Gem from the Global South

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Scientific Disinformation in Times of Epistemic Crisis: Circulation of Conspiracy Theories on Social Media Platforms

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Abstract: The spread of disinformation about science in social media has been a major concern worldwide, especially at a time of crisis in which all institutions that produce knowledge and truth, including science, are delegitimized or discredited by society. Given this, the purpose of this research is to map the circulation of information on the most frequent conspiracy theories in Brazil, seeking to identify actors, discourses, and interactions on different digital platforms. Using a mixed methodology for identifying informational flows among supporters of conspiracy theories on Facebook, WhatsApp, and YouTube, the results show that, even though there is distrust about the relationship between science, government and industry, scientific authority is a symbolic capital of extreme importance for the circulation of information on conspiracy theories related to science.

Keywords: conspiracy theories, science, social media platforms

1 Introduction

Concern over science-related misinformation is not only a Brazilian phenomenon. Science in Brazil is facing serious difficulties and challenges, partly because of recent cuts in investment (Folha de São Paulo 2019), but also because of the

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ongoing delegitimization of scientific research institutions by the Bolsonaro government. However, the difficulty of communicating science to society, and of confronting increasingly visible anti-science phenomena, are not only a Brazilian problem but a worldwide concern (De Albuquerque and Quinan 2019; Apitz et al. 2017; Hotez 2019; Kenrick et al. 2018; Leaf et al. 2016). Movements such as the anti-vaccine movement have been steadily gaining ground on social networks. A range of actors, one of which is the algorithms used by the digital platforms themselves (Gebelhoff 2018; Hoffman et al. 2019), corroborate the finding that myths about vaccination campaigns are propagated through various channels, that they are increasingly adopted by the non-scientific community, and that they endanger people's health.

Aside from health, other movements have attracted attention on social networks. Climate manipulation as a weapon, flat earth-ism and creationism are examples of social media controversies in which universal scientific assumptions are discredited and delegitimized. These debates about scientific legitimacy make it difficult to communicate science to the general public, and widen the gap between academia and the rest of society. At a time when the world's epistemic communities, in other words the institutions involved in the production of truth (De Albuquerque and Quinan 2019), are experiencing an epistemological crisis, the spaces in which information circulates are disputed by different interests and different sets of actors. Communication paradigms are being challenged.

Constantly associated with misinformation, informational excess (Steensen 2019) and a conservative right-wing religious agenda (Benkler et al. 2018), this epistemic crisis reflects the shift from a regime of truth based on trust in institutions to another regime regulated by individual belief and personal experience (Van Zoonen 2012), giving voice to conspiratorial movements in which information is a field of dispute over the narrative production.

This aim of this research is to understand how science-related conspiracy theories circulate in digital social networks. Is there an information flow in which these science-related conspiracy theories are propagated? Are there disputes about scientific information among conspiracy theorists? What political and ideological positions do these research subjects share? What is the role of Science Communication in this epistemic crisis? To answer these questions, we adopted a mixed method approach, seeking to identify the ways in which people interested in science-related conspiracy theories consume information, and to identify the interaction relationships of these themes on different digital platforms. We believe that this research can provide us with insights into understanding how political and ideological disputes unfold in digital social networks and how science communication can react to misinformation about scientific knowledge in times of epistemic crisis.

2 Conspiracy Theories and Science Communication in Times of Epistemic Crisis

One of the biggest challenges in contemporary information ecosystems is the circulation of disinformation. In recent years, there has been widespread concern in public, political, and academic debate about topics such as “post-truth” and “fake news” (Vosoughi et al. 2018), in which alternative facts and conspiracy theories emerge as a field of dispute over the truth.

Conspiracy theories have long been understood to be irrational narratives produced by extremist social groups on the edges of political and social life (Warner and Neville-Shepard 2014; Van Prooijen et al. 2015). The phenomenon is not new. It dates back to the French Revolution, where many people believed that secret societies were involved in destabilizing governments (Azarias 2015). The term was first used in the 1960s, when US media outlets made pejorative reference to theories that denied the official version of the assassination of President John F. Kennedy (Quinan 2018).

Unless they have a significant social impact, conspiracy theories are stigmatized (Barkun 2016) and ignored by institutions dedicated to the production of truth, ignored in other words by “epistemic communities”. Epistemic communities are groups of individuals with socially legitimized knowledge who work with states and exercise influence in the public sphere, such as government agencies, research institutes, political parties, legal systems, and other interest groups. These are the institutions which, as part of the Enlightenment project, have traditionally used their mastery of specialized knowledge to distinguish themselves from other social groups.

