Interviewer: Don't you think that in the case of scientists there is a lack of specialization in how to express in front of the media?**

That's what I saw, that's what happened. Don't forget that journalism is a business, you have to sell. If your news is digital, you have to sell clicks. Unfortunately, journalists are going to need sensationalism. It happened that, during the crisis of El Niño, the Peruvian satellite, the Peru SAT-1, was questioned a lot. They made a live broadcast from Senamhi. A young man who shouldn't have been there, but the boss arrives at ten in the morning. News broadcasts earlier. Journalist Augusto Thorndike asked him: "Are these images from the Peruvian satellite?" "No, these images are from a US satellite". "Why isn't the Peruvian satellite used?" "The images from the Peruvian satellite don't do this. Boom, the headlines said the Peruvian satellite was useless. The guy explained it well, the Peruvian satellite doesn't see rain. But it doesn't mean it won't work. You can't imagine the crisis inside Senamhi. The scientist who speaks to the press must be clear about his speech. It's very different to talk to a reporter X than to talk to the big fish. They're going to make you fall if you're not prepared. In fact, that's the job of a journalist. You have to be much more careful if you're a state official. There are very few private scientists in Peru. As a private scientist I defend the interests of my company, I worry about that. If I have to hit the state, I do it. That's why the state must be careful. Also many old scientists don't want to go out in front of cameras for fear. "You better go, you talk nice". The journalist does not have to be taken care of by the one who speaks beautifully, the one who knows has to be taken care of.

**Interviewer: What sources are used to find national and international science news?**

The locals use international news. Sometimes they're just copy and paste. I don't know if you remember a few weeks ago, I think a couple of years ago, a news said sausages were carcinogenic -which is not true- and was shared everywhere. Even a supermarket stopped selling these products. What happened? That news originally came out in *The Intellectualist*, which is a scientific online newspaper in which I have written several times there, and it said that a recent study had concluded that if you eat kilos and kilos of ham, your risk of having cancer increases by 15 percent. They translated it and in the Spanish translation it appeared as "Sausages increase the risk of having cancer". This is how it was published in Spain's *El País*. Here in *El Comercio* it appeared as "Eating sausages gives cancer". They will never read the paper. Of course *El Comercio* refers to *El País* and *El País* to reference *The Intellectualist*. No one bothered to read the article, which said it increased by 15 percent. Smoking increases by 45 percent. Consuming ecstasy increases by 65 percent. The local scientific news production is very little, unless it affects us. Rains, earthquakes, cholera epidemic.

**Interviewer: How accessible do you think these sources are?**

They are not accessible. You go into Springer or Elsevier and they want to charge you thirty dollars for a paper. So much so that there is a world of paper piracy that is fantastic. ScienceHub,

I couldn't have finished my doctorate without that. You find a reference, google it and read it costs you thirty dollars. You have two options: pirate it or write to the author. If it's Stephen Hawking and others, you're going to write to them and they're not going to answer. Something very nice that CONCYTEC<sup>4</sup> did until a couple of years ago is that if you were registered in their database, in which anyone could register, you had access to a lot of papers. I think that was lost because it cost a lot of money. Science as such is not accessible. For *El Comercio*, RPP, La Karibeña is almost impossible. That's why they resort to copy and paste through cable news.

**Interviewer: How economic factors influence when producing science news?**

A lot, a lot. I've had several interviews cancelled. I was waiting for the journalist, who was on his way, and a reality show girl broke a nail and they went to cover that, and they didn't come to interview me anymore. (That's happened to me) more than twenty times. Science is not fashionable in Peru. Reality shows, politics and football are trendy. If I could have written the best podcast chapter in history and got it out at World Cup time, even my mother wouldn't listen to me. You have to choose the right moments: rains, huaicos. In those moments, I'm interviewed everywhere because later they don't even call me to wish me a happy birthday. I have to update my podcast this week and next week because then comes the Copa América and people forget. You are going to listen to Mr. Chip's podcast, the podcast of someone with football statistics. Unless we have a mega-earthquake in Peru, science doesn't interest us. In life sciences it is more constant: people die every day of cancer; they die in accidents. If you're an urban scientist and you publish the same day that the Peru-Colombia match on how to fix traffic in Lima, nobody cares. Science journalism is not in fashion anywhere. I don't think there was as much science journalism as there was in the 1970s because we were going to the Moon. People were interested in how rockets work, how they live and what an astronaut eats, where he urinates. We had a peak that was at COP20. Everybody was talking about Earth Hour, climate change, straws. But apart from those occasions it is very little, very low. There are peaks but they are very small. For example, I love that people like Bruno have a space in *El Comercio*. The guy is an *El Comercio* employee, he gets paid to do science notes. But he doesn't just do science notes, but he also does technology. It's better for him to do an unboxing or a review of the last phone than to talk about something related to atoms. On the other hand, there are those of us who only do science. You give me a camera to do an unboxing and I have no idea. We have a latent and permanent audience that is very small. I assure you that if I didn't talk about weather and earthquakes on Twitter, I wouldn't reach 40 followers. When there are peaks, you have to take advantage of them. And another topic is the charlatans. It's so easy to go out on the news and say that tomorrow Lima is flooded, that a universal deluge is coming. You bounce everywhere and if you're wrong, you're a nobody.

**Interviewer: Can the economic factor also limit fieldwork?**

There is no such thing. Zero. Or there are supports but they are very few, especially when you do basic sciences such as mathematics or physics, the Peruvian State does not change its life to have one more mathematician. And for a journalist to go out with a scientist to do an

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<sup>4</sup> The governmental body in charge of the field of science, technology and innovation

analysis of the last epidemic of dengue post Niño, nobody gives you money. Except for one NGO, very specific things. On the economic aspect, I lose money making my podcast. Because it's free, nobody sponsors me and even though I host it in a free site, I waste my time which in the long run is money. I do it as a hobby.

**Interviewer: What other factors restrict the production of science news in Peru?**

Making a scientific note takes time. You have to consult several sources, many of those sources are in a foreign language, mainly English. You need to translate. If you don't speak English, you're lost. Time and quantity of production. There is not one important scientific news every week. There isn't a load of news to say the least. In physics, the Higgs boson and gravitational waves have been the news of the millennium. To find similar news we have to go back to Einstein. On the other hand, in other areas you have lots of news. The science journalist has to dig up old subjects. First, he must have an idea: how the paper is made. You have to get into the story. That the Chinese used to grind tree bark and take out the cellulose and now it's used... That doesn't interest anyone because you can find it on Wikipedia. But if you explain how to make ecological paper, it might be interesting. But writing an article like that takes two weeks or three weeks for three thousand characters. Then you think, I better talk about this reality girl. It's more profitable. Being a science journalist is a job and every job has to give you money so you can support yourself. So, if Jesús Veliz, Arturo Goga or Bruno were to dedicate themselves only to science, they wouldn't have the status they have. But if they do the review of the last mobile phone, that interests everyone.

**Interviewer: With respect to the time factor, don't you think that contacting a scientist in Peru influences the production of scientific news?**

It's difficult. First there aren't many. And of those few who want to talk to a journalist, it's more difficult. As a journalist it is very easy for you to run out of sources. If the editor says: "Bring me news about the floods" and you don't find a scientist who talks to you about floods, a specialist, you're going to have to interview the non-specialist. Suddenly, your note ends with Hayimi predicting floods in the north because he was the only one you found. That's the worrying thing. I loved that, in the hardest time of El Niño, when I was advisor to President PPK and director of COEN<sup>5</sup>, and everything went wrong... Today it was raining 10 and tomorrow it was raining 20 and the day after 30 and the Piura River was going to overflow. On Twitter, my favorite charlatan, Reinaldo Dos Santos, posted a tweet mentioning America (Television) and Latina "Friends, I have news to give you" or "I had a dream". And the same media from their Twitter account told them, "Dear, we are busy helping our brothers". They told him to fuck off. The guy wanted to sell himself, take advantage of our tragedy, and the jerk wanted to come here and be a fortune teller. The media ignored him. I said, "Our journalism has jumped a hundred years". As I was in the government, I couldn't express myself so freely from my Twitter account, I just put a big hahaha. At that moment, everyone understood, including journalists, that we were one force. A charlatan had no space here.

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<sup>5</sup> Acronym in Spanish for National Emergency Operations Center.

Journalist interviewed experts from COEN, Senamhi or Indeci<sup>6</sup> officials. That was fantastic. The problem is that when you don't have sources, you have to turn to others not so suitable.

**Interviewer: What factors do you think could improve the production of scientific news in Peru?**

That the media train their journalists. Because you, as a scientist, are not going to be on the RPP or América Noticias payroll. You have to send your journalist to another place to be trained in science. First is to invest in that. And second, that media understands that science article takes time. And that one can make a good scientific note where everything is very clear twice a month. Above all, to be clear about what is scientific dissemination and what is knowledge dissemination. Dissemination of knowledge is tips on how to make better ice for your chilcano. That's not science, it's freezing water. But if you start explaining why Antarctic ice is retreating and we're going to have a problem, that's science. But writing about it takes time. The editor must understand that scientific diffusion is limited in time because it is complex. Because it is complex, there have to be people who dedicate to it full time. Above all, although this is more difficult, there has to be a line between what is scientific and what is not. To say it's going to rain next week is not scientific. But to say that Lima is facing an earthquake risk and why, that's scientific. It's a very thin line. As in the example of cancer, eating ham gives you cancer or eating ham increases your risk of cancer by 15 percent in a study of 60 people. That's the difference. I think it's easier for the journalist. The communicator in general has to be a very cultured person. I am amazed when I am interviewed in the studios and the journalist is talking to a lawyer about laws and amendments. I go in and we talk about natural disasters. And then comes Jefferson Farfan's latest romance and they talk about clothes. The journalist knows everything, has a spectrum of coverage, of very broad knowledge. You ask me the name of the Minister of Education and I have no idea. We are very specialised. Ask the head of Senamhi, Ken Takahashi, about earthquakes and he will say: "I don't know, the Earth is moving". The journalist, on the other hand, has an enormous knowledge spectrum. Add to that a little more science, a little more so that he understands and you create a race of supermen. That's what surprises me about the communicator: they know everything. They have to transform scientific communication, the paper into pleasant news that the housewife reads and understands.

**Interviewer: What subjects that do not receive so much diffusion should receive it in a probable development of science journalism?**

We have wasted an opportunity to exploit the subject of the Peruvian satellite. Politicians came out to say that the satellite doesn't work. The Peruvian satellite is good, but within its limitations. The United States has its fleet of satellites that are like Lamborghinis. The GOES satellite costs 330 billion dollars. Twice Peru's GDP. We have a satellite that is like a Hyundai. Compliant, reliable, but it doesn't see rain, it has its limitations. But at least we have a satellite; before we didn't have anything. The Chileans have two, the Ecuadorians had one, the Brazilians, nine. We have wasted the opportunity to talk about the space issue: how often does the satellite pass

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<sup>6</sup> Acronym in Spanish for National Institute of Civil Defense.

through Peru? People think they can look at the sky and see the Peruvian satellite standing there. People think they can see the traffic of Javier Prado [street] from Peru-SAT. It's not like that, but people think we're in a James Bond movie. That you're going to be able to see the car, point it at it and kill it. We have wasted an opportunity to teach and explain to people what types of satellites there are, what Peru-SAT does and doesn't do. We lost it because of El Niño. The Peru-SAT was put into orbit in September, with all the tests being optimal in March. We already had El Niño phenomenon on front of us. People began to criticize it. We missed an opportunity. There are also incredible Peruvian talents. I felt very sorry for this Ayacucho engineer who worked on the anemia cookies. This guy should have his name on a street. He has taken some cookies, has put a lot of iron on them and produced them. This is important, but it only comes out in a few media outlets. This guy should be working at the Ministry of Health.

**Interviewer: It comes out in a few ways and doesn't even come out at first...**

If they didn't say that Patricio Parodi was going to be the image of the fight against anemia, the guy went unnoticed. The news was that Parodi was going to be paid 250,000 dollars to be the image of the campaign. Instead, here's a guy who made a cookie that cures anemia in five days. It's focusing the spotlights on the right people. There's a scientist who cleans the lagoons, Marino Morikawa, that guy should be director of a state institute. I've never talked to him, but I admire him very much. The guy went to Japan, learned his doctorate in nanotechnology, came back and cleaned up gaps. Now the guy is cleaning the Titicaca. The guy should be a superstar to us. But we see him on the street and we don't recognize him. It's a topic of diffusion too, to diffuse the good. As this there are several of these cases, Peruvians working at NASA. There is a scientist working on Mars Rover Control. Focusing on the right people and the right news, especially what is life sciences and natural phenomena that is what affects us most.

