

**Popular Science at the Crossroads of New Linguistic
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scientifique au croisement de nouvelles sphères d'activité
langagière**

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**Popular Science at the Crossroads of New Linguistic Spheres / A
divulgação científica no cruzamento de novas esferas de atividade
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ABSTRACT

This paper deals with the field of popular science with a focus on the different linguistic spheres that intersect it. It starts by reviewing the classical linear model of scientific dissemination. The authors then show the displacement that took place with the involvement of traditional media that established a dialogue between different language communities (politicians, consumer associations, farmers, researchers, etc.), in particular for scientific events. Finally, the changes to forms of participation and speech resulting from new technological tools and made possible by the Internet are presented.

KEYWORDS: Popular Science; Linguistic Spheres; Scientific Events; Media; Scientific Blogs

RESUMO

O presente artigo aborda o campo da divulgação científica através das diferentes esferas de atividade linguageira que nele se cruzam. Evocaremos inicialmente o modelo clássico e linear da divulgação científica, antes de apresentarmos o deslocamento produzido, em seguida, pela mídia tradicional, que possibilitou o diálogo entre diferentes comunidades linguageiras (políticos, associações de consumidores, agricultores, pesquisadores, etc.), especialmente em acontecimentos científicos. Mostraremos finalmente as modificações trazidas pelas novas ferramentas tecnológicas nas formas de participação e de tomada da palavra proporcionadas pela Internet.

PALAVRAS-CHAVE: Divulgação científica; Esferas de atividade linguageira; Acontecimentos científicos; Mídia; Blogs científicos

RESUME

Dans cet article, on aborde le champ de la vulgarisation scientifique en mettant l'accent sur les différentes sphères d'activité langagière qui s'y croisent. On rappelle d'abord le modèle classique et linéaire de la diffusion scientifique avant de montrer le déplacement qui s'est ensuite produit avec l'intervention des médias traditionnels, qui, notamment lors d'événements scientifiques, ont fait dialoguer différentes communautés langagières (politiques, associations de consommateurs, agriculteurs, chercheurs, etc.). On aborde enfin les changements apportés par les nouveaux outils technologiques dans des formes de participation et de prise de parole qu'autorise l'internet.

MOTS-CLES: Vulgarisation scientifique; Sphères d'activité langagière; Événements scientifiques; Médias; Blogs scientifiques

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A brief review of the recent history of popular science discourse will be presented, with a focus on discourses characterized by *linguistic hybridity* caused by the heterogeneity of discursive genres – particularly Internet genres – that are found in scientific communication and give a wide range of stakeholders the chance to speak. As D. Wolton remarked at the end of the 20th century: “There are no longer two players – scientists and the public – but at least four – science, politics, communication and the publics – each of which is often divided into several subgroups” (1997, p.1; our translation).¹ The discourse found in the media is de facto at the intersection of various *spheres* of activity in the sense of Voloshinov and Bakhtin, as S. Bouquet and S. Grillo indicate in the introduction to issue 56 of the *Linx* journal dedicated to “genre linguistics,” “Bakhtin’s programme,” and “contemporary perspectives.”

As the editors of this issue highlight, this perspective puts forth a “classification of discourse genres by sphere of human activity,” which groups literary and non-literary genres “that are constantly interacting.” Therefore, the “constant interactions between genres [...] develop as one genre is absorbed by others and as these genres intersect” (BOUQUET; GRILLO, 2007, pp.9-10; our translation).² It may then be assumed that these human activity spheres correspond to linguistic spheres that are quite close to what French discourse analysis calls “orders of discourse,” which this paper refers to as “language communities” (see 3.3 below). It can therefore be argued that *several* “linguistic spheres” correspond to *one* human activity sphere and that, in the field of the dissemination of science and techniques, various linguistic spheres will inevitably meet.³

The evolution of the discursive forms of the dissemination of science (referred to as popularization or disclosure) can also be seen from two complementary points of view. The first is that of the constitution of corpora, including “new” genres in which the public is led to become a participant through the Internet. The second is the construction of what can be observed through analysis, that is to say the categories of analysis at the different levels of the “genre” studied and how it is rendered in the medium studied. The authors

¹ Text in the original in French: “Il n’y a plus deux acteurs, les scientifiques et le public, mais au moins quatre, la science, la politique, la communication et les publics; et chacun est lui-même souvent divisé en plusieurs sous-groupes.”