The epistemic community that acquired the greatest prestige and credibility was the scientific community. Technological and industrial progress gave scientific knowledge a leading position in the nineteenth century. This elevation of science, to the detriment of other types of knowledge, was bulwarked by the belief that everything could be explained using scientific methods. The hyper-valorization of scientific knowledge drew on validation systems for the production of truth that were based on instruments legitimized by the scientific community itself. A system of knowledge deemed scientific was a system of knowledge endowed with recognized authority. Driven by the positivist current of thought according to which scientific knowledge was the only form of true knowledge, science achieved religious status.

Today, epistemic communities – including the scientific community – find themselves in the eye of the storm. As Luiz Signates points out (2012), science in the contemporary world is experiencing a series of questions and crises, arising from a

range of factors, including the crisis of truth and science's societal crisis. Signates claims that the crisis of truth stems from the postmodern attitude according to which scientific knowledge is only one of many representations of reality. The societal crisis of science, on the other hand, proceeds from the recognition "that science has failed to deliver on some of the most precious promises of modernity: social justice, ethical frameworks and solidarity, based in reason" (Signates 2012, p. 140).

In addition to the crises mentioned above, we can add the crisis of science communication. Scientific communication has its historical roots in the 19th century, when a "crisis of disciplines" (Signates 2012) made science so specialized that "translations" became necessary so that it could be understood by the general public. In the 1950s, governments promoted science communication to attract investors to certain programs and encourage enrollments (Weingart 2016). Over time, the responsibility for communicating science was transferred to universities and research institutions. These days, responsibility for science communication is delegated in part to researchers (Marcinkowski and Kohring 2014; Oliveira 2018), part of whose democratic duty and social commitment is to devise a strategy that allows them to survive the fierce competition for online attention driven by social media platforms.

Science may have been unable to fulfill the promises of modernity in solving social ills and delivering social justice, ethical frameworks, and solidarity (Santos 2000; Signates 2012), but today scientific research is only funded to the extent that it can demonstrate a positive social impact for its work. In general, the social impact of science can be measured through the influence of scientific production on public policy, but also in the presence of scientists in the news media and on digital platforms and social networking sites. This dependence on journalism is in fact an aggravating factor in the contemporary world because journalism – a modern institution founded on Anglo-American principles of truth and objectivity – suffers from the same crisis of credibility as science. As gatekeepers of scientific information (Badenschier and Wormer 2012; Guenther and Ruhrmann 2013; Rublescki 2009), science journalists suffer from a double loss of credibility in the epistemic crisis.

These gatekeepers have now been displaced by the rise of social media platforms.¹ Scientists are now content producers, able to disseminate their own scientific production. Previous studies (Newman et al. 2017; Recuero 2011) have

¹ Many studies offer conceptualizations of digital social media: "Social Networking Sites" (Recuero 2008), "Digital Platforms" (Helmond 2015), "Social Media" (Recuero 2019), etc. This article acknowledges the platformization of society (Van Dijck et al. 2018) but does not focus on platform *affordances*. Instead, it recognizes that the platforms are a fundamental part of the social order (Beer 2017). Opting for the term *social media platforms*, and including the algorithmic mediations that modulate visibility, we delve into the interactional dynamics of digital

shown that social media platforms have become a more important source of news and information for the public than traditional journalism, which is perceived as unreliable because of a history of political positions that deviate from the Anglo-American Western model of truth, objectivity, and impartiality (Brants and De Haan 2010).

However, the promise of wide dissemination on social media platforms raises thorny problems, since it brings so many actors to the information battlefield. In addition to the huge range of subjects in these digital spaces, the algorithms that supposedly enhance content according to consumer preferences turn out to be driven in reality by marketing imperatives, which implies the formation of echo chambers (Colleoni et al. 2014) in which only partial information actually reaches the user.

As conspiracy theories occupy an increasing amount of space in public debate, scientific authority is replaced by other knowledge and the information battle is waged by different actors, we examine how these “alternative facts” circulate and how adherents of these theories consume the information.

3 Methodology and Results

Conspiracy theories are pervasive. They percolate into all corners of society and, as such, lend themselves to multidisciplinary research. Mixed methods research integrates qualitative and quantitative methods into a single study, with the aim of obtaining a broader view and deeper understanding of a phenomenon. Researchers maintain separate structures for each stage of their research and then integrate complementary data, or collect data simultaneously for cross-verification and comparison by triangulation (Johnson and Onwuegbuzie 2004). Our investigation is a mixed methods investigation.