**Interviewer: Finally, how do you evaluate the development of science journalism in Peru over the next five years?**

I see it growing. We can't go back, that's unacceptable. After El Niño, we've had a huge leap. In 2018 we were asleep because of football. We changed president and nobody noticed. I was in France and they said to me: "Your country must be in anarchy, they are taking out the president". But everyone was buying the album and its stickers. The World Cup didn't make us fall into the hole. In 2017 it was our peak; I was invited to write for *El Comercio* and I published an opinion column several times. Not just me, but Ken Takahashi, scientists and non-scientists like Abraham Levy. Hate him or love him, the guy knows. His tweets are clearer than those of Senamhi. He's not a meteorologist, but he gives you a picture and explains it well. We had the peak with El Niño because people needed to know why it happens. We've had a rise, we can't go back. For five years, I think what we're going to achieve is to separate science from technology. The news of the new cell phone is next to the news of the microwave and cancer. We have to separate things. You have technology journalists and science journalists. That will happen, it's inevitable. He always asked me why I have more than 15,000 followers on Twitter if I'm talking about just one thing: disasters. And that's because people are interested. It used to be, that doesn't interest anyone. Now people are starting to read. So it separates the science and technology section into two sections. TV Peru started doing that. In America you have

TEC, with the Pinasco brothers, who receive the last iPhone, the last computer, the last iron. While in TV Peru there was the program of a boy who talked about science, although in a slightly wrong way. Science is not test tubes, science is not Big Bang Theory, science is not nerds with aprons. Here they focused on mixing things and colors. But it's a beginning, we have to move forward. Why doesn't TV Peru go up to the top of the Huascarán to talk about climate change? Money, unfortunately, is money. That's why El Comercio sends its journalist to cover the launch of the last iPhone but does not send to cover the launch of a space probe. In five years, I see that the experts in technology and science will be separated. To what I aspire, my dream is that there will be a scientific media like Publimetro, free in the streets. In the social media there are youtubers, there are videos. But you need something you can take to the bathroom. Why? Because to earn money on YouTube you have to produce a lot, otherwise your videos are decanting. I listen to a podcast of which I'm a fan in English called Science versus. Science versus UFOs, science versus ghosts. It's great, but it has about 300 chapters. I listen to the first three and explore some other interesting ones. But on the other hand, if I get a paper once a week, you glance through it and you get something. Although I think it's very romantic to think about paper, maybe better in digital. But in five years science will be separated from technology.

**Interviewer: Is there anything else you would like to add that you have not mentioned yet?**

What really caught my attention in my personal experience is that my Twitter account has become a reference in the subject of prevention and natural phenomena. I don't really understand why. I'm not an influence, but people follow me and ask me very personal questions. And that's cool because if you don't ask me, they're going to ask Agatha Liz. "Hi, Patricio, I live in La Punta, my father is in a wheelchair. What can I do if there is an earthquake?" The magnitude of the response I must give is... If I give the wrong answer, I'll kill her and her old man. It's a huge responsibility. Sometimes you have to give generic answers because I don't know her house to begin with. If his house is well built, he will endure. If your house is badly built it will fall off in a second. People are looking for very personal answers. What am I going to do with my pets? Should I put food for my pets in the emergency backpack? What do I do if my cat disappears? That seems important to me because people, especially on Twitter, feel that if they ask someone they know, they will get the right answer. That's to stop using Santa Natura and go to the doctor. That decision saves lives. That makes a difference in the long run. For example, in earthquakes, I feel like I've already won the battle. No one can come and say that tomorrow there will be an earthquake without about five people criticizing it. "Hey, you're a liar, my friend Patricio says..." There you see that you've sown a little seed and it's not going to be easy to be deceived. Imagine there are doctors, veterinarians, mechanics on Twitter. More scientists and fewer charlatans. I think that's great and it's happened thanks to social media.

## **Appendix 9: Interviewee Víctor García-Belaunde**

**Interviewer: What do you think are the main functions or tasks of science journalism in Peru?**

I think it's important to inform the public about scientific theories, about how they work and about the method. For example, one way is to explain each week the latest discovery or technology. And take the opportunity for the person who discovered that to explain how it works. In that way, the public not only has the content and information about the latest advances in science, but also knows how those advances work. That's important because through the scientific method they're going to be able to identify a pseudoscience and they're not going to be deceived by pseudoscience.

**Interviewer: In your opinion, what are the most popular scientific topics or those that receive the most coverage in Peru?**

Technological topics are very popular, especially in medical topics. There are people who suffer from cancer or know someone in the family who has it. Any advance in medical topics is very listened to. Also in psychological topics, people want to be happy. Any offer of therapy that leads to happiness is also popular. What is also popular are pseudoscience topics. There are many people who believe in homeopathy or that antennas produce cancer. So when you go out and deny those facts you also become popular. The subject of alien mummies or extraterrestrial life. You can present these stories as if they were real at first by talking about mummies and extraterrestrial life and then deny it. You capture attention with a pseudoscience, like a magician captures attention with a trick. And then you explain how you did the trick. Scientific dissemination has two functions. One is to report objectively on the progress of science and how science works. Take advantage of scientific advances to explain scientific theories in general. Currently, there is dissemination of the latest iPhone, but that is not to explain scientific theories. There has to be an excuse to explain scientific theory and in the process the public is educated. Point two, scientific skepticism. The content of science is one of the pillars. The other is scientific skepticism, according to Carl Sagan. To explain one without the other is not possible. Skepticism is extremely important and can be applied correctly when some fundamental theories, a method, are known. You can apply Carl Sagan's kit of lies, which are nine questions you should ask about the sources: if they have been replicated, if it makes sense with other theories, and so on. Ideally, science journalism in Peru should develop these two pillars so that the average Peruvian is informed and can read a paper and understand it or know if it is true. Or watch news in the newspapers and have questions like "This homeopath is not asked questions? Why do they validate their belief?" Most journalism in Peru is credulous and validates the beliefs of the guests. But there is not much criticism of the beliefs of those guests. There is little criticism of astrologers, seers, morphopsychologists who read the faces of candidates, homeopaths. These beliefs are validated in the media.

**Interviewer: In the last five years, there has been any improvement in science journalism in Peru?**

I think so. I think there's a growing interest in science in general. Above all, families see that technological careers can be a way out of poverty. If they have the means to do so, they can develop a scientific career. This is seen as a possibility. But there is also a stigma towards scientists. That they are introverted people, that they are always going to work for someone because if you really want to make money you have to get into business or politics or being a lawyer. But I think that science journalism, the interesting thing about this career is that it mixes the political part with the scientific academic part. It's a bit of an approach to the general public. It's also a power because one, as a scientific disseminator or journalist, influences a group of people who are going to hold important positions in the country and who are going to develop the country's technology. Something like putting a satellite into orbit: how many branches of science are required? A space program requires even psychologists to study the effects of space travel. You use all the sciences to go into space. There is still no idea in Peru that science is going to take us forward, that we can export technology and thus grow.

**Interviewer: Compared to other countries in the region, how developed is Peru in this area?**

There is more dissemination in Chile, Argentina and Uruguay, I think. But the topic of podcasts is starting in Peru, in Ecuador, in Colombia. But it is much more developed in Anglo-Saxon countries. But what's common is that there is a growing community of skeptics in Latin America who are mostly informing themselves with podcasts and YouTube channels in English. Until a few years ago, Spanish-language channels appeared, which are becoming popular. People are getting informed with both. There's El robot de Platón, which is about science, QuantumFracture and some other that I forget. They are channels where you hear someone speak in your language about a scientific subject in an entertaining way. That wasn't there before. The first ones to go on YouTube were pseudoscience and you could see pseudoscientific proposals like The Secret. But there wasn't a review in Spanish. That's important, that those efforts of scientific and skeptical journalism be made so that there are pseudoscience critiques of your locality, in your own language. It's not something that's far away. We believe that Flat Earthers is a U.S. problem. Last year was Peru's First Congress of Flat Earth. There is already a growing community of Flat Earthers in Lima.

**Myra Flores: Do you have any idea why that community is growing so much?**

Because it fits all the conspiracies. It's the most compatible conspiracy with all the others. You can believe in God and you can believe that He created that dome. You can believe in the reptilians who keep everyone in this kind of trauma-shock. (You can believe) that man has never reached the Moon, that too is questioned. If he had invented the AIDS virus. They think that (the universe) is like a bluff. It's like an IMAX and you see figures. I have a telescope, which is in my parents' house and I can see the planets. Jupiter with the red storm, the atmosphere, the polar caps of Mars. But what they say is that I'm seeing a screen.

**Myra Flores: So there is only Earth and...**



You don't know what's out there. There is no gravity either. They do it to keep people motivated that you can go into space. It also fits with the AIDS virus and the idea that vaccines generate autism. That's being controlled outside the sphere to see how people react.

**Interviewer: In the Peruvian case, what factors do you think would benefit the production of science news?**

Peruvian apart from being criollo is smart in many aspects. Peruvian is not trusting; he is not a person who is ... The people from Lima always has a position of doubt. What happens is that he does not have the tools to have a methodical doubt and be able to unmask pseudoscience. But there is an initial posture of doubt in the face of something new. I think that's a good thing. I think we are not as credulous as other nations. But we need scientific information to filter that nonsense. For example, if you're offered a perpetual motion machine, you know there's no device that can be 100 percent efficient. You cannot conserve the energy of the pendulum. There will always be some friction, it can't be perpetual. The second law of thermodynamics would be broken. If you don't have that knowledge, you can believe it.

**Interviewer: In your case, what sources should you use to find local and international scientific histories?**

The first thing I recommend is Wikipedia, despite being a university professor. It makes me desperate that professors don't recommend Wikipedia. I think it's a good first source for a general search. Better if it can be in English because the English community has much more variety. Wikipedia in English is as reliable as the Encyclopedia Britannica, according to a study published in *Nature* a few years ago. It's super reliable, especially for general articles. If you're looking for a general explanation on a subject, there's nothing better than going in there. Then you can see the Wikipedia quotes and enter them, which are usually good. There are also the classic magazines that one can review. For example, *Nature* or magazines like *Skeptic*, by Michael Shermer. It would be interesting if a science journalist could have more informative magazines such as *Nature* and other more critical magazines such as *Skeptic*.

**Interviewer: How accessible are these sources?**

I know there are online versions, online alerts. I believe that access to the Internet allows for several alternatives to stay informed. But you are not going to have the magazine in physical, but you would have to pay for it. I'm not subscribe to any of those magazines, but I follow the pages. One can at least access the introductions of the articles in many cases. But of course, in order to do academic research, writing a thesis requires the originals. But to be informed in a general way about any topic you don't need to pay for a magazine. The Internet has equivalent sources that are free and accessible. The important thing is to ask the right questions to Google because depending on how you ask the question, you skew the search. For example, if you want to read about homeopathy and you only put homeopathy you will get favorable things. You probably have to criticize homeopathy. Or homeopathy and skepticism. What does the community of skeptics think about homeopathy? You can read both versions. What do homeopaths think about themselves and their theory? What are the

most important criticisms of that theory? You read both and draw your own conclusions. And you realize that it's nonsense, that it's contrary to medical science. What is known and has been working in medicine for centuries is that when you increase the dose, the effect increases. Homeopathy tells you that when you increase the dose, you decrease the effect because the product most dissolved in water, with more dissolutions in water, is more potent than one with fewer dissolutions of water.

**Myra Flores: But if ever... as I am a chemist, sometimes in the dissolution there is not a single molecule.**

Not even a single atom of the active component in the bottle. Why? Because it depends on the memory of the water. (Homeopaths) They say that water acquires memory and remembers having been in contact. How does water, how do molecules acquire ions or other molecules stick together? If the water molecule is no longer printed, the surface would change and cease to be water. If you know something about how the molecule or chemistry works, you can't believe this from memory. It helps a lot that: question yourself and ask the right scientific questions. And when looking for information, look for the best explanation of the proposed theory and the best criticisms. Then you draw your conclusions. People are cognitively biased and predisposed to believe in something. If you believe in an avalanche of pseudoscientific things, this one here fits your way of thinking. So you're just going to google positive things on the subject and ignore some negative ones.

**Interviewer: In the case of the YouTube channel, how do you make contact with scientists? Or how do you find out?**

You subscribe to the channels. Plato's Robot, for example. The channel of...