² Text in the original in French: “Les constantes interactions entre les genres [...] se développent dans les processus d’absorption d’un genre par d’autres et dans l’entrecroisement de ces genres.”

³ For the notion of sphere borrowed from Voloshinov/Bakhtin, see texts by S. Grillo and P. Sériot in *Linx*, no. 56 (2007).

shared this proposal in 2003 during a day on “oral genres” when they attempted to “rethink” categories on three levels: (a) the “micro” level of word usage and syntactical and semantic linguistic contexts (where the forms of the act of naming and restatements are rendered); (b) the “meso” level that studies the characteristics of the textual sequence, the period, the conversational turn-taking, the thematic framework and the shift in what is being discussed; and (c) the “macro” level that tries to link “internal” forms of genre to external socio-political elements. Indeed, as Myers (2003) says regarding the popularization of discourse, the interactions between science and techniques on the one hand and economic, political, social, etc. worlds (i.e., *spheres of activity*) on the other amount to discursive forms encountered in the dissemination of scientific facts and events.

For the record, the first displacement that the authors observed was moving from the study of the words and structures of *special languages* and *specialized discourse* towards discourse aimed at less scholarly publics, i.e., the analysis of what is known as *secondary* discourse and its diversity of genres and situations. This paper will show the displacement that took place after this, when this linear dissemination model was shaken by media communication, and how the intervention of various spheres of activity can be seen, in particular during health crises and food or environmental issues in which various language communities connected to these spheres of activity come into play in particular in the media (politicians, consumer associations, farmers, ordinary citizens, multinational food corporations, pharmaceutical groups, etc.). Finally, the changes to forms of participation and speech resulting from new technological tools and made possible by the Internet as well as the subsequent appearance of widely different “genres” will be presented. How are they more than just the “absorption” of previous genres (BOUQUET; GRILLO, 2007, p.10)? What is new? How can the emergence of these new genres be explained?

1 A Brief Overview of Recent History

The classical model of popular science, which dates back to the Age of Enlightenment and expanded considerably in France and in Europe in the 19th century, rests on a linear model of the transfer of knowledge, either with two or three voices.

The two-voice model represents a direct transfer of discourse from the sphere of scholars (scientists, researchers) to the general public and/or people belonging to “non” or “less” scholarly spheres. The source discourse (from the “scholarly” sphere) is then restated by people belonging to this sphere through a range of secondary discourses that vary widely depending on the target spheres that are outside of the scientific community: general public, students, informed amateurs, people who are just curious or people belonging to spheres connected to the source sphere (e.g. paramedical professions in the field of medical science). The three-voice model adds an “intermediary” sphere (popularizers, teachers, editors, scientific journalists) whose language activity is the act of “rephrasing” the discourse of the scholarly sphere for less scholarly publics (this is also referred to as the “third man” model, where the third person is more or less a specialist of this language mediation).

It is this three-voice model that has mainly been the focus of descriptive work from linguists (MORTUREUX, 1982; JACOBI; SCHIELE, 1988) and that is reflected in the enunciation texture of these knowledge transfer discourses, particularly when they feature speech that can be attributed to both spheres between which they are located. This is what most “traditional” media favours – “scientific” sections or shows (written press, radio and television) as well as the specialized publishing industry (works of general interest, semi-specialized journals, CD-ROMs) – for example by using questions, pronouns or the imperative form, as in the examples below.

Ex. 1

Hall-Bopp passes the closest to the sun
Night of the Comet

How to find it? Astronomers will tell you it's easy: it is located north-west, approximately 25 degrees above the horizon. OK, but how do you find the north-west? There are three solutions: if you have a compass, the issue is resolved. If you don't have one, locate the sun (DURAND; SOUSA, Libération, 29-30 March 1997; our translation).⁴

Ex. 2

Why does happiness make us cry?