Since our objective was to map the ways in which science-related conspiracy theories circulate, we divided this research into three steps. The first two qualitative-quantitative steps took place simultaneously, with the third step comprising a structural analysis of social networks. To identify where the interactions between fans of conspiracy theories took place, we used a *snowballing* mapping technique for Facebook, using the keywords “teoria da conspiração” OR “teorias da conspiração” (“conspiracy theory” OR “conspiracy theories”). As we observed the interactional dynamics in these digital spaces, references to WhatsApp groups appeared in the description of the pages and groups identified,

environments, recognizing the specific structures of these digital spaces, following Bucher et al. (2017). Our specific focus is on three platforms: Facebook, WhatsApp, and YouTube.

prompting us to include this platform in the methodological design of the research, as a second investigation step.

Two methodological procedures were adopted for step two: the first involved sending a questionnaire to participants of the WhatsApp groups we had identified in order to learn more about their demographic profile and their modes of information consumption. WhatsApp proved to be a more dynamic platform than the Facebook groups, with intense conversation between group members, prompting us to adopt a second methodological procedure to allow us to triangulate the research. To understand the social dynamics of these spaces, and the information flow of science-related conspiracy theories, we used a netnography approach (Kozinets 2014), based on participant observation and mapping. We mapped the circulation of text and audiovisual materials exchanged among group members.

The materials shared among members contained a high number of YouTube links, used to validate their information and expand their knowledge on certain issues. This led us to add a third research step based on the use of YouTube Data Tools and keywords identified in the previous stages, in particular the questionnaire and the WhatsApp participant observation. The three most common conspiracy theories identified from the WhatsApp conversations and the answers to the questionnaire were: Terra Plana (Flat Earth), “verdade” sobre as vacinas (“truth” about vaccines), and Nova Ordem Mundial (New World Order). It is worth noting that our first search on the term vaccine did not include the term “AND verdade” (“AND truth”). That search produced a mass of information about vaccination. We therefore added the term “verdade” (truth), because this linguistic combination had been observed in the methodological procedures of participant observation and in the responses to the questionnaire.

Numerous studies have highlighted the role played by algorithms in the way information circulates on social media platforms (Nicas 2018; Tufekci 2018). In the third step of research we collected videos from depth level 1 of YouTube Data Tools. In other words, we sought information about the videos being recommended on YouTube, in order to gain a better understanding of how the platform’s recommendation algorithms work.

In step three, in order to understand the interactional dynamics and the influence of certain actors in the YouTube video sharing information ecosystem, we made use of the Gephi tool, applying it to data captured by the network data visualization system. After analyzing the data for each search term, we inputted data from each of the three searches into a Gephi data laboratory spreadsheet. We initially opted for a structure based on the three terms (Figure 4): Nova Ordem Mundial (01) (New World Order); Terra Plana (02) (Flat Earth); Vacina AND Verdade (03) (Vaccine AND Truth). After a network analysis of this result in terms of degrees of influence on input, output and Betweenness centrality, we adopted the

degree of modularity suggested by the Gephi tool, in order to understand the clusters that are formed from the junction of these three combined searches.

4 Step 1. Journey in Search of Information Flows and Conspiracy Theory Supporters

Who are the people producing and consuming conspiracy theories on social media? Is there an information flow in which these science-related conspiracy theories are propagated? Basing ourselves on the Reuters Institute report (Newman et al, 2018) which indicates that Facebook continues to be the main news information network for Brazilians, we sought answers for the question that launched this research inquiry by collecting information about this social networking digital platform. An initial mapping of Facebook groups was carried out, using the *snowballing* technique based on algorithmic recommendation and recommendation by administrators. Fifteen groups with more than 300 members were identified. I was accepted as a participant in just five groups: Teorias da Conspiração e Origem Estelar II (Conspiracy Theories and Star Origin II), Share Your Teoria da Conspiração (Share Your Conspiracy Theory), Ufos e Teorias da Conspiração (UFOs and Conspiracy Theories), Hermetismo – blog Teoria da Conspiração (Hermeticism – Conspiracy Theory blog), and Conspiração: Além da Teoria! (Conspiracy: Beyond Theory!) Engagement in these five groups is relatively low: approximately one to three posts per day. However, participation in these spaces led me to two more active WhatsApp groups: “Conspiração, a Origem” (Conspiracy, Origin), with 115 members, and “Por Trás da Mídia Mundial” (Behind World Media), with 220 members.