**Interviewer: I mean when you're looking for a scientist to interview. How do you do that?**

Sometimes I happen to know someone interesting who has a doctorate in science or has a research and I can propose it there. Other times I go to a conference and I see a speaker that interests me and I contact him there. Or simply by the media. It appears in media or has an article and that is the opportunity. I write to him, call him and tell him that I have a channel called La Manzana Escéptica and that I would like him to come. We have a modest but exclusive audience of scientists.

**Interviewer: What do you think is the relationship between the journalist and the scientist in Peru?**

Many scientists have this attitude of modesty and of not wanting to appear in the media. However, they want their work to be known and they want to seek funding for what they do. But they also have to fight with an image of modesty. Sometimes it has happened to me that a scientist has wanted to come, we coordinate the interview, the questions. Once he arrives, he tells me that he cannot answer the questions. In reality, he is an expert in this and not in the other. And he didn't share the interview and didn't talk to me later. He didn't like it. Maybe he wanted to tell me that he didn't want to be on the show.

**Interviewer: How economic factor influences the production of science news in Peru?**

The media move by the rating. If you are going to do a pseudoscience program, you will have more audience than (if you were doing one of) technology or scientific theory or skepticism. The community of skeptics who would listen to you would be few because there are little who have this mentality. Most people are more credulous, I think. I think you have to generate an audience. There is still no public for serious science journalism. There is a small audience and there are also some journalists who do science journalism in Peru. But they are small groups. You have to present a better product to generate interest in the public. This has been done in Spain, in Mexico. I also believe that in Peru it is growing. But there is a lack of better products, the media have to bet on science journalism. It should grow, there's no way science is boring if it's presented in an entertaining way. It's very entertaining that someone tells how the robots came to Jupiter. Or how the Parker solar probe is going to touch the first star.

**Myra Flores: That could compete with reality shows.**

Yes, it can take away some ground. Little by little, as generations become more educated. Interests in the media are going to change. Television is also losing strength. So is radio. They're not going to disappear, just as cinema didn't disappear when television appeared. But the audience has shrunk because now many new generations don't watch TV, they're on Netflix or YouTube.

**Interviewer: Apart from these factors, what other factors do you think restrict the production of scientific news in Peru?**

I think what limits it the most is the fact that it is not a topic that generates a lot of rating. It's a public that generally is small. For example, how many people have a scientific career? How many people who have a scientific career are really interested in science? Because many have a scientific career and are dedicated to engineering. Pull levers and push buttons and tighten nuts. But they're not interested in scientific thinking or skepticism. They don't give a damn what new pseudoscience has appeared in their field of research because they're not going to run into it in their lives.

**Interviewer: And do you think the issue of science education is a factor in Peru?**

I think it's very important that there are scientific mentality and entertaining teachers in schools, especially in primary school. That they arouse interest in science among children. Why is the sky blue? What is the sun? What are the stars? Or being able to use a microscope to make children realize that there is an invisible world. It is there, in primary school, that scientific interest and thought develops. I believe that on the one hand it is education, but also journalism can change the mentality of people and parents. Many parents are not educated, but they see the value of education. And as soon as they make money, they put their children in the best school or in the best university. For that there has to be dissemination. Ideally, science journalism should be heard by someone who doesn't know much about science, but who understands and follows the argument. That's what it's all about, that it's entertaining for someone who's a scientist, but can also be heard by someone who's not an expert.

**Interviewer: What factors do you think would benefit the production of science news in Peru in the future?**

I think that the State should invest more in science channels, instead of canceling them. Channel Seven, Umbrales ceased (to be broadcast), now there is another (program). But they have to invest more in science channels, of scientific explanation and not only for children, but science for adults. In bookstores, the science section is a part of the children's section. There are astronomy books with drawings, but scientific books for adults, books by Carl Sagan or Stephen Hawking are very few. If there is no option, interest is not generated. That's important: that there is an interest on the part of the State to choose teachers in schools with a scientific and skeptical mentality. There should be more science courses, especially experimental science. Seeing from a telescope or microscope or doing an experiment. See how the scientific method works at the moment. That requires infrastructure, material, expertise, many things that do not exist in most of Peru. Sometimes it solves it by importing people, they bring foreigners and they even do it in English. It is a double gain to learn science in English. There are international organizations where you can get people with scientific mentality, are well educated and can raise the level of a population. That would be interesting

**Interviewer: The issue of specialization in the case of journalists?**

Yes, of course. There should be. I understand that in Peru you can already have a career in science journalism. I think it's great that this is the case.<sup>1</sup>

**Myra Flores: Can you? Where?**

**Interviewer: At Escuela de Lima, I started looking yesterday. It seems so.**

The first generation is coming out. I think it's excellent. Until a few months ago I didn't know either. A boy and a girl came and they interviewed me for a homework for that specialty, science journalism. But that should be changing because as there are politics, as there are ... What are the issues that attract more in the media? the police and politics and some scandals of the show business. But a Canal 7 documentary about the decrease of the bee population in Ayacucho. Occasionally a natural disaster. That's also what they publish. And sometimes they report on a scientist maybe making a breakthrough. But it's not much, there's no science section that exclusively... Because every week a Peruvian discovers something or publishes a research or a thesis. There could be a show that tracks all those advances. In the newspapers there is also a culture section, where scientific articles usually appear.

**Interviewer: Which fields of science do you think could benefit most from the development of science journalism?**

The advances generated by scientists in the different areas. That is not being systematically covered. From time to time a scientist who has access to media calls and is interested in becoming known and the media gives him interest and he is published in two or three newspapers or interviewed. But there is no media that covers that on a daily basis and is

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<sup>1</sup> No information about this course or career has been found.

constantly publishing news on the progress of scientists in Peru. It's only some that for A or B reasons, which sometimes are not so important, but they appear because they have the contacts. Or in many cases they discover something extremely important. For example, here we are making progress on Alzheimer's, the centers to discover the cure for Alzheimer's disease. The subject of the mummies of Nazca, has not appeared in the mass media, nor an interview with someone who denies this case. Only on Capital Radio, Anthony Choy seems to me, that he is a ufologist but he doesn't believe in these mummies. There hasn't been a complete interest, there are many people for whom the subject has gone unnoticed. And they presented them in the Congress as if they were real. There has not been a media coalition. If there had been a scientific channel in some mass media, such as Canal N, there could have been a formal position. But there has not been a reaction from the unified media. It's not like the gay marriage issue. Most of the media supports gay marriage. Or there are things the media agrees on: support the poor peasants in the mines. Likewise, there should be clear coalitions when pseudoscientific issues like trafficking and destruction of heritage with mummies come up. There has not been a response from the media as a coalition. It has appeared in one or another secondary medium and period. By the others it has been ignored. In the fourth power, science journalists need to have a greater presence. And that increases the power of opinion and influence and change that can be generated in people.

**Interviewer: How do you evaluate the development of science journalism in Peru over the next five years?**

It has to increase. I bet it has to increase. It seems to me that more and more people are able to study a university degree and a scientific degree. Then the percentage of people with an interest in these subjects should increase. And in general, any university degree predisposes you in general terms to learn more about science. It equips you academically to understand any subject. It gives you some training.

**Interviewer: There's something else you'd like to add about science journalism in Peru.**

I would love more journalists to be interested in science journalism and especially skeptical. It's gratifying because personally what I do is report on any topic that I want to inform myself and I search for the right person to come and explain it to me. And in doing so, I help others to understand the subject. So, it's a double gain to do science journalism. Because sometimes I imagine myself doing crime reports: you have to interview the person, you have to make them cry a little and then write all that. I find it more pleasant to go to a scientist and explain to me what he does in a laboratory and to understand the logic behind it in order to be able to explain something super complex like science and to be able to chew it on the public in an article, in an explanation. I find that enriching and of all types of journalism, the most exciting and the one in which you can learn the most. That's why I would be very interested in increasing interest in this type of journalism and making it an important influence in general in journalism, which is the fourth power. We can change history.

## **Appendix 10: Interviewee Barbara Fraser**

**Interviewer: What do you think are the main tasks or functions of science journalism in Peru?**

I would say informative. A combination of informative and investigative because there are some science journalism, that is also environmental journalism that has to do with thing like illegal mining, illegal fishing. These topics have mixed the boundaries between of environmental journalism and science journalism, and it is more investigate. But for the most part I would say informative.

**Interviewer: In your opinion, which are the most popular or most covered scientific topics in Peru?**

If we are talking about science journalism in Peru, I need to clarify first: I don't write for Peruvian audiences. I write for English speaking audiences elsewhere in the world usually. So, my consumption of Peruvian media is relative limited. I don't watch television, I listen some radio news, I read two newspapers, *La República y El Comercio*. And I look at some web sites. I am not going to give you a particularly broad view of consumption of science journalism in Peru. That said. Probably health journalism is the most widely consumed. And topics that have to do with the natural world probably. Ecology, biology. For what I see, that are two most common. There is also some astronomy as well. There is not a lot of science journalism in this country. That is the first thing. But health is one of areas that is well represented. There, I think, the quality is spotty because there is a lot of repeating health myths in the media.

**Interviewer: In your opinion, has there been any improvement in science journalism in Peru in the last five years?**

I think there is. The interest on science topics probably reflects at least some improvements in education. Also the interest of certain scientists, to try to do some science education through the media. There is been some improvements, but I don't think there is a lot.

**Interviewer: How developed is science journalism in Peru compared to other countries in the region?**

I can't speak from many Latin America countries, but certainly there is more in Argentina, Mexico and Chile. And Brazil probably, but I'm not really sure because I don't see media from Brazil. The countries that have more scientific research, has more science journalism, I think.

**Interviewer: What factors support science journalism reporting in Peru?**

Which factors in what sense?

**Interviewer: The factors that helps the journalist who writes about science to write or find a story**

I would say the most important thing is that the editors or the director of the media which they work for are interested in science topics. Some other people were trying to organize a group of, in the case, environmental journalists. First, it was next to impossible for journalists to specialize and in certain field it was difficult for them to get their bosses to be interested in these topics. I think the same is true for science journalism, even worse so. Is almost easier for me to, you phrased the question as a positive, what helps people do their job. I can phrase kind of as a negative, what are the obstacles, and then we can flip it to positive. One of biggest obstacle is lack of knowledge. Interest on the part is that the gatekeepers, the people who are making decisions about what kinds of stories will be write. Second, a lack of specialization on the part of journalists. It is difficult to specialize, and I don't how many people... I think it is harder to study and specialize, it is probably more difficult to do that because of cost of doing that. I don't know if there are specialized courses in science journalism being offered. But it is harder to specialize, to get your media interested in it. If you can find an outlet for your story and you interested in doing the story. (inaudible). I get a degree in science to do science journalism, but certainly didn't when I started. I did a master, but there are plenty of scientists working in this country who are worth talking about their work. On the other hand, scientists who are doing more cutting-edge science are further. Probably another obstacle is crappy language, many people who come out are English speakers. So having or been able to speak English or read it is probably a factor that would be helpful specially for reading scientific papers and preparation and doing interviews.

**Interviewer: Where do you look for local and international science stories?**

I read every morning one, two, three, at least four digests of stories, a combination of science and environment and health. I get EurekaAlerts notifications about papers that are published or are going to be published. So, I review there for topics. I sort of keep, I have been talking to several scientists, I keep track on them, where are they coming to the country, what are they working on. I have attended to science conferences, science journalism conferences where scientists may have presentations. And mostly I read and look for people who are doing research in the fields that I cover or the research that might be interesting for the media.

**Interviewer: And how accessible are these sources?**

My experience with scientist has been that they are very willing to talk about what are they doing. Some had welcome me to going to the field with them. Very rarely do I run into someone who is not willing to talk to me. When the scientists, not exclusively but largely, younger scientists who are in their kind of forties, their peak of their careers, they tend to be communicators also. So many of them are extremely good at promoting their work, explaining their work, doing visuals, they have blogs. I find it some of them good

communicators, good at explaining things. I also true for old scientists but there seems to be that the scientists in their thirties and forties really get the need to communicate.

**Interviewer: In your opinion, what do you think is the collaboration between the journalist and the scientist in Peru?**

My own is being good. Like I said, they are happy to talk. They are usually going to explain things. I go to the field with scientists when I need it inside reporting. For the most part, it is been good. Scientists are happy to have journalists writing about their work.

**Interviewer: What are the main concerns when explaining science to the average reader?**

Mainly that it is understandable for a person who doesn't have a science background, who doesn't have a level of expertise. I should make sure that I understand it clearly. I should think about on ways to presenting things that they are understandable and interesting. And after you must find a story. It is not enough to have research; you need to be sure that is going to hold your reader interest.

**Interviewer: How do you think the economic factor influences the production of science news in Peru?**

Most of them (inaudible) and expenses. If you want to go to field with somebody, expenses are always an issue.