You have anxiously been awaiting the results of a very important competition exam. What is your reaction? You laugh, you shout... You cry? In another situation, looking at a lovely puppy, you might feel like

⁴ Text in the original in French: “Hall-Bopp passe au plus près du Soleil. La nuit de la Comète. Comment la trouver? Facile, vous diront les astronomes: elle se situe au nord-ouest, à environ 25 degrés au-dessus de l'horizon. Oui, mais comment trouver le nord-ouest? Trois solutions: vous possédez une boussole, le problème est réglé. Vous n'en possédez pas. Repérez l'endroit où se trouve le soleil.”

squeezing it tight. *But aren't crying or aggressive tenderness "negative" reactions? Not necessarily. According to researchers from Yale University, the brain uses this technique to control excessive happy emotions (Mentecérebro, May 2015, p.38; our translation).*⁵

This suggests that science journalists belong to an “intermediary” linguistic sphere between the sphere of scholars (e.g. astrophysicists) and the sphere of ordinary readers (who are interested in comets). The *intertext* (MOIRAND, 2000; REBOUL-TOURÉ, 2000) of the resulting discourse (that of the journalist) alternates between the questions readers ask themselves and the answers provided through the discourse from the sphere of astronomers or astrophysicists.

The mediator – often a science journalist – speaks under the eye of the sphere of scholars. In addition, the intertext, which is a *monologue*, refers to the discourse of the source scientific sphere, all the while with the concrete aim to be *didactic* (see *Les Carnets du Cediscor*, no.1) for interested readers whose questions are anticipated, which could be described as a type of *interactional dialogism*. Therefore, the three-voice situation of popular science, which emerged during the Age of Enlightenment and became prominent towards the end of the 19th century through works such as C. Flammarion’s *Astronomie populaire*, has carried on in the science pages of daily newspapers and journals intended for informed amateurs (*Pour la science, Ciel et Espace, Science et vie*). It serves as a forum for observing (and conserving) the intrinsic dialogical nature of popular science discourse and is at the same time interactional (using the first and second persons) and intertextual (and interdiscursive).

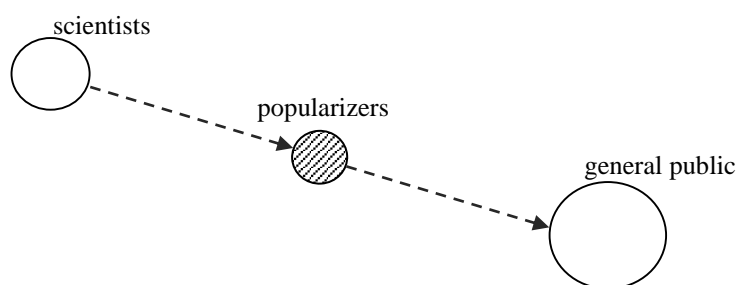


Diagram 1 – The Hubs of Popular Science.

⁵ Text in the original in Portuguese: “Por que choramos de felicidade Você espera ansiosamente pelo resultado de um concurso muito importante. Qual sua reação? Ri, grita... Chora? Em outra situação, diante de um lindo filhote, talvez você sinta vontade de apertá-lo. Mas lágrimas ou carinhos agressivos não são reações ‘negativas’? Não necessariamente. De acordo com pesquisadores da Universidade de Yale, são um recurso do cérebro para controlar emoções excessivas de felicidade.”

This prototypical model in which the mediator relays scientific discourse to the general public is effective and can still be found in broadcasting mediums such as the press, semi-specialized journals, CD-ROMs, etc.; numerous restatements are used to try and explain the terms used in the original discourse. The discursive places built by the discourse from the three hubs that represent three specific socio-discursive spheres are visible, just like the many *dialogical lines* that seem to be woven between the discourse attributed to various groups and the mediator's discourse that "reveals" his position as an intermediary.

Ex. 3

Far far away, there may be planets with such an abundance of life that they make the most beautiful places on Earth look as inhospitable as deserts. They belong to the recent category of "*super-inhabitable*" planets, that is to say planets that are much better suited to life than ours. This is no joke. *The concept was published* for the first time in 2014 in the *Astrobiology* journal by René Heller, from McMaster University in Canada, and John Armstrong, from Weibert University in the United States (NOGUEIRA, *Superinteressante*, June 2015, p.51; our translation).⁶

Ex. 4

The drug, [Yervoy], which works against melanomas – *a serious type of skin cancer* – is a pioneer in what is currently the prize jewel of cancer researchers: *immune-oncology, which aims at strengthening the patient's immune system to fight the tumour* (MIOTO, *Folha de S. Paulo*, 4 June 2015, p.B5; our translation).⁷