We decided to carry out qualitative netnographic research by observing participants on WhatsApp, following the steps outlined by Kozinets (2014, p. 62): planning, entering the field, data collection, interpretation, guarantee of ethical standards, and disclosure of research. When I joined the two groups, on 9 February 2019, I introduced myself to the administrators as a researcher and asked permission to disseminate our survey to their members. I was expelled from the first group the next day without any prior communication justifying the action. In the second group, Por Trás da Mídia Mundial (Behind World Media), I was not authorized to share the research, but was able to remain a member, presenting myself publicly as a researcher.² In the period February 9–13, 2019, as I was

² In my interactions with participants during the period of observation, I reminded them more than once that I was a researcher. Due mainly to the fact that the inclusion of WhatsApp groups had not been foreseen in the initial research design, but arose from our mapping of Facebook, this aspect of the research had not been previously submitted to the Ethics Committee. However, we

observing the political and ideological behaviors and positions of members of both groups, I sent all members an individual private message with a questionnaire containing open and closed questions. The main objective of this questionnaire was to understand the modes of consumption of people (research subjects) interested in conspiracy theories; it sought to verify which channels and/or media they trusted the most. Feedback was received from 31 respondents. About 20 people responded to the message proposing tests to check whether or not I was a “real person”, to see whether I worked for the government, and asking me what theories I believed in. Some messages stated that my photo did not “look like me” or that it was false, almost as though this was an initiation to the group, a way of differentiating neophytes from those that have deeper knowledge. There was also concern about the marketing of data, about whether it might be used for research purposes, and about algorithmic marketing.

4.1 The Circulation of Conspiracy Theory Information on WhatsApp

We observed that videos and links were shared as a way of proving an argument. Generally, videos circulate on WhatsApp, but also refer to platforms external to WhatsApp, principally YouTube. Of the 43 videos shared during the period, six came from WhatsApp, 36 were YouTube links, and one was from Facebook. The videos shared on WhatsApp indicate that YouTube is a fundamental part of the conspiracy theory information flow, highlighting the need for a deeper investigation into the information ecosystem on the YouTube platform, carried out in a later stage of this research.

4.2 Political and Religious Positions of the Followers of Conspiracy Theories

Benkler has pointed to the involvement of the far right in conspiracy theories (Benkler 2018), but there is no homogeneity among conspiracy theorists, who come from right across the political spectrum. Political-partisan discussions occurred frequently in the group. However, references to God and to biblical sayings were more common in private conversations than in the group discussions, although

followed the procedures recommended in resolution 510/2016, such as the presentation of the Term of Free and Informed Consent (TFIC), so participants were aware of the research angle before answering the questionnaire.

Christian beliefs were occasionally mentioned and anti-Jewish Zionist positions were frequent. Given that one component of Brazil's "new right" is its religious wing (Romancini 2018), it is not possible to separate politics from religion in the Brazilian context.

Conspiracy theorists prefer not to take a stand for or against particular political representatives in private conversations. However, collectively, we observed general mistrust of President Jair Bolsonaro as well as speculation about his role in a New World Order. The New World Order, along with its derivatives such as the *Governo Oculto* (Hidden Government), *Iluminati*, *Maçonaria* (Freemasonry), and the *Protocolo Sionista* (Protocols of the Elders of Zion), was the most frequently recurring conspiracy theory in group members' conversations. Bolsonaro's reference to a "Brazilian cancer" is one example of a political position, and of distrust of the government, where group members, attempting to make sense of complex social events, take a similar line to academic research on the subject (Quinan 2018). Despite little unity regarding the political spectrum, the discursive sharing on the lack of belief in political institutions and their rulers is almost unanimous, a phenomenon resulting from dissatisfaction with the democratic regime itself, reflecting the epistemological crisis in which the institutional trust system is replaced by individual belief and personal experiences (De Albuquerque and Quinan 2019; Van Zoonen 2012).

It is important to note, however, that despite the frequent messages – on average 150 per day – that invariably generated multiple conversations with several areas of agreement, there was little debate about the arguments themselves. When prompted to explain their convictions, most people provided few counterarguments. Instead, they remain silent until a new topic arises, displacing the previous topic. This kind of behavior corroborates research carried out by Fernbach et al. (2013), which shows that when extremists – whom the authors liken to conspiracy theorists – are confronted, they tend to moderate their attitudes and relativize their points of view.

4.3 Authority of Epistemic Communities Among Conspiracy Theorists

Stories from newspapers such as *Uol*, *Veja*, and *Jornal do Brasil*, and magazines specialized in science and technology such as *Revista Galileu*, have special status in the links shared in the group. The content of these articles is never questioned. On the contrary, when the content coincides with their beliefs, the fact that the story has appeared in a large-circulation newspaper or a journal specialized in science is seen as support for their arguments. In such cases, despite their mistrust of the media, the dual loss of credibility of the science journalist does not in fact occur.