**Interviewer: Apart from the economic factor, do you think there are other factors that restrict scientific news reporting in Peru?**

Do hiking and those things the way I used to. When I go to field with a bunch of twenty something year old, keep up with them. There are certain kind of field I couldn't going to because of the physical (Audio is lost).

**Interviewer: What factors do you think could improve science news reporting in Peru in the future?**

I think that the most important thing is that directors of media understand the importance of communicating science. That science plays an important part in the social context, in the social life of countries. And that a lot of policies require also scientific foundations, people need to understand these things. And science education in Peru is still rather deficient. So, been able to provide information through the media, would be extremely helpful. And the most important thing is that there need to be an awareness of importance of the topic. And that media encourage journalists on their staff to specialize. And there need to be more possibilities for specializing and studying. For getting skills that doesn't have to be a degree program. I don't know if you have talk to Nelly Luna of Ojo Público. On Friday and Saturday, they are doing investigate science journalism workshop. Reading the schedule, you can say it is a investigate environmental journalism workshop. Where is the line between science and



environmental journalism? There shouldn't be a line, I'm not sure it is necessary to draw a distinction there. But in any case, they are making an effort to provide an opportunity to people learning skills, which I think is great. More initiatives like this will be good. Training in universities, training it is not necessary a degree but just workshops. I think these are two things: science literate editors and media directors that are science literate and reporters. Scientists are out there; they are interested in communicating. It is matter of having the people who are capable and skilled to do it and media that is willing to invest on it.

**Interviewer: In your opinion, how do you evaluate the development of science journalism in Peru in the coming years?**

I think it will improve. It will grow because people are becoming more aware of issues like climate change or food production. Things like health issues are important to people. I think there will be more demand and therefore more production. I don't if it will grow fast. It will be great a couple of universities start offering some specialization because that would give it more legitimacy. That university give this some importance, to produce some journalists who specialized on this. That might help to increase, raise activity on the part of media directors. I would hope there is will be some interest.

**Interviewer: Is there anything else you would like to add that you have not mentioned yet?**

One of the things that probably needs to be mention. I don't know how many journalists are aware of these things. But the Knight Center offers Spanish language courses, and I think there are some in science. I'm not 100% sure. There are resources that journalists can used the more, those resources are up there. The Open Notebook, I just saw that they launched a page in Spanish. I was about to put in Facebook today. This is reminding me to do that. The information is up there for journalists about the resources that are available to them. Putting these resources in Spanish, the faster the things will take off as well. The faster and the greater the improvement will be. Have you tried contacting Dr. Elmer Huerta? Doctor Elmer Huerta might have an interesting perspective about health communication. Because like I said there is all kinds of weird stuff about health circulating there. Everything from myths to weird diet stuffs. In coverage of health stuff, there is a lot, there are stories that appeared in newspapers that I'm starting to think are publicity for products or for companies. And there is not just much critical thinking about health. And this is ultra-important in a country where health care is not that good and good health care is not available to people.

## Appendix 11: Interviewee Bruno Ortiz

### **Interviewer: What are the main tasks of science journalism in Peru?**

Basically, I think the main one is to be a tool to contribute to people's scientific literacy. Unfortunately, here we have the problem that the sciences are seen as a burden. Or they teach you to see them as a burden from school. Like something you need to know, but they don't explain why. So you see them as a burden, when, in fact, they are the opposite. It's knowledge that helps you understand the many things you're living with every day. We have a society that is not accustomed to knowing science topics or to handling certain scientific concepts that are basic to understand what is happening. Science journalism at the local level tries to cover that gap, that space for people to understand a little better why certain things happen.

### **Interviewer: What are the most popular topics in science journalism in Peru?**

I can tell you how our audience reacts. You have to take into account that our audience has a very particular cut. Those who read the paper, which is a very small group, are usually oriented towards A or B audiences and are 45 years or older. On the web it is a wider audience. On both platforms, what attracts a lot are -and may sound strange- apart from health issues, are astronomy issues. In health issues, what attracts most attention are - in print - those related to Alzheimer's, Down syndrome, diabetes, cancer. If you want to look for an explanation, based on who my paper audience is, I could tell you that these diseases are more interesting because, due to the socioeconomic level of my target audience or the target audience of the newspaper, these are diseases that people who have money can diagnose. Or you have the resources to manage them, to seek treatments. On the web, health tends to attract. The theme of astronomy on paper works great. But on the web it works best when it has to do with these apocalyptic approach topics. The user of the web in general, not only the user of *El Comercio* has an interest in knowing if we are going to die as a planet. If you put a note that says: An object is going to pass kissing the Earth. You know that kissing the Earth in astronomical distances are thousands of kilometers. But just tell him that and Armageddon, Deep Impact, what time do we send our six heroes to drop a bomb and destroy the asteroid. You realize that those notes or the supermoon, phenomena like the supermoon. Phenomena that don't happen often but that aren't new or strange, but thanks to the media of other countries that give them these appellatives, these names so grandiloquent, that give them a halo of fear that attracts people... In the end, you go here, in a sky like Lima's, you want to see the supermoon and you only see the super-cloud.

### **Interviewer: How much has science journalism improved in Peru in the last five years?**

I'm lucky to be in a newspaper that has a printed edition, six out of seven of the week, a science section, and there's a permanent edition on the web. I'm lucky that I work in a newspaper that can -it's badly said that you can afford it, because you shouldn't afford it, it should be an obligation-, that has a science section. There are other newspapers that don't have that space, that sometimes dedicate one page a week and that sometimes that page is replaceable. That if there is not enough space, it appears. And if there is too much space, something more interesting is published. There are people who dedicate themselves to this

mostly for pleasure, not for obligation. There are not many new media that have come out for you to say this is advancing. In free-to-air television I don't think there's a program dedicated to science. In Channel Seven there was one called Umbrales, but I don't know if it will continue. It was a nice show, but the problem, from my point of view, was that it had four hosts. What happened was that they took turns for weeks because each of them was a specialist in something: one week they talked to you about medicine, another week they talked to you about another science. In the end it was just one program, but I didn't really have a unit because it had several visible faces.

**Interviewer: But do you think there's more interest in science?**

I think there is. Because you can see on the web that you have more and closer information. It can be observe that in certain days the most popular news have to do with science. That it's because of fear or morbidity, but they are the most read. A couple of media have appeared. A new means of science that is N+1, which is already a couple of years old. But it's not Peruvian either, it's foreign initiative. It's in several countries, they have a website in Peru, which I think is excellent. There are Peruvian boys who are working there. But it is not that it is a site that has been opened in Peru so that there are more people dedicated to this, that have where to write, where to publish. I don't think I've made much progress in these five years.

**Interviewer: Compared to other countries in the region, how developed is science journalism in Peru?**

As far as I know, not so much. Other countries have more serious economic problems than we do. What is bad for other countries and for the development of science journalism because... For example, in countries like Argentina they have been closing the pages dedicated to science. Before, there used to be a lot of newspapers that had pages every day dedicated to science that have been closing them or just keep them on the web or appear once a week or just got rid of them. (In Argentina) You have radio programs where you have columnists who talk to you about technology, science. You have radios where there are exclusively scientific programs. And now you have podcasts that are spaces where the disseminator himself can make his content known without the need for someone else. In Chile, you have science and technology shows, in free-to-air television, cable, radio. In Colombia, you have newspapers, radios too. And not just one or two, but several. But you look in Peru, the only media that offers an almost daily space for science is *El Comercio*. And it is a media in an industry that is collapsing to the wall because nobody buys newspapers. To be told no, that you can't sell a science program, that it's impossible to find advertising for it, that's a lie. Peru is not well ranked in that sense because there is no space and new spaces are not created. And people interested don't even bother to prepare because they know it's going to be for pleasure, for mere taste, because they don't have a place to develop.

**Interviewer: What factors do you think support the reporting of science journalism in Peru?**

For example, one of the things that can benefit you to do a good job is that because you don't have a specific professional training for science journalism, these topics generate genuine curiosity. While curiosity is a key aspect in journalism, being more curious about science journalism will lead you to understand the issues. There are some factors that are repeated here and in other countries. We have scientists who aren't used to telling what they're doing. It is more complicated for the journalist to report with the direct source. Since they're not used to it, sometimes you need to publish something for tomorrow or the day after tomorrow and they say "Great, next week we'll talk", even though it's a news story of the day. But it lacks that mentality so that just a good source becomes one. Right now, the fact that it's not very well developed plays a big role. It might sound kind of weird. Due to not being developed, you have a very fertile field to grow. I think there are people there, communication professionals who are interested in the subject of telling these stories. On the other hand, you have professionals in science research topics that like to tell and there is also an opportunity, I think. That's a positive factor because right now pseudoscience information is starting to grow, the charlatans who talk nonsense to you. For example, unlike countries like Spain, here you don't have one or two figures that are moderately mediatic so that they can say: "This guy is talking nonsense, this is wrong". And not only to say it, but also to justify it. You don't have that right now. It would be better for you to have such a figure, for the media to pay attention to it. Or on Twitter or Facebook. But there's no such thing. That could be a factor in favor, there is space for new figures to appear that are representative of the academy or the guild of scientific dissemination to deal with false news and pseudoscience.

**Interviewer: In the case of *El Comercio*, what sources do you use to find both local and international stories?**

Like most media, we subscribe to news services that are linked to specialized journals, such as EurekaAlert. We use it because five years ago we found it and subscribed. It doesn't mean that this was newspaper policy. But as soon as we found the service we subscribed. We use that, we use news cables, we check the internet a lot. We subscribe to several newsletters. Suddenly we are searching for a piece of news that appeared in the newspaper X and we try to contact the authors of the investigations directly. We contacted them by email or phone. We have the formal services to warn us about news like EurekaAlert, we have generic services like news agencies, we have information that we get directly through direct contact, through email. We try not to necessarily do, unless it is very important, the news that does the rest. We try to have an agenda of our own without... Without leaving aside what other media publish. Sometimes the situation gives you to have an opening topic, sometimes just gives you to mention it in a small space so that it is not left unreported.

**Interviewer: In your opinion, how accessible are these sources?**

They are very accessible, except for scientists. It is very easy to contact a scientist from a university in the United States or a country in Europe by e-mail. Because universities have better websites, are much more intuitive, have more information available to the visitor. I can find a note "Mr. John Smith is doing research on potato growing on Mars". I go to the university page and see the press release with the mail and its data. I can send him an email and most likely this

person if not on the same day, the next day, the person will answer my email saying yes. Or I can send an email to the university press unit. Last week my colleague published a story about this artificial meat boom. We found the page of one of the most important companies that does this and we emailed it. They answered us within three hours. “At the moment we are not giving interviews, but we have this information available”. We already had information that was validating a source. For example, here you call university X: “I need to contact a researcher”. “Look, I just got to university and it turns out that the spokesperson isn't there”. “But won't there be another specialist?” “No”. “When does the spokesman come back?” “In two weeks”. Or call doctor Y: “I'm working now. It is not possible”. You realize that there, what I told you at the beginning was the lack of scientific culture in those who do research, but the lack of scientific culture from the point of view of communicating what you are doing. In order for people to know what you're doing, you have to communicate it. If you don't like to do it directly, tell your press office at the institution you work for and they will carry the message. If you don't want photos or videos taken, that has to be respected. But if you don't bring that information as clearly as possible to the masses, no one will know what you're investigating.

**Interviewer: How do you think the economic factor can influence or limit science journalism reporting in Peru?**

The other time there was a report that said that journalism is expensive: going out, interviewing, taking photos. You need money to move from one side to the other and you don't have it. Or you're paying your own expenses. It's really an important factor. Again, especially for a society like ours, probably if you find out that a media that has a science section and is getting money for the science section... If they find out, the public is going to say: “Why don't they spend that money on more useful things?” That's because you don't have in mind the importance of science dissemination. For me this factor has a lot of influence. If you have the necessary resources, you're going to do better journalism. If you don't, you're going to have to manage as best you can.