However, when events lead to questioning the discourse from "source" spheres – particularly during health crises to which science cannot provide immediate answers (they are sometimes referred to as "cases": the case of contaminated blood in France, the case of mad cow disease in Europe, the avian or porcine flu, etc. in the world, the issue of global warming, the shale gas issue, etc.), the three-voice model cannot withstand the

⁶ Text in the original in Portuguese: "Em alguns lugares distantes, podem existir planetas tão cheios de vida que fariam os melhores paraísos da Terra parecerem inóspitos como um deserto. Eles seriam parte de uma recém-catalogada categoria de planetas, a dos "super-habitáveis", ou seja, bem melhores para a vida que o nosso. É sério. O conceito foi publicado pela primeira vez no periódico científico *Astrobiology*, em 2014, por obra de René Heller, da Universidade McMaster, no Canadá, e John Armstrong, da Weibert, uma universidade americana. E olha que nem foi tão difícil achar possibilidades atraentes."

⁷ Text in the original in Portuguese: "Eficiente contra o melanoma, um tipo grave de câncer de pele, o medicamento [Yervoy] é pioneiro na área que é a atual menina dos olhos dos pesquisadores de câncer: a imuno-oncologia, que tenta utilizar o fortalecimento do próprio sistema imunológico do paciente para combater o tumor."

arrival of discourses from communities outside the sphere of scholars and the sphere of “approved” intermediaries. Specifically, when something happens and becomes “the story of the day” or of the “moment” in the fields of health, food or nutrition, these discourse objects move from the science pages or shows to the front pages of newspapers and/or most general televised or radio news reports.

This is the case for scientific facts that have not yet been established (Can bovine spongiform encephalopathy be transmitted to humans?), economic and financial considerations that are better left to public action – and thereby politics – than science (Should the population be vaccinated? Should people who live near nuclear power stations be evacuated? Should shale gas be extracted?), as well as ethical considerations that are highly controversial in the public sphere (see *Les Cahiers du Cediscor*, no. 6: CUSIN-BERCHE, 2000).

2 How Does the Traditional Media Cover Scientific Events of a Political Nature?

When certain occurrences of a scientific or technical nature become events because they question scientific knowledge and thereby the capacity of politicians to anticipate or prevent what is happening, they invade the mass media to which ordinary citizens are “exposed” on a daily basis. These citizens pounce on the information and images provided, if only because the consequences could be felt by the society in which they live or their own lives, whether it be the dangers of nuclear technology or shale gas, mad cow disease or bird flu, the issue of GMOs, the issue of cloning or global warming. Indeed, all these occurrences have a strong social impact as they are connected to health, nutrition or the environment and therefore to a certain quality of life that is demanded by citizens from currently developed democracies.

The media (including online) thus echoes the expectations of its audience and becomes a wrestling arena for the different spheres involved in the event, which often have competing – or even opposing – interests. As a result, the desire to “explain” science that was predominant in the 19th century (BENSAUDE; RASMUSSEN, 1997) declined and a new model arrived: the *media coverage* of scientific and technical occurrences, which is based on staging controversies between spheres that do not have the same interests (or the same beliefs). Therefore, data collection can no longer be limited to

knowledge transfer discourses and scientific pages, sections or shows. A wide variety of *discursive genres* must now be taken into account: all of the discursive genres that are involved in the processing of scientific or technological events of a political nature. This is now a different communication model from the popular science model inherited from the 18th and 19th centuries (WOLTON, 1997).

The linguistic diversity of stakeholders belonging to the different spheres involved comes into play directly – or indirectly – when what they say is repeated, thus forming part of *the meaning* of the words, the expressions, the utterances produced, etc. during the media coverage of these scientific events of a political nature. When a member of a community cannot find neutral words but words “filled” with the voice of others, because “[o]n all its various routes toward the object, in all directions, the word encounters an alien word and cannot help encountering it in a living tension-filled interaction” (BAKHTIN, 1981, p.279),⁸ this is wonderfully described by the media coverage of scientific facts and techniques in the same place/time frame: that of the show, the newspaper page or the screen page.