The existence of unethical links between scientists and the pharmaceutical industry provokes distrust. Despite this, science – accessed through traditional media – is constantly cited as authoritative discourse. Despite the strong suspicion of media manipulation, which has already been widely discussed (Brants and De Haan 2010), the group frequently shares links to newspapers or magazines that publish research results. However, it is noteworthy that scientific authority as the dominant form of symbolic capital in relation to the scientific field (Bourdieu 1976) is attributed to scientists who appear in the media rather than to the quality of the research itself. In the 1970s Pierre Bourdieu observed that those who appeal to an authority outside their field only bring discredit on themselves. This is no longer the case. Given the imperative of being visible, the mediatization of science (Oliveira 2018) and the celebration of media scientists makes those scientists major digital influences.

Media visibility and popularity reinforce the reputation of these figures, even when they are dogged by controversies about their own scientific competence. In the recognition of authority figures, there is a dissociation between technical capability on the one hand and, on the other, the social power derived from media presence. Take the case of “Dr. Lair Ribeiro”, famous among Brazilian conspiracy theorists, who combines the roles of scientist and coach. As he himself proclaims, alongside his articles on cardiology published “in North American journals”, he has published books with titles such as “Increase your self-esteem” and “Success doesn’t just happen”.

Themes that emerged during the observation period and which relate to both the political and the techno-scientific spheres were: vaccines, mind control through the use of new technologies, the use of pesticides (no reference to common conspiracy theories that point to their use as chemical weapons), and the New World Order, together with its derivatives like the Illuminati and the Protocols of the Elders of Zion. The New World Order often functions as a supreme theory, the ultimate explanation for almost all events.

5 Step 2. Questionnaire Results: Looking for a Network of Trust

Of the respondents to the questionnaire ($n = 31$), 74.2% were male ($n = 23$) and 25.8% ($n = 08$) were female. The average age was 33 years old, the youngest respondent being 16 and the oldest 56. Of the group, 58% ($n = 18$) had either completed ($n = 09$) or partially completed ($n = 09$) higher education. For 74.2% ($n = 23$) of the respondents, average total household income was no more than four minimum wages.

YouTube was cited by 71% of respondents ($n = 22$) as their principal channel for conspiracy theory information, followed by Facebook pages ($n = 19$), Facebook groups ($n = 15$), and WhatsApp ($n = 15$). This is in line with studies that found that digital social networks are preferred to traditional media as information spaces (Newman et al. 2017; Recuero 2011). The respondents said that scientific articles were one of the five channels of information they use ($n = 14$), but were not questioned more closely about where they get this scientific information (Figure 1), leaving open the possibility of a future discussion on this subject.

Figure 1: Main channels for information based on responses from 31 respondents.

We used the five-level Likert scale to weight responses: a weight of ± 2 for values of greater intensity and ± 1 for values of moderate-strong intensity. This revealed that the respondents considered scientific articles (32) to be the most trustworthy spaces for information, followed by journals specialized in science and technology (23), YouTube (20) and newspapers (15), while government websites (2) and Twitter (3) were considered the least trustworthy (Figure 2).

When questioned about the reasons that lead them to believe in conspiracy theories, media manipulation and government manipulation were cited as reasons for believing that alternative facts may reflect a “hidden” reality more than the information conveyed by traditional media. This reflex of distrust is emblematic of the epistemic crisis, in which institutions consolidated around Enlightenment ideals of production of truth are undermined by a loss of popular confidence, a symptom of the transition from a regime of trust in authorities traditionally involved in the production of knowledge and the regulation of society to another regime rooted in individual belief and personal experience (Van Zoonen 2012).

Figure 2: Measure of trust in different communication channels.

It's not that I don't believe the mainstream media, but there are always two versions of the facts, the true version is usually omitted by the media. (Respondent 02)

Governments manipulate facts. The history recounted in books is not what happened. We were all indoctrinated from childhood, including you. Search and you will find the truth. (Respondent 10)

Another epistemic community that is discredited in their eyes – in addition to the media and government – is schools and teaching materials, which are seen as tools for reproducing discourses that hide the truth. Other hidden enemies are designated as “them”, as the elite, or generically as organizations with commercial interests. They refer to previous experiences that led them to believe that official information does not match what they believe to be the “truth”, a term that recurred constantly in their comments (Figure 3).

Previous studies have shown that people (research subjects) form opinions based entirely on emotion (Sunstein and Vermeule 2009). However, the respondents frequently ($n = 06$) stated that they look at two or more versions of the facts, that they analyze events thoroughly, and that they make an in-depth search of information circulating on the Internet, all of which are characteristic of media-literate subjects (Livingstone 2011):

I neither believe nor disbelieve conspiracy theories or official information, everything can be verified by logic and empathy. Every lie has a basis in truth and every truth can be manipulated. (Respondent 25)

investigation into the way conspiracy theories circulate. We were able to distinguish themes that appeared in both the questionnaire and the *WhatsApp* group, such as flat earth-ism and the “truth” about vaccines, in addition to the New World Order which functions as an explanation for almost all the other theories.