**Interviewer: In the case of when you want to do more field research. In that case, the economic factor is fundamental.**

It's essential. I tell you that in our case we don't do... INIA<sup>1</sup> invites us or we want to do an investigation on how they are recovering other cotton colors besides white in the high Andes. I have read a report and I know that there are people working on it. For example, I couldn't go to the chief editor and say, "I want to do a report on this, but I need travel expenses. He'll probably say, “Great. Don't do it or make a phone call”. For example, from a business point of view, there are many obstacles for you to do an investigation directly. Last time there was an article -a while ago, actually- about some little calves that were cloning in Amazonas. The person who covered it was one from another section. Why? Because he found out about it, he was on vacation, on vacation he went to Amazonas on purpose. Obviously before he called and said: “I'm going to be in Amazonas, I want to interview the researchers”. He went, made his note and came back. All expenses were paid by that person. There is a limitation there. As I

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<sup>1</sup> Acronym in Spanish for National Institute of Agrarian Innovation.

said before, the more money you have, the better you'll be able to do your job. Unfortunately, this also has to do with scientific literacy. As a media, if you are in a science section you are probably... I feel like it says CONCYTEC, which is the governing body of science, but it does not have the rank of ministry, I depend on another ministry and the ministry is not always going to make a face for me because I am too small. It's more or less the same to be in the position of a science section or to work as a science journalist. Why? Because you don't have representation, because you have to go (on a trip) with your money, your topics are probably good, but they don't make the front page because people say "meh".

**Interviewer: Apart from these factors what others do you think limit science journalism in Peru?**

Knowledge. This is what happens in any other specialized journalism practice. You need not only knowledge of sources, but also knowledge of jargon, of how dynamics are. For example, you can send a political journalist to cover a science congress. He or she will probably do well and be very precise and exact. But you're not going to get the look of the one who, instead of giving an account of an announcement that was made, is criticizing the announcement because there's a background. There, education is a very important factor that prevents you from practicing good science journalism because you are not formally trained. If you are doing it, the most likely thing is that you are doing it because you like it and you have learned it as I learned it in my case.

**Interviewer: What factors do you think would benefit or improve science journalism reporting in Peru?**

I believe that we must be sure that a media outlet, preferably a free-to-air or a national mass circulation, takes risks and has more space for science issues. That they are no longer in international or in crazy world or in sections such as miscellaneous. That they bet on having a science section managed by science journalists who know about the subject and are open to collaborations from other people who are not... I lost the idea. I've been like this for a while, I'm looking for words and my ideas are gone. I think I made myself understood.

**Interviewer: What scientific fields or subjects do you think could have a greater diffusion in a hypothetical development of science journalism?**

I believe that the issues that have to do with tropical diseases that are endemic in many parts of Peru. I'm complaining that we don't get much attention, but for someone from Lima people from the rainforest doesn't exist. You ask him and unfortunately, he doesn't exist. I think there must be a lot of very interesting things being done there that we have our backs to. For example, Arequipa for some reason has the most important universities from where the most important computer scientists in the country are coming out. Their computer science graduates are leaving, people come from Google and Facebook and go to those universities and hire the most skilled. That could quietly be several notes on why no one knows that Arequipa is becoming a pole, not of technological development, but of training professionals for technological companies. As I said at the beginning, since there is so little of this you have a super fertile ground where you can develop professionally. You have a lot of

information, a lot of cases that are not touched that could be touched very well. From those that only interest someone from Lima, to topics that can be much more global, that could attract the attention of other countries.

**Interviewer: How do you evaluate the development of science journalism in Peru over the next five years?**

I sincerely hope it improves. We just got together a group of people who are interested in the subject and some of us who are working in the media. Others who aren't necessarily journalists but who are involved in popularization, maybe from the institutional level because they work in some ministry, institute or government agency. And people who do it independently from their website or their YouTube channel. We are trying to set up a kind of guild for people who are interested in issues of scientific communication, dissemination. Currently it doesn't exist. What we are looking for with this group is, first, to identify how many people there are. Try to associate all the people who are interested in science journalism. Have a mapping of how many people would be interested in these issues. Promote the creation of media spaces so that these issues can be portrayed frequently. But above all we want to form this group to take a stand against so much biased, false or perhaps pseudoscience-linked information that is made public. We see that an authority such as CONCYTEC<sup>2</sup> does nothing or that the government does not say anything because they are not very interested in the subject of science. Then go out as an organization and say, "Hey, this is wrong" to establish a position and to confront people who want to deceive the population. That's basically what we want to do. If this works, we hope to have a lot of effort to, on the one hand, try to help people interested in training. And on the other hand, we want to put the necessary pressure on the media to start opening more spaces to talk about science. Or that in any case people can manage their own digital spaces in blogs, in podcasts to talk about these topics. We hope that with this we can contribute in a much more effective way so that science journalism develops at a local level.

**Interviewer: Is there anything else you would like to add that you have not mentioned yet?**

Basically, here the problem lies, many of the problems in our country lie in an issue of education. We have education problems that are taking their toll on us. But one of the education problems we have in science is that we have been used to being disgusted with science. It's not even about mastering the sciences, but, as a user, understanding science better could help you understand many things that happen around you. And to understand your real dimension in a universe like the one we live in. And we are precisely in such an important time in which we have many more scientific advances in a short time that allows us to dream that in a few more years we are going to have societies that we did not even imagine in science fiction books. We need people to explain these transformations to us, to explain these processes to us. May it help us, may it accompany us in this transformation, and may it accompany us by understanding these changes through journalists so that we can adopt them in a better way.

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<sup>2</sup> The governmental body in charge of the field of science, technology and innovation.

## **Appendix 12: Interviewee Hildegard Willer**

**Interviewer: My first question is: what do you think are the main tasks or functions of science journalism in Peru?**

Functions of science journalism in Peru. And do you think it would be different than in another country?

**Interviewer: No, but perhaps there are some that are more important than others.**

Well, there is an area of what is called science journalism that is called popularization. I would say that is to make digestible what some scientist says. I believe that most of what newspapers and all those who do science journalism do here refer to that: to scientific dissemination as popularizing it. But then, there's another type of science journalism that I would say is the most... Well, that's also demanding. It's no small thing to be a good disseminator. It is demanding and respectable. But as a journalist, just as when you investigate any other field you have to evaluate your sources, right? In fact, as a science journalist you should know how to evaluate different scientific sources and compare them and from there come to your conclusion. That's much more difficult, because that means on the one hand that you need some knowledge. Then there is also still too much respect for what science is. You can't question the doctor.

**Interviewer: Which fields of science journalism do you think are the most reported or the most popular?**

Well, it's dissemination.

**Interviewer: No, I mean which fields.**

Disciplines. Most reported?

**Interviewer: More reported, more popular or receiving more coverage than others.**

That's hard to say because I have no idea, they get more coverage. Also, with dissemination, now a lot of people are on YouTube, for example. But those that are truly important fields that is all that has to do with climate change and rainforest. Everything that has to do with climatic phenomena such as El Niño and also the eruption of glaciers. The issue of water, which is a bigger issue, is partly the same, but it also has to do with drinking water systems and technology. Then biodiversity is also a big issue. Seismology is always a topic in Peru. What I do see in general is health journalism. This is a great subject that you also see as a part of it, but I don't see it as something special in Peru than in another country. And of course this whole clash, the encounter between nature and new infrastructure projects, exploitation. When man's projects meet nature or at least they meet a very traditional culture that has lived there for centuries. That is a subject that is science, but it is not only science but also social sciences.

**Interviewer: What aspects do you think guarantee science journalism in Peru? Is there any factor that you say helps science journalism here in Peru?**



One thing that will help a lot is that all journalists know English and that they know how to read papers. That's not usually done yet. The international language of science is English and not Spanish. This would raise the quality. The other thing is to have some clear methodological things as a science journalist. If you read a paper: what was the methodology? how big was the sample? Who financed it? It doesn't matter what field you're looking at, but ask those questions as well. What other factors? Going to the field has been reduced in media because field trips are expensive. For that you need special projects. And a factor that I realize sometimes when you're with scientists. They think you're their public relations officer, but journalists aren't the public relations officers of any scientist.

**Interviewer: How has science journalism in Peru improved in the last five years? Do you think there has been an improvement?**

There is little science journalism because there is also little scientific production. I think that when you look at journalism you also have to see how scientific production has increased. I think it has increased but it is still very low compared to other Latin American countries. When we did the science journalism meeting, I saw that there were several guys who had several platforms, a YouTube channel. But there seems to be a small increase. Then there are all the new ones: Ojo Público, Convoca. Everything that has to do with environmental conflicts. There I believe that the scientific part of that until recently has not been worked much and that goes a little better. For example, Ojo Público has a meeting this Friday and Saturday on science journalism. There were three meetings, one in Pucallpa, another in Colombia, and now in Lima on Friday and Saturday. Maybe if you want to go I can ask you. So that's also a sign that there's a greater interest. For example, if you write about socio-environmental conflicts or if you write about the rainforest you should also take more account of scientific sources.

**Interviewer: How developed is science journalism in Peru compared to other Latin American countries in the region?**

I don't know how to tell you that in a systematic way. But I do know that there was a girl from Mexico, who is at UNAM, and everything they do there is light years away. Then there was a journalist who came from Argentina, but I don't know if it's him. But I suppose that in the big countries that have more scientific production, of course, it is better. The Andean countries are still bad.

**Interviewer: What factors support the practice of science journalism in Peru?**

First, scientific sources. It is something you don't normally learn in journalism schools. It's searching for sources as well, start with Google Scholar for example. Also look for scientific sources on this subject and not only read but go look for and interview the scientist. Just like everyone else is going to look for a politician. Travel is very important, especially because many of these phenomena are not in Lima. You have to see the jungle, the mountains and that worries because the media have less and less budget for that. English is fundamental. Another thing is that access to public information is bad here. We would need better access

to public information because it is also technical information. I don't know if it's scientific, but if it's technical. I also experienced it last year in two cases. MINSAs<sup>1</sup> is a disaster.

**Interviewer: What sources do you use to find local and international science stories?**

Last year I did for *Süddeutsche Zeitung* about women with breast cancer in Venezuela. So what do you do? On the one hand, I have a friend who is both a doctor and a cancer patient. She told me, she put me in contact with other specialized doctors. Luckily they answered me and sent me part of their articles, the ones that had articles. Then I also contact a lady from a society of patients affected which is very important. My friend the doctor, several doctors in that case and a representative of a patient association. Of course, that was not super-scientific.

**Interviewer: What are the sources you use to find out?**

One source has been several doctors. I've called them on Skype and WhatsApp. Well I had already been in Venezuela. Another example, I recently did something about Cerro de Pasco. For example, everyone knows that Cerro de Pasco is contaminated. Everyone knows that children are heavy metal contaminated. I found a case: a serious illness in a girl where the diagnosis was very clear and in the medical literature at least it is associated with arsenic. I search for that girl's doctors and through them we also looked for medical literature, we looked for one or two scientific medical articles that sometimes tend to be very short. Or on Google Scholar you just search aplastic anemia and arsenic and you're going to find something. The hard part was getting permission from MINSAs for the doctor to talk to me. You don't believe what it cost me.

**Interviewer: How accessible are these sources in Peru?**

I told you that example. He has been the director of a department of the new San Borja Children's Hospital. A super cool doctor. I had to get the cell phone, but as I knew the patient's father: "Yes, I talk to you, but the MINSAs has to authorize me". Very difficult. You don't know how many calls and the WhatsApp messages it cost me. Then someone told me that the MINSAs has like a staff of thirty communicators. I don't know if it was a lack of coordination, that they didn't care about or if they really didn't want it all together. In the end I got at least that doctor could speak officially, but I didn't get, for example, an interview with an official. Well, I also went to the MINSAs. They were the parents who fought like warriors for their little girl and took action in front of the MINSAs. The affected parents chained themselves and when you cover it there are also officials. They don't talk but you have to look, you have to be there. In fact, I also made requests for information, but not from the scientific field, but about concessions.

**Interviewer: How does the collaboration between journalists and scientists in Peru work?**

Generally fine. I'm very close to Barbara. It's a friendship of many years. Then we share sources. We talk each other. One thing that is important to me when I write in German... You normally do an article, a very long investigation, I would like you to show it to a colleague before passing it on to an editor. "What do you think?". I don't have that here and it has to be someone who knows too. *El Comercio* seems to me to be more about scientific dissemination,

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<sup>1</sup> Acronym in Spanish for Ministry of Health.

I think it's more about that. But on the other hand, there are those who make socio-environmental conflicts such as Ojo Público, Nelly Luna. I'm in the foreign press association, someone would also be needed there.

**Interviewer: What are your main concerns when writing these science stories?**

I can tell you what it is. I recently wrote an article about the retreat of the glaciers in La Paz. I interviewed some glaciologists. When it comes down to it, you ask: "Tell me what is it?" "Well, it's very relative". They kill your story. In fact, that seems to me to be an inherent contradiction between journalism and science. Science doesn't look for a story and maybe in journalism we look too much for a story. I sent the quotes to the two glaciologists and it was really like saying "in the mountains of Peru it rains something like that". The other is a fact: that extreme weather events have increased. One of them told me: "There are no data. That's a subjective feeling of the people". That kills your story. That exasperated me. I must make a more or less attractive story. The scientists are going to tell you, "Those journalists simplify everything. You explain it to them ten times and they misunderstand. But sometimes it's not that, we just don't have the same space and we have another reader. You must simplify it. You need to be interesting and at the same time to be rigorous and the other thing is that they are relevant things. If you write about science it has to be something relevant for society, for life. Because a lot of people, at least when I was in university, had the impression that there was a lot of research that I don't know if anyone was interested in.