Words, syntactic constructions, claims that are reported or mentioned – or even forgotten or not said – therefore constitute the point of access for relationships between science and society in the media. This is a significant transition of the focus of research compared to the first work of linguists on semantic relationships between scientific and technical terms (GUILBERT; PEYTARD, 1973). This also represents a major difference with the analyses of communication specialists for whom the ways language is registered in verbal (and now technological) materialism are sometimes considered to be negligible.

Beyond the words and statements from the various communities that are directly or indirectly involved (through all the possible forms of reported speech), one can see how a discursive category such as *explanation*, which is part of the continuity of speech, corresponds to an increasingly complex actional structure for each recorded displacement (S = the scientist, science; X, Y = something; M = the mediator; J = the journalist):

- S explains [X] to P
- S explains [that X explains Y] to P

⁸ BAKHTIN, M. Discourse in the Novel. In: BAKHTIN, M. *The Dialogic Imagination: Four essays*. Edited by Michael Holquist and translated by Caryl Emerson and Michael Holquist. Austin: University of Texas press, 1981, pp.259-422. [1934-1935]

- M explains [that S says (that X explains Y)] to B
- J explains [that A, B, C, D, E, S explain Y] to B.

Thus, as scientific/political facts and events are given media coverage, the explanation becomes a contentious issue between spheres of activity that contend through large media institutions (press, radio, television) on the same show and throughout the same newspaper article. This is reflected in the very *enunciation texture* of the media text, which provides an opportunity to think about the genericity of a new information genre, that of controversial information, which will be used as an example here.

Although information genres where the utterance strives for objectivity and comments that lean towards subjectivity are often crudely separated, controversies in written press (printed or online) seem to create a specific *genre* where the confrontation between opposing linguistic spheres is “depicted” in a text written by the same author (see MOIRAND, 2014a).

Ex. 5

The Temptation of Shale Gas

As the former Prime Minister François Fillon *expressed his belief yesterday* that forbidding research on shale gas was “*a criminal act*,” *the Head of State pointed out* that the prohibition of hydraulic fracturing dated back to July 2011 and the presidency of none other than Nicholas Sarkozy. The reason this topic has suddenly returned to the forefront is that *oil executives, relayed by elected officials*, have found a *powerful argument*: this godsend could restore economic growth. “We are the only country in the world that refuses to look for it, even though *treasure may lie under our feet*,” asserted Jacques Sallibartant, *president of the Amicale des foreurs et des métiers du pétrole association*. According to former Prime Minister Michel Rocard, *France might even be “blessed by the Gods.”* Corinne Lepage, former Minister of Ecology, believes that this “*myth*” was *entirely fabricated by “the oil and gas lobby.”* [...]

These arguments have seduced many members of the socialist party as elected officials hope that the government will soften its stance before the end of its five-year term. “This reversal would be political suicide,” says *Green MEP José Bové, who spearheads the fight against shale gas* [...] (MOUCHON; BENEZET, *Le Parisien*, 14 November 2012, p.02; our translation).⁹

⁹ Text in the original in French: “Gaz de schiste: la tentation. Alors que l’ancien Premier ministre François Fillon *estimait hier ‘criminel’* de s’interdire les recherches sur le gaz de schiste, *le chef de l’état a rappelé que* l’interdiction de la fracture hydraulique date de juillet 2011 et la présidence... de Nicolas Sarkozy. Si le sujet ressurgit, c’est que, depuis cet été, *les pétroliers, repris par des élus*, ont trouvé un *argument de poids*: cette manne pourrait relancer la croissance économique. ‘Nous sommes les seuls au monde à refuser de chercher alors qu’*on a peut-être sous nos pieds un trésor*’, fait valoir Jacques Sallibartant, *président de l’Amicale des foreurs et des métiers du pétrole*. Pour l’ancien Premier ministre Michel Rocard, *la France*

This paper will not review all the different forms of reported speech or the plurilogal intertext that characterize some media texts. Instead, it will focus on how this genre of text “establishes a dialogue” throughout the text by using statements produced by the competing spheres of activity, as if it were trying to reproduce what is seen on television or heard on the radio during these debates, to the point of “establishing a dialogue” between speakers who will never meet in the public sphere. It is therefore possible that this genre of text – which can be found in all the French daily newspapers, from *Libération* to *Le Figaro* – developed under the influence of mainstream oral and audiovisual media, just as the genre of “dialogue interviews” developed in the written press under the influence of the first radio interviews. It is even more likely that the development of Web 2.0, which allows audiences to answer the question of the day (from *Le Parisien* or *BFM TV* in France, for example), had an impact on the development of this genre of text.