Data was collected on the video networks using *YouTube Data Tools* and the following keywords: “Nova Ordem Mundial” (New World Order), “Terra Plana” (Flat Earth), and the combination of the words “Vacina” (Vaccine) and “Verdade” (Truth). To understand the algorithms used by the conspiracy theory video recommendation system, 50 videos were selected for their relevance for each of the three search terms, at level 1 depth, resulting in the collection of 5995 nodes and 62,064 edges (see Figure 4).³

Figure 4: Graph combining the three search terms.

Using weighted input to grade nodes in terms of number of incoming connections, the video with the greatest local centrality was “Nova Ordem Mundial está na Ásia?” (Is the New World Order in Asia?) from the channel Verdade Oculta (Hidden Truth). Most of the videos with a higher input grade are located in the Nova Ordem Mundial (New World Order) network node, confirming what we had observed in previous stages: the Nova Ordem Mundial (New World Order) is very

³ The network visualization data used in this third phase of research has certain limitations that prevent a deeper analysis of relationships and interactions modified over time. It is therefore only a snapshot taken at the time the data was collected. For a discussion of the possibilities and limitations of applying temporal metrics to social media platforms – including classification visualizations and computational change metrics – we recommend reading Rieder et al. (2018).

frequently cited and referenced because it functions as a supreme theory that explains and justifies other theories.

At the *Betweenness* centrality, which measures the “influence a given node has on the spread of information on the network” (Newmann 2003), a few videos stood out: “Vacinas Esterilizantes de Bill Gates! Gripe Vírus para Reduzir População!” (Bill Gates’ Sterilizing Vaccines! Flu Viruses Reduce the Population!) from the channel Firmeza da Verdade (Firmness of Truth) and the religious video “Ezequiel 33: A Missão do Verdadeiro Atalaia” (Ezekiel 33: The Mission of the True Atalaia) with Rômulo Maraschin from the channel Firmeza da Verdade (Firmness of Truth) and André Bastos from the channel Verdade Absoluta (Absolute Truth). The third-highest Betweenness centrality video is “A verdade sobre a febre amarela e a vacina” (The truth about yellow fever and the vaccine), by Dr. Lair Ribeiro. Truth, a recurrent term in conversations among members of the WhatsApp group, appears in each of the three most influential videos for the dissemination of information on the network.

Using the degree of modularity, a network metric that refers to the algorithm used to observe the sets of a given graph (Recuero 2014), we were able to identify the five densest clusters in the network where the disagreements observed in the WhatsApp group and in the questionnaire are visible.

In the cluster referring to the search for vaccine and truth (cluster blue, Figure 5), it is possible to identify a set of actors whose scientific authority is the dominant form of symbolic capital in the scientific field. The pronoun “Dr.” is used repeatedly in the videos of this cluster, where Drauzio Varella and Lair Ribeiro compete for network attention with Patrick Rocha, a physician who authored

Figure 5: Modularity graph.

recipe books on weight loss. Terms like consultation, consultancy, advice – and other synonyms for meeting together with other members to make decisions that ordinary people cannot make – appear frequently in the “Illuminati” discourse of the actors in this cluster, in which coaching practices and a joint effort to disseminate science to the public combine.

Evidently, in trying to define science, we have to take into account the hierarchization of fields and the fact that the Humanities are not recognized as a scientific field. As Bourdieu (1976) points out, in the struggle in which each agent must engage to define the value of their own authority as a legitimate producer, the power to impose a political definition on science is always at issue. This dispute between legitimization and legitimacy, authorization and authority, appears in the grouping of “doctors” in this cluster. In other words, even if they are not authorized to talk about a specific scientific subject as a scientist, some actors have authority in the network, and power to influence the network. Authority and power in the network is measured by the degree of input of the node. Patrick Rocha, for example, introduces himself as a doctor and president of an association, but there are no records of his research performance. Despite this, he is influential in network discussions on health, and also in the commercialization of magical solutions for weight loss, for example.