**Interviewer: How do financial factors influence science journalism reporting?**

Above all, if you have to travel and how much time you have you can invest. Those are the two things: because time is also money. The journalist Joseph Zarate, he has won several awards and makes long reports, he said in an interview that he earns his money with other things: doing editions, public relations. That kind of investigations where you spend a week, two weeks in the community don't even try it. No media finances that.

**Interviewer: Do you think there are other factors that restrict the practice of science journalism besides what we've already talked about?**

The importance of the volume of production and the accessibility of scientific production in Peru. I think that also many scientists still feel in their ivory tower. Don't know English. What else do you restrict? Normally scientists do give you interviews. As a foreign journalist at least everyone thinks I'm going to make them famous. I don't know what it's like if someone comes from a media not so mainstream. You know that science journalists don't know how a media works. They think you're a public relations officer. I realize it in Católica University. Where Miguel Ángel has been for years, they've been working on science journalism and they think that's divulging what the scientists at Católica do. That's not my concept of journalism. I'm critical of scientists, I question them about things. Who finances you? Is the result stable? Is the methodology relevant? The other thing is that the scientist is a source, but he is not a god. It's difficult. For example, years ago I did a story about Swiss glaciologists in Huaraz. They had set up an early warning system for when a rock falls from above half an hour before there is going to be an alarm that can save you before the avalanche comes. It

turns out that the community itself has dismantled it. For fascinating reasons, several reasons. They didn't understand. They thought that was why it didn't rain because the machines were there. I did something for the Swiss radio and put it as a title or in the link The project of the glaciologists has failed. That scientist then said to me: "But I didn't say that it failed". Of course, that's how you say it. Failed is a clear thing, that attracts attention. Besides, people are fed up just listening to those superb projects, where everything is going well. I don't know if that glaciologist will give me another interview. A journalist always has to evaluate that.

**Interviewer: What factors could improve science journalism reporting in Peru?**

Accessibility and promotion of scientific institutions. I gave you the example of Senamhi<sup>2</sup>. I realized that with the El Niño they had changed. For example, the scientists there themselves have explained what El Niño is. It has been great that they themselves also change their access, that they understand that it is a dialogue. I think that would help. Do you know what is a science slam? Do you know what poetry slam is? You read your poetry or what you've written in public and it's like a competition. In the end those who listen to you say who won. The same thing is a science slam... A scientist has to explain a pitch. And there was one here in a place in Lince. I remember that I was going to go, but it was already full. There seems to be a little movement. It's super cool because it's done by the same students, the young researchers.

**Interviewer: Do you think there's a field that could be improved from these factors, a field that's forgotten that doesn't receive as much coverage?**

Yes, I think it's a good example of the last El Niño and the information policy and that many journalists have picked it up. At Senamhi, they have understood that they have to be there, they have to explain to the journalists. It seems to me that the bad information has been less than at other times. And for journalists it would be better to have a specialization as well.

**Interviewer: Finally, in your opinion, how do you evaluate the development of science journalism in Peru in the coming years?**

Science journalism refers above all to those fields that we said at the beginning. Here we don't have a high-tech industry, nor a car industry. There are several things that are a little limited to do. For example, I have colleagues in Germany who do about virtual reality. The basics here have to do with nature conservation, the clash between nature and man and climate change. Of course, sustainable agriculture, climatology. That will develop.

**Interviewer: There's something else you'd like to add that you didn't mention.**

You know that there are a lot of support tools that are now on the internet. Do you know The Open Notebook? Just today I heard that they have launched a Spanish version. Those articles are fantastic. And they're very practical because the journalists themselves write there. I'm going to use it now in my class. As I say, there's a lot going on the environmental side here.

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<sup>2</sup> Acronym in Spanish for Spanish acronym for National Meteorological and Hydrological Service of Peru.

### **Appendix 13: Interviewee Milagros Berríos**

**Interviewer: What do you think are the main tasks or functions when communicating science or innovation in Peru?**

It is to bring people, in this case the reader, information that is useful or can impact on their lives, their health, their knowledge and report on information about what is being done in the scientific field. In Peru I think there is very little investment, very little interest in this field from a budget and everything else. People think: “I think that here you investigate, you discover things, but in a super silent way”. Then it's time to show what researchers work here in the country.

**Interviewer: What are the most popular or most widely covered science or technology topics in Peru?**

I think what people are very interested now is the topic of technology in general. The subject of artificial intelligence also pleases them very much. When I was in *Domingo*, we didn't do so much on science. We started with that topic to see how we were doing and it turned out really well. We worked with videos and people were interested and opined. They saw it on the more nationalist side. “What pride that Peruvians innovate and propose that! What pride that a Peruvian researcher does things abroad!” Actually, science does interest people. The question is how to approach it and how to make it interesting because if we start talking about specialized technical things people won't care. So returning to questions: the subject of artificial intelligence, the subject of technology, the subject of neuroscience also likes very much because they are the subjects that I have worked on and I have seen that have impacted. Also topics that are useful, of service. I remember that once I made a note about water purification, a process carried out by the National Health Institute. They needed funding and the researchers told me that they then called them to fund them because they know that they can benefit a broad sector of the population.

**Interviewer: Do you think this production of science news has increased in the last two or three years? Is there greater public interest in science?**

I think it's the same. Because if you realize that there are no specialized portals on the subject, there aren't many. There's *Sophiamania*, *El Comercio* publishes its things, *La República* publishes its things. But from there I don't see that the scientific field has expanded. I think it's the same.

**Interviewer: How developed is Peru in the coverage of these issues in relation to other Latin American countries?**

I think we are lacking because, for example, we don't have a section specialized in science. Generally, the media do not have a section specialized in science. Sometimes we publish it in the local section, in the international section, in society or we publish it eventually when they have received an award or when they have discovered something. But it's not a common thing. On the other hand, I believe that in other international or regional media, they have their spaces specialized in science. There are science journalists. Here it is not that we are

specialized in science, but we begin to cover the subject a little. We start to have contacts, sources. They tell us something interesting, we take the topic and we start to develop it. I think we lack in comparison to the region.

**Interviewer: What factors do you think helped or benefited you at the time of reporting science and technology news?**

It's a field I like. I've always liked biology before. When you like something you obviously put more effort in general. First that was what I liked. Second, I found it much more interesting as a reader, as a public to know a little more about these subjects. I think it's an interest that comes from before I start doing journalism.

**Interviewer: What sources do you use to find these stories?**

I find the stories in a very particular way. In the case of Quechua, which I always tell because it was a very particular way how I found that case. That case took me to Italy because I won an award for that report and did an internship at a university in Milan. I found that case on Facebook. I was on Facebook and I saw a comment of an x about a YouTube video where it said: "Can you imagine that a robot or your smartphone starts speaking in Quechua? Well, I'm making it possible". It was just that and I found it super strange. I entered the profile of this person I started looking for who he was, I started to google him and found that he was an engineer of Pontificia Universidad Católica del Perú working on a project linked to Quechua. I contact him, I research a little more of his work, we began to talk with him, with the people he works with, and we wrote that note. In that case it was journalistic curiosity. But in other cases, it has happened to me that I'm going to cover a local news, a conference. Suddenly a researcher who exposes mentions a figure or something that I find interesting and I take it to the side and start asking more about that case. And there are other sources that say to me, "Look, they're going to present this. Are you interested?". Sometimes it's the sources or it's the same curiosity. You also follow up on cases that have happened, of a researcher who has been working on something five years ago. What happened to him? You call him and he has the project he was working on ready.

**Interviewer: In your opinion, how accessible are these sources?**

I haven't had many problems. They are well accessible in most cases. They are also special because many scientists do not have a good relationship with the media. They want to be very precise because we, the journalists, don't know much about the field and they want you to pass on the story before you publish it. I don't pass on my notes, but we are always in constant contact so that everything goes well. But yes, they have generally been accessible people. I remember only one case of a nuclear engineer who works in the United States and I have waited a year to interview him until he came here and interviewed him. I still don't work the article. Because of the jobs he has abroad, it is sometimes complicated by the timetables, but in reality they have been very accessible.

**Interviewer: In your experience, has the interaction between the journalist and the scientist been a positive experience?**

Yes, it has been positive. In fact, in my experience they have been open, they have understood that when I don't understand something I'm going to ask them until I'm clear. First I have to understand it and then I have to write it down. But I have also perceived that there is a certain mistrust in the media on the part of scientists when it comes to exposing or disseminating their research.

**Interviewer: How does this mistrust manifest itself?**

When they ask me to give them the article and they asked me once to repeat what they were saying to confirm that I had understood well what they have explained to me. I have felt that they have mistrust with the treatment given to their investigation.

**Interviewer: Do you think economic factors influence the production of science news in Peru?**

No, generally. Apart from that, the notes I have worked on have been here in Lima, as if there hasn't been a problem. Once I remember that we were going to Chachapoyas for a case of cloning, in a university. There, the issue of travel expenses made it impossible for us to cover the story. We didn't go there anymore. We were like "tomorrow we go" and they said: "It's very expensive, you don't go".

**Interviewer: What year was that?**

That was 2 years ago, a case at the Universidad Santo Toribio in Chachapoyas.

**Interviewer: Did you already have the plan?**

Yes, I had already coordinated it. Everything was ready, but when they were going to buy the tickets for us, they told us: "We can't afford it". It got frustrated.

**Interviewer: Apart from the economic factor, do you think there is another factor that limits the production of science news in Peru?**

I suppose it could be the editorial line in some cases or the priority they give to the coverage of other topics. Sometimes you think your science and innovation topic needs is big space. Sometimes there are other things or of interest and they give you a little space. They say, "No, that's not a good topic". It can also be time because there are complex subjects that do need time so that you can perhaps consult other sources and be sure of how you are going to produce the text. In the diary everything is fast and in the weekly also. Sometimes you didn't have enough time. I've had a year since I interviewed the researcher in the United States and until now I don't do the article because it doesn't give me the time to listen to everything he's told me, start seeing the information and working on it.

**Interviewer: Do you think that a limiting factor is the scientific education that exists in Peru? I'm not only referring to journalists but also to the population.**

Yeah, people have other interests. There are people more interested in entertainment, more in policing than in science. But I think it's still a niche that can still be exploited. We didn't

trust that the science news were going to work, but in the end they did work, people did get interested.

**Interviewer: What factors do you think could benefit the reporting of science news in Peru in the future?**

As journalists is that the treatment of the articles can be more interesting. For example, I have worked, in addition to innovation research, I made more profiles. I have done several profiles on scientists. People are interested in stories through narrative journalism. Don't go through the hard, technical and numerical thing, but take a chance on stories, on the audiovisual aspect. The videos were also very supportive. We also take advantage of tools such as computer graphics when it comes to designing news. This makes the information easier and more digestible. Use different tools to make the information attractive.

**Interviewer: And the subject of specialization?**

Yes, anyway. It would be good for the media to dedicate or give time to specialize their journalists. That they can receive workshops, that they can specialize in different topics, including the scientific topic. For example, I've been to some talks by the Gabriel García Márquez foundation on health journalism and these are things that help you. You talk about health subjects, how to report on them, you share experiences with colleagues, you acquire sources, you see different angles to deal with a story. But that's what the foundation does, I don't know if the media really promotes this kind of workshops to specialize their journalists.

**Interviewer: What fields or scientific topics do you think do not receive enough coverage and should perhaps receive it in the case of Peru?**

I haven't seen much of the basic sciences like mathematics. I don't see that kind of science receiving any kind of coverage. The subject of technology, of innovation, the things of biomedicine, yes. Basic sciences and hard sciences I don't see that they receive attention. And the social sciences in the case of anthropology when there are discoveries.

**Interviewer: And in your opinion, how do you evaluate the development of science in the coming years? Do you think it is going to improve or will it be maintained?**

If we continue as we are without specializing, I believe that it will remain as it is. The good thing is that at least there are some spaces that advocate for science and also some publications such as *Domingo*, because when you see that they have turned out to be of interest you keep working. But the issue of specialization is urgent and also urges that the media give a little more focus to the scientific issue because it works. If you want to focus only on people's interests, it does work. It has to change, improve the subject of specialization so that it can move forward. Perhaps now that digital media are appearing, more digital options will also appear that bet on science journalism.

**Interviewer: Finally, is there anything important that you haven't mentioned that you'd like to mention about this specific topic?**



It is very important for journalists who sometimes work on science to be very clear, to try to make very simple the information you are going to transmit and to try to be very insistent with the sources. You should not only keep what the scientist told you, but also look to other sources. When I worked on some articles, you have to use, for example, indexed journals, epidemiological figures from Minsa<sup>1</sup>. As a journalist, you are not only a scientific disseminator, but you must also contextualize the topic and take advantage of the situation to talk about certain topics. For example, with El Niño you could talk about the lack of water, you could talk about how to purify it for people who didn't have water. Sometimes from the current situation you can get a topic and you can approach it from the scientific side, but you need to resort to different sources. The mistake that many journalists make is that we are left with only one source, with what the scientist says. It is necessary to go to more sources. It is necessary to contextualize. It is necessary to include figures, to give a more national panorama and not to focus on what is happening here in Lima, in relation to innovation and science issues.

**Interviewer: And about figures, how accessible has it been for you to get the figures, has it been simple or rather complicated if you have worked with them?**

Yes, we have. There are public figures. It is up to you to look for them well because here the government's information system is not so simple. You don't have it there at hand. They are very unfriendly. If you already use it, you know which route to follow and you find it. In other cases, you have to request them and that takes a while. The ministries give you figures that you are going to use. Many times I've asked and they haven't given me anything. You have to appeal to the issue of transparency to obtain figures. But there are different cases. There are times in which I have not been given anything. Others have left me waiting, but in the end they have given them to me. And other cases I did. In other cases, there is a lack of figures. There are ministries that don't have updated information on different diseases.

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<sup>1</sup> Acronym in Spanish for Ministry of Health.

## Appendix 14: Interviewee Víctor Román

### **Interviewer: What do you think are the functions of science journalism in Peru?**

I would say to generate critical thinking, to make the public understand that reality is much more complex than it usually is or what it usually seems. People tend to see things in a simplistic way. What dissemination does here in Peru is to teach you these nuances and make you understand that it's not that simple. In addition to generating critical thinking, it is to inform. And it has a political function because as we have more access to information, we are going to ask that our authorities are well informed. That they make their decisions based, based on science, in order to promote driving science and technology.

### **Interviewer: And in the Peruvian case, what are the most popular or recurrent scientific topics?**

I would say physics and astronomy. Astronomy is a subject that almost everyone reads, although I don't think everyone understands it. But cosmology, astronomy and planets and that kind of subject usually draws a lot of attention. I remember that within CONCYTEC space sciences were not included in one of the guidelines for doing research, even though there is a community in charge of propulsion or satellites. But curiously, when the former head of CONCYTEC<sup>1</sup> launches her think tank, she names it *En Órbita* and uses a lot of imaginary space science because she just pulls a lot. Obviously, technology always draws a lot of attention.

### **Interviewer: And how do you think science journalism in Peru has improved in the last five years?**

Yes, we are already a lot. We are just... Before we were Claudia, Aldo, Bruno of *El Comercio* and me. But now there is Maite Vizcarra, Daniel Meza, Bryan Lucero and there are two other guys who write in *El Comercio*. I'm forgetting professor Unger. In recent years there has been a boom. In fact, we are working to form the association. Maybe Bruno told you.

### **Interviewer: He told me that there is still no guild of science journalists.**

We have recently been registered with the Colombian science journalism association. They have given us the statutes and we are reviewing them. On Monday we are having a meeting to open the association.

### **Interviewer: How developed is science journalism in Peru in relation to other countries in the region?**

We are not so developed yet. I would tell you that in Latin America the one that is more developed is Argentina. Then comes Colombia, Mexico and then there's us. It's not that much science journalism is done in the region. Bolivia, Ecuador don't have any. No scientific disseminator comes to mind. Not Uruguay, not Chile either.

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<sup>1</sup> The governmental body in charge of the field of science, technology and innovation.

**Interviewer: What factors do you think benefit the journalist when it comes to reporting science news in Peru?**

I imagine that the predisposition of scientists. Scientists have begun to understand that the dissemination of their work is important and that they can benefit from the press, from the work of the journalist. Social media that allow us to reach more people. We still don't have spaces in print media, but we have through social media.

**Interviewer: What sources do journalists use to find for local and international science news?**

Journals: *Science*, *Nature*. Also Nat Geo. Right now I'm more of an editor than a writer or a reporter. I'm hardly a reporter anymore. Here I used to go to UTEC<sup>2</sup>, the International Potato Center, UNI<sup>3</sup>, INICTEL<sup>4</sup>. Those were the places where I was going to report. I also used to report on the technological community, the guys who make innovation. But in innovation we are still in our infancy. The basis is science. As long as science is not broad, nothing else can be built because you need to engage with the economic factor. I also use some foreign specialized media.

**Interviewer: How accessible are they?**

Yes, they are accessible. They are in English, in technical English. Often one has to communicate in English with some scientist to absolve one or another query. But I'd say it's simple.

**Interviewer: What is your impression about the collaboration between journalists and scientists in the Peruvian case?**

Positive, the scientists I have worked with were ready to answer the questions. If we sometimes make a mistake of interpretation because we are not scientists, they will probably get upset, but they have a lot of patience. I think that is positive.

**Interviewer: Do you think the age factor has something to do with this?**

Very probably. What happens is that I do not remember a negative experience in this time that I have been working. Engineers, researchers and scientists have always been very kind, very open.

**Interviewer: What are your main concerns when explaining science to a reader who doesn't specialize in science?**

Hook the reader. In the press, that within the first two paragraphs there is something the reader can relate to. If you then write something important and he didn't understand you, it doesn't make much sense anymore. That's my first concern: to hook and that the reader understands. The second thing would be that the information you are receiving is important.

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<sup>2</sup> Acronym in Spanish for University of Engineering and Technology.

<sup>3</sup> Acronym in Spanish for National University of Engineering.

<sup>4</sup> Acronym in Spanish for National Telecommunications Research and Training Institute.

The last factor is to try to astonish him. When the reader reads the news -although it can't always be- when I see my article I'll say: "Wow, that's great!". That the reader wants to know a little more, click on the hyperlinks and go to Wikipedia to find the rest of the articles or sources.

**Interviewer: How do you think the economic factor influences science journalism reporting in Peru?**

Quite a bit, I would say. If there were many more resources, one could make a narrative story, which is what Ojo Público tries to do. Ojo Público tries to do a little science journalism from a more social and environmental perspective. I think they have a little more resources and can reach more audiences. When you do narrative stories, you hook people more.

**Interviewer: Apart from the economic factor, do you think there are other factors that limit science journalism reporting?**

I would tell you the lack of scientists specialized here in Peru, for example, in nanomaterials. Here we do a lot of research in biology or tropical diseases. If you choose one of these topics, you have a place to pick and ask. But if you perhaps want to do an article about a type of binary star or a new material, you're not going to have many sources to go to. You must send a mail abroad.

**Interviewer: Have you had any experience of sending mail abroad? How was the communication?**

Very good. In the United States and Russia, the scientist understands that dissemination is important. So they take their time, they contact you via Skype. It's been very cool.

**Interviewer: And do you find any difference when you've had to talk to national or international scientists?**

Not in addition to the language. There are certain scientists who are not used to talking to journalists and you have to spoon out the information. "No, I don't want to tell you this, I want to tell you that". That happens with Peruvians and foreigners.

**Interviewer: In your opinion, what factors could improve the reporting of science news in Peru?**

Give it more space on television, in bigger media. That doesn't end up making my work much simpler, but it expands the spectrum.

**Interviewer: This guild of press guild you think could help...**

That's the intention. One of the things we want to do is to fight pseudoscience. That there aren't those midday shows where supernatural things are portrayed as if it were science news. Either that journalist who interviews cosmobiologists or they tell you that earthquakes happen because there are so many negative energies. That kind of nonsense shouldn't have room in a society that already has access to science and knows how things work. That's one

of the things we want to do in the association: to create a network and eventually issue press releases when someone comes out with some stupidity.

**Interviewer: What scientific topics that aren't so widely disseminated could eventually become more widely disseminated if science journalism develops?**

I'm in a kind of bubble. I spend all day reading, writing and reviewing. My closest circle is informed people. Because of my own routine, I can hardly get out of that bubble and get in touch with the average citizen. I would say critical thinking, scientific method. Not even advanced societies can solve that (inaudible) problem. In order to be able to tell you I would have to know which one is missing. Biology because we are finally a country with great biological wealth and computer science. Those are the ones that should be promoted.

**Interviewer: How do you evaluate the development of science journalism in Peru over the next five years?**

I'm optimistic. Technological development is driving us in that direction. There are going to have to be science journalists, just like there are sports journalists. There have to be more science journalists dedicated to processing all these new advances, innovations, inventions so that people know and at the same time make an analysis of how these advances, innovation and research can impact society and how it can modify it.

**Interviewer: There is something else you want to say that you consider important on the subject.**

I think there should be a couple of faculties that teach specialization. Journalists should be taught the scientific method and they should be taught to communicate science to the public. That's what I think there should be here in Peru.

## **Appendix 15: Interviewee Zoraida Portillo**

### **Interviewer: What are the main functions of science journalism in Peru?**

I believe that science journalism not only in Peru, but in general has as its specific and basic function to communicate science, to communicate what is done from science. And to serve as a nexus or a bridge between scientists and a much wider audience, which not only includes readers or people who want to consume science, but also political decision-makers. Sometimes science journalists become the only channel, the only connection so that policy makers can know what they are doing, what solutions can be made from science for development.

### **Interviewer: In your opinion, what are the most popular or recurrent topics in science journalism in Peru?**

Undoubtedly, here in Peru, the environment. Environmental topics that are sometimes taken biased. By this I mean that there are things within environmental topics like climate change or natural disasters that are always recurrent, but without going into a deeper analysis. They only stay in the surface, in the news of the day without further investigating what is happening. In fact, the environmental issue is considered, when you talk to a lot of people or editors, they say to you: "I do science journalism because I do environmental issues". Another topic that is also quite covered is that of new technologies. But here too there is another bias. New technologies are understood as electronic devices. But when you try to go a little deeper into nanotechnology, those kinds of things that are also related, those topics are not so covered. Then, health issues are a constant and, as in the case of environmental issues, they are covered from different perspectives and sometimes not with the right depth. Much importance is given to what public health is, but without going any further and without considering that there are very deep, epidemiological investigations that can help public health issues. It seems to me that these are the main issues. There are also topics that fall into pseudoscience and are portrayed as if they were scientifically valid.

### **Interviewer: What kinds of topics?**

For example, within the field of biotechnology, the issue of transgenics is touched upon a lot. They remain in the surface again because sometimes the sources consulted are not scientific. It is used that "there is a study over there", but there is no mention of which study. There is a lot of lack of seriousness in these matters. There are other topics such as traditional medicine, which are good, because really the incorporation of traditional knowledge into scientific disciplines is very important. However, it only remains that through traditional medicine you can cure even cancer. This type of research on sweeteners does not really have a scientific basis, but is taken from the pharmaceutical industry, from the sectors involved. In these topics of pseudoscience, the particular interests of some sectors are very mixed with what are really scientific studies. In health issues, in environmental issues there are many pseudoscience issues.

**Interviewer: In your opinion, how has science journalism in Peru improved in the last five years? Has there been any improvement?**

I don't know if we could talk about improvement. I think we could talk about greater knowledge, about the existence of this specialization within journalism. Because if we go back five years ago, I think very few people knew... I think there is a break in Peru when COP20 is held in 2014. As a result of COP20, many training sessions were held that year. There was a lot of activity around training and training communicators, not just journalists on environmental issues. I believe that there were many who realized that there was something else that could be covered. Environmental issues began to appear, environmental research issues appeared in many media. And there began to be a greater diffusion about the existence of this discipline. I believe that in the last five years there has been a greater knowledge, a greater openness. Not only by the media, but by scientists who have realized that it is necessary to communicate. That they can no longer be locked up in their laboratories, but that they have to communicate it. And that they can find in the science journalist or in the science communicator an ally.

**Interviewer: How developed is science journalism in Peru compared to other countries in the region?**

Unfortunately, I don't think we are at the same level. In October, we had a Latin American meeting of science journalists in Panama. There it became very clear that in South America there is a division of countries. Ecuador, Bolivia and Peru are at the same level of science journalism: almost zero. Another Andean country like Colombia is years away from us because, in the last five years, they have greatly promoted science journalism and science communication. I believe that, in the case of Peru, we are still far behind. We still have to talk to lecturers of the universities, of communication faculties and explain to them what science journalism is, what science communication means, because many do not know. And they don't consider it something important within the professional training of the journalist. I think there's a lot to do.