Between the promise, on the one hand, of immediate coaching solutions or achieving divine grace through religious sacrifice, for example, and on the other hand the imposition of universal norms of scientific reason legitimized by social mechanisms arbitrated by scientists, lies the space of theoretical and interpretive abstraction of the Human Sciences (and pure Mathematics). The premise of this space is that scientific knowledge is a historical production, in other words it is anchored in time, in a specific political and social context, and that therefore the narratives it produces to interpret social events may be controversial. We noted the formation of a cluster (in green) where disputes between science, religion, politics, and humanities appear in the interrelationship of information flows, as in Nando Moura’s video, “Quem disse que a Terra é Plana???” (Who said the Earth is Flat???). Nando Moura makes presentations about a range of topics such as philosophy, theology, music, and economics, with a clearly right-wing political bent. He is one of the five most influential actors in this network. In his channel “Mistérios do Mundo” (Mysteries of the World), mainly dedicated to flat earth-ism, Bruno Alves stirs and attracts his audience with compelling phrases such as “Descontamine a sua mente, Liberte-se do Sistema e saia da Matrix” (Decontaminate your Mind, Free yourself from the System and Leave the Matrix), promising to “disseminar a verdade doa a quem doer” (spread the truth no matter who gets hurt in the process). Another highly influential conspiracy theorist group in this cluster is the “IN – Inteligência Natural” (NI – Natural Intelligence) channel, which describes itself as

“a space free of manipulation or lies”, the channel “free of hypocrisy”, offering a playlist about politics and flat earth-ism. “NI – Natural Intelligence” mixes history, religion, and politics, promising to “expose all lies”, accusing the politician Cabo Daciolo, for example, of being a leftist, and summoning up historical facts and biblical passages to reinforce their arguments. Among these actors, Nerdologia is a dissonant voice. It disseminates science and education in an informal manner, aiming to combat the anti-scientific narratives that circulate in social networks as part of the public sphere in political dispute between different social actors.

The political dimension of conspiracy theories is also present in the cluster with the greatest diversity and number of nodes (purple). The themes of videos in this group include the manipulation of Jair Bolsonaro by the New World Order, or the assimilation of Emmanuel Macron to the Anti-Christ. Other political actors are also targets of conspiracy theories: attacks on the journalist and politician Jean Wyllys and the televangelist Malafaia are bundled together with denunciations of George Soros, the singer Anitta, the footballer Neymar and the actress Xuxa, among others. The channels Tio Lu (Uncle Lu), Desperte – Thiago Lima (Wake Up – Thiago Lima), and Verdade Oculta (Hidden Truth), all of which produce conspiracy theory content, are the major influencers on the network.

Between this dimension of involvement of media figures and the political and religious relationship of the groupings described above, the channel Ciência da Verdade (Science of Truth), produced by Afonso Emidio de Vasconcelos Lopes, who holds a PhD in Geophysics from the University of São Paulo, is another major influence in the network (orange cluster), characterized by a high degree of input and output and interactions with all the other groups. When we analyzed their most weighted videos, we found a variety of scientific information served up with biblical arguments. For example, studies pointing to connections between antibiotics and the vaccine, and the need to protect the intestinal flora before taking these medications. These studies made reference to “they”, without explaining who “they” might be, claiming that “they” want to end the human species, or at least the descendants of Adam rather than those of Eve, who had sex with angels and gave birth to demons. Lopes’ authority and legitimacy ensure the channel’s influence with supporters of conspiracy theories on the network and rank it in the top 10 channels in terms of Betweenness centrality, making it a “bridge” (Recuero 2014) to several other actors. It is one of the main bridges to actors in the (black) cluster, which is central to the network and an important vector of scientific, religious, and political conspiracy theories. In this cluster a set of themes that resonate among conspiracy theorists can be mapped. They include: population reduction through the use of the vaccine, genetically modified foods, transgenic mosquitoes, pesticides etc., denunciations of the political influence of the New World Order in Brazil and in the world, denunciations of President Bolsonaro and

Vice President Mourão, evidence of the existence of reptilian creatures and demons, and connections between natural catastrophes, the prophecies of Enoch, and the end of the world.

7 Final Considerations

The phenomenon of Conspiracy Theories is not new. However, in the current context of disputes about truth and misinformation, there is widespread concern that these theories reduce citizen participation in the political sphere and negatively affect attitudes towards science (Jolley et al. 2018). Solutions to the truth crisis we are facing range from authoritarian policies of curtailing and defining the truth, such as fact-checking agencies (De Albuquerque 2019), to investing in more effective science communication and media literacy for the population (Craft et al. 2017; Mihailidis and Viotty 2017). However, as the results of this research show, conspiracy theory producers and consumers are able to access, analyze, criticize, and create content (Livingstone 2011). It follows that science communication faces multiple challenges: scientific narratives are disputed in both traditional media and on social media platforms, new actors keep appearing in digital spaces, and the algorithms continue to function.