**Interviewer: What factors support science journalism reporting in Peru?**

I think our geography is a factor that plays in favor. With such a rough geography, and if we see it in the light of climate change, you have enormous possibilities of covering different topics that are not just environmental issues. You can start from an environmental issue such as a natural disaster and from there find other research that is linked to those issues. I believe that a favorable factor that is not being taken into account is geography. Also important is the geographical location that we have in South America. Being an Amazonian and Andean country, we have many topics that we can cover. From earth sciences to health itself and even biodiversity, the research that is being done on that, the development of agricultural systems. In reality, there is an infinity. The question is to search for them and identify them.

**Interviewer: What are the most commonly used sources for finding both national and international science histories?**

It's good that you ask me that question because it allows me to talk about something that is very important to me and that is not considered when talking about science journalism. Undoubtedly, the sources would be, in the first place, all the studies that are scientifically validated between peers, those that are published in the international journals. This is a first line from which stories can be extracted. Obviously as a reference because then it is necessary to contrast them with reality, with other sources. But when I told you that it was a good question, it is because in our case, in the Peruvian case, as in the case of other countries, a primary source are the scientific research centers. What happens in the Peruvian case? These scientific research centers are practically forbidden to journalists. Why? Because there is an obstacle -and it is very regrettable to say this- which are the institutional image and communications offices. They are the first line that we have to face if we want to do a report or an investigation. The people in charge of these offices are the first obstacles to talking to the press and reaching scientists. I think that's not a bad intention, but a lack of training and a lack of knowing exactly why it's important to communicate science, why it's important for the journalist to be able to reach the scientist easily. They become a hindrance rather than a primary and very important source to access new stories, to be able to tell our stories in a proper way. I always say that we need to work very hard there. To have journalists specialized in science communication so that they can be allies and not become obstacles.

**Interviewer: My next question went in that direction. How accessible are these sources?**

When we talk about accessibility of sources, we also have to refer to the scientists themselves. Sometimes - here I'm talking about the Peruvian case - the Peruvian scientist is not very accustomed to talking to the press about his research. He is very suspicious, he is very fearful, he is very cautious about how he is going to be quoted. In general terms, I think they have an absolute ignorance of how the media work. That means that when the scientist agrees to be with you, the journalist stops being a mortal enemy to the guy who is going to solve all the problems. He starts talking and talking, he thinks you're going to publish it as it is, that everything he's saying is important. He has no notion that an edition must be made, not everything he says is important to the public. That creates a new problem. Next time he doesn't want to talk to you anymore. Or he calls you and says: "You misquoted me. I've made a fool of myself". A series of reticence that I also believe there is another field where it is necessary to train people. They go from being an almost inaccessible source to being a fairly accessible source and then become inaccessible again because of these problems. In other countries the scientist is very willing, he understands that the only way for his research to get to where it needs to go is by communicating. Then he is very accessible to talk. Speaking of those who publish in journals, they are also very accessible.

**Interviewer: My next question was also directed at that aspect. How does the collaboration between journalist and scientist work in Peru? In a previous interview, I was told that with younger scientists, collaboration is easier than with older ones.**

I couldn't generalize. More than an age problem, it is a problem of perception on the part of the scientist. Because there may be a young scientist who knows the importance of communicating and is going to be very accessible just as there may be a young scientist who



is still afraid and says, “better not”. Similarly, there may be an eminence who is not interested in communicating if he already has a name. Or vice versa, he is an eminence and therefore knows the importance of her research being widely disseminated. Here I can tell you an anecdote of a scientist who has passed away, who was really an eminence in Peru. He always said he never gave interviews to the local media because the local media made him look like a cretin. And he wasn't willing to have his fame, his trajectory exposed that way. In part he was right because effectively one of the problems we have here, with our science journalists, is that they don't prepare. They don't have an adequate academic background, but in addition they don't fix that deficiency by preparing adequately for the interview. Because interviewing a scientist is not the same as interviewing a politician. You can ask the politician about the trip to the moon and he will answer you. If the journalist asks the scientist something that is not from his field, the scientist will simply say: “I'm not answering that”. This implies that on the journalist's side there must be a documentation, a previous preparation so as not to screw up. There are several factors that come together.

**Interviewer: What are the main concerns when explaining science to the average reader?**

The first big responsibility we have as science journalists is to try to communicate what we're told in simple language that people understand. In addition, not only do they understand it, but they also understand the importance of why that topic is being addressed. Because it's not the same to deal with a crime news, the importance of which is debatable, and a science news with which the audience can ask, “What good is it to me? Why are you telling me this?” I believe that the first requirement is to translate into simple language what the scientist is communicating to us. Secondly, how we are trusting our sources. The precision of the things we are saying. There's also a big responsibility there because we don't just have to accept what a scientist told us. We always have to contrast other sources. I think that to present a diversity of sources, that they know about the subject, that they are authorized sources is something very important when you do science coverage. Finally, it is very important and that social networks allow a lot of feedback. How am I getting this information to the public? Is it helping them? What is it helping them for? How could we give better coverage? These are concerns that must be considered.

**Interviewer: How do you think the economic factor influences the production of scientific news in Peru?**

What do you mean? On the part of the media to hire science journalists or if there are economic interests in the work...

**Interviewer: In the work of science journalists.**

I think that with that you must be very careful because there are economic interests that can always be (inaudible). Generally, everyone -scientists, politicians, sportsmen- has some interest in the way. You always should keep that in mind. In the case of science, there aren't so many conflicts of interest, but particularly if you ask me about my experience, it's when you cover health issues that I've found the most conflicts. Because pharmaceuticals are very

involved in health issues. Also in agrarian issues, now with corporations, with multinationals. I believe that these are the cases where there may be a conflict of interests in economic terms. Because we even know that there are people in these big corporations who pay, if not with money, it could be with products or travel so that their news appears in the media. And not only that they appear, but that they appear well, so that good marketing can be made for them. These elements of marketing that are mixed with information, with communication are very important to consider. It remains a little to the ethics, the deontology of the own professional not to fall in these games.

**Interviewer: I don't know if the economic issue limits when a journalist wants to do fieldwork.**

That is the other problem of the economic part. Generally, in the media they don't have a budget for this kind of thing. If they don't see the importance of covering scientific subjects and it's going to be an expense because I have to transfer the journalist, they don't do it. There can also be another conflict -good thing you mentioned it- when the entity that is summoning the press is covering all the expenses. I believe that this is a conflict of interests that must be well defined. I speak to you from my own experience. For fifteen years I was a communications officer at the International Potato Center, which is one of the sixteen CGIAR centers in Peru. We as an international organization organized many expeditions, field trips. In addition, we knew that the media did not have the means to cover this, but we were interested because we were trying to put the issue of native potatoes on the public agenda. We were very interested in journalists attending the harvests, which were outside Lima of course and took two or three days. We paid them all their expenses. One thing that always caught my attention is that no journalist from the local press raised the issue of conflict of interest with me. They simply accepted it, some even asked me: "How much are you going to pay me?" Compared to the international press, which was also invited, they said to me: "We cannot accept that the institution pay us or we will only accept that it pay us the hotel". They also told me that the fact that we pay them did not mean that they were going to publish what we want. I'm going to look for my own sources. It was a logical and expected thing. We never had problems with this, my problem came from the other side: how was it possible that you didn't ask me, you didn't tell me anything? They even asked me for the materials and published them as they were. Then I would say: "Why did they go on a trip if they were going to publish the press material at the end?". I'll tell you this because in some way it's an indication of how far we still have to go to make progress on these issues that are also important but are never touched. If you don't have adequate training from the university classrooms, it's going to be very difficult when later you're in the middle and with all the vortex that that implies and the pressure from your bosses and the fact that you have to bring a story.

**Interviewer: Apart from the economic factor, do you think there are other factors that restrict scientific news reporting in Peru?**

It seems to me that the main thing is the self-censorship that the journalist experiences. Because he is aware that he does not know and he is aware that he is not well prepared. That

his bosses are not going to consider the topic and the little importance given to the subject. That is the obstacle to entry. If you have that in your mind, it will be difficult for you to encourage yourself to cover it. Also, you haven't had proper training in your university years about the importance of this. If no one has told you that there may be an important phenomenon here, you won't consider it either. So, you're not going to cover it or it's not going to be in your interest. At first, you're going to have a problem. You self-censor because you say "this is not important, but I'm not interested in it, I don't know how to cover it, I don't know about science". There are several things that come together.

**Interviewer: What factors do you think could improve or benefit science news reporting in Peru?**

There are several factors from different sectors. On the one hand, training obviously needs to be improved. I don't know if it would be possible, as in other Latin American countries, to have a course in science journalism or a specialization, which would be ideal. In particular, I would be satisfied with a course within the professional curricula. That's where we'd have to start. We would also have to raise awareness with the scientists to communicate to them the importance of communicating their work. Also with the people in charge of these offices of communication and institutional image and with the politicians, because that is very important. Politicians, authorities and decision-makers are always left out when these issues are discussed. They have to understand that sometimes the only way they are going to find out about the development research they are doing is through the press. There we are neglecting a field that is very interesting. Sometimes the politician says to you: "I talk to scientists and they bore me. I don't understand them". They give you so many explanations that in the end you don't know what it's for. Of course, if you have a communication space in which you can say to them: "Look, there is this research and how you can support it". In their political decisions they will also realize that science journalism can play a key role in the development of society.

**Interviewer: What scientific fields or topics could be improved by these factors, could they be more widely disseminated?**

In fact, I think every topic would win. But there are some other topics that are not mainstream that could also be more in the media. For example, all the topics that have to do with earth sciences, which are so important that they are practically not considered. Everything that has to do with aquatic resources. In a country like this where there is a center like IMARPE<sup>1</sup> that does first class research that nobody knows about. This is very important for future development. Other topics are epidemiological ones on health. The origins of certain diseases, what is being done at the level of viruses and bacteria, of molecular biology.

**Interviewer: How do you evaluate the development of science journalism in Peru over the next five years?**

I believe that the improvement will depend on us, on all of us who are interested in one way or another in doing it. There are good initiatives, yes. Because more portals are appearing.

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<sup>1</sup> Acronym in Spanish for Institute of the Sea of Peru.

Social networks in that sense are helping a lot. More portals are appearing, more alternative media. They are dealing with scientific subjects from different levels because scientific subjects can also be dealt with as entertainment, education or subjects that help development. There's a wide range of how to cover those topics. I think these media are helping a lot. One thing that would help is that journalists or communicators who are interested in scientific issues have some level of organization, which we don't have here. There are individual initiatives, many efforts, but not as a network. For example, a limitation that imposes us not to have a primary level of organization is that we cannot be in the World Federation of Science Journalists, which is a federation that includes ten thousand science communicators, in which there are journalists and scientists. Peru is not there because it is not represented. I believe that there is a pending task for all of us who want to promote this issue, to organize ourselves better, to have better levels of collaboration among ourselves. Finally, it will depend on the interest that the universities themselves put in giving importance to these issues. In answering your question, I have mixed my personal wishes with what may happen. My personal wishes are that in the next few years we have plenty of room to develop. Whether that is going to happen or not depends on all the sectors involved.

**Interviewer: Is there anything else you would like to add that you have not mentioned yet?**

What I always say when I do workshops because I like to do them, especially with the students so that they realize that there is a good space here where they can develop, they can see the goals for which they studied journalism satisfied. They need to prepare because it is the only way to close this gap that we currently have and for scientists to no longer see us as second-class professionals. That's a problem that many scientists see us over our shoulders: "That's just a journalist". We are as professional as any other career. We must see each other as equals. But for scientists to see us like this, we must make up for this lack of preparation, of training that we have, preparing ourselves, taking an interest, making a little more effort, documenting ourselves. Now there are good sites on the Internet where you can find good materials to train and even do it on your own. If you are so interested, you can train on your own and you can do it well. Without this being publicity, on our website we have many practical guides for scientists, for journalists so that there they can find what they need. I think that there is a pending task, but it depends a lot on ourselves that we can fulfill it.

## Master Thesis Declaration

"I hereby declare that I have written the submitted thesis independently. All passages, which were quoted literally or analogously from published or unpublished works, I have identified as such. All sources and aids that I have used for this thesis are clearly mentioned. This thesis has not been submitted with the same content or substantial parts to any other examination board.

I understand that the University reserves the right to revise my work for plagiarized content and that the discovery of plagiarized content can lead to the nullity of the work, the withdrawing of its recognition and to my deregistration. "

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