The communication of science has been affected by the current turmoil in public research funding, making us increasingly dependent on media attention. Different voices compete for public visibility (Gomes 2006) in the media and on social media platforms, and the dynamics of these platforms – with their echo chambers – creates an adhesion effect not unlike homophilic binding; to put it in another way, just as the scientists and positivists of the Enlightenment created bubbles for themselves, so the conspiracy theorists create and prosper in their bubbles. In these digital spaces, phenomena that intertwine politics, science and religion – such as flat earth-ism, creationism, and other themes – flourish, along with other movements that attack the legitimacy of scientific work, forcing us to rethink modern scientific authority.

Conspiracy theories thrive in many social fields, even if politics and science are the most recurrent topics in this type of narrative production. With their arguments, elaborately constructed around alternative versions of reality, conspiracy theorists contest epistemic authority and publicly resist the “regime of truth” (Harambam & Aupers, 2015). However, what we observed in our research was that, despite the desire to contest scientific explanations, scientific authority is constantly appealed to as the dominant form of symbolic capital in the field. In order to prove points of view that contest science, scientific research is cited, especially research published in traditional media information channels, such as

newspapers and magazines specialized in science and technology. There appears to be a legitimization of the media and science as reinforcements of authority, even though they are seen to be part of a great worldwide conspiracy.

However, the same does not occur in other spheres, especially among institutions that have also been suffering from the epistemic crisis, including the media. Despite their suspicions about the involvement of science with other social sectors, such as the government and the pharmaceutical industry, science remains a prestigious institution for conspiracy theorists. But traditional media continue to attack universities. Examples of media contributions to the crisis that science is currently facing include articles such as the one published on June 13, 2017 in the newspaper *Gazeta do Povo*, in which Gabriel de Arruda Castro (2017) lists 10 surprising thesis topics supported by “public funds”, all from the Humanities or Applied Social Sciences; another article in the same newspaper, penned by Professor Carlos Adriano Ferraz (2018) and published on April 19, 2018, is an opinion piece in which he claims that one way to save humanity is to put an end to the Human Sciences. Articles appear in the Brazilian media – and in the discourse of government representatives – claiming that the choice of an academic career dooms a person to depression (Moraes 2017a), suicide (Moraes 2017b), or prostitution (Vespa 2018), and that universities are hotbeds of prostitution and drugs which produce science that has a “very low international impact” (Ferraz 2019). Both government representatives and the media affirm that public universities in Brazil should be privatized (Costa 2016), and echo suggestions contained in the 2017 World Bank report, which saw the solution to Brazil’s financial crisis in cuts to education, research and health, and fiscal adjustment programs. This has been the policy position of the current government. Examples of recent events that confirm this policy bias include the censorship of research by Fiocruz (G1 2019a) which showed that Brazil is not in the midst of a drug epidemic – contradicting the position of the Bolsonaro government – or the exoneration of Ricardo Galvão, former director of the Brazilian Center for Physical Research and the National Institute for Space Research, after President Jair Bolsonaro had challenged Amazon deforestation monitoring data (G1 2019b).

For social scientists such as ourselves, the key points are, firstly, that to be able to carry on a wide-ranging dialog with the public and be active in disputes about scientific information, we need the media. As our research has shown, scientific authority is still an important symbolic capital for society. Secondly, the reality is that we face attacks from the media – and from government – that relegate us to the same level as conspiracy theorists. We criticize the political use of the media to push a neoliberal agenda, and yet we depend on the media to disseminate scientific production and on its metrics to measure its social impact.

What this research shows is that the social impact of science should not be. A impact of science would be to develop ways to dialog with people affected by disputes about information: the sort of people who have lost hope because of “all the stuff out there” and who then immerse themselves in complex research. As they navigate their way through channels that propagate scientific misinformation, these people leave traces of their own social preferences. Meanwhile, scientists have to deal with the ban announced by the digital platforms on January 25, 2019, in an attempt to combat conspiracy theories. This ban imposes a recommendation system to prevent the spread of false information even though there is no consensus about the definition of truth.

In discussing conspiracy theories, we are talking about a complex relationship that persists as a popular means of articulating opposition to the forces of global capitalism. Conspiracy theories are a phenomenon that should not be stigmatized or belittled by academics. On the contrary, they must be understood as part of a movement that also targets us. We must take into account the complex relationship between science, politics and religion, at a time when the regime of truth has launched a witch hunt on those opposing established social hierarchies. The community of conspiracy theorists expressed doubts about the stabbing of President Bolsonaro in September 2018 – and were not the only ones to do so. Under the banner of a dangerous search for truth, we may find ourselves also becoming conspiracy theorists, and run the risk of not being able to access information about important political and social events.

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