Beyond the words of debaters, linguists can notice the role played by print reporters as they present themselves throughout the text as “moderators” of debates, through the writer’s decision to use “reported” sequences, in particular by framing them and referring to them as “arguments” for example but also by characterizing them (*a powerful argument, arguments that have seduced*) or by presenting their origin (*fabricated by the oil and gas lobby, who spearheads the fight against shale gas*). The diagram below depicts the arrival of these new players in scientific communication, in particular from the political sphere:

serait même ‘bénie des Dieux’. Un ‘mythe’ construit de toute pièce par ‘le lobby pétrolier et gazier’ selon l’ex-ministre de l’écologie Corinne Lepage. [...] Des arguments qui font mouche dans les rangs du PS où des élus espèrent que le gouvernement assouplira sa position d’ici la fin du quinquennat. ‘Ce serait un reniement suicidaire politiquement’, selon l’eurodéputé vert José Bové, fer de lance du combat antigaz de schiste [...].”

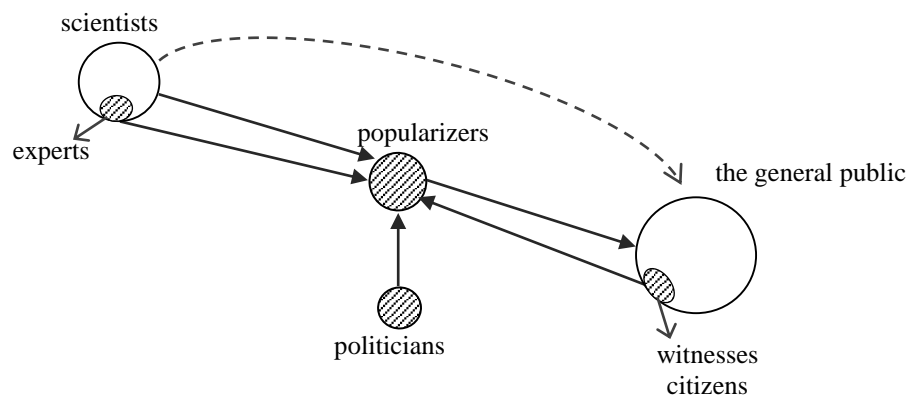


Diagram 2 – New Players Enter Popular Science.

From a textual specialist point of view, the “meaning” of these metalinguistic markers can be examined, along with the manner in which they function alongside other markers indicating heterogeneity (e.g. *verba dicendi* that introduce the words of opposing spheres) “outside of narratives of words” and the manner in which they connect “proposals of textual sequences upstream, downstream or anywhere” (VÉRINE, 2005, p.12; our translation).¹⁰ This is how the marks of this specific phraseology could be found in a study on rats that were fed GMO corn for two years, along with the metaphors that characterized them when the press made mention of it.

Ex. 6

Feeding rats GMO corn for two years kills them [...] (NOUALHAT, *Libération*, 20 September 2012, p.19).

A ticking time-bomb that reopens the debate on GMOs [...] (NOUALHAT, *Libération*, 20 September 2012, p.19).

The publication [...] has fuelled the debate anew [...] (NOUALHAT, *Libération*, 21 September 2012, p.18).

Spreading like wildfire... Prof. Gilles-Éric Séralini’s study [...] has reignited the debate (DEMEY, *Le Journal du dimanche*, 23 September 2012, online) (our translation).¹¹

From the point of view of a specialized media analyst, the manner in which these controversial issues are announced can also be examined in the media’s paratext (the

¹⁰ Text in the original in French: “les propositions ou les séquences textuelles à leur amont, à leur aval ou à leur ailleurs.”

¹¹ Text in the original in French: “Nourrir des rats pendant deux ans avec du maïs transgénique leur est fatal”; “Véritable bombe qui relance le débat sur les OGM”; “La publication a ravivé le débat”; “Une traînée de poudre... L’étude du Pr Gilles-Éric Séralini... a rallumé le débat.”

editorial authority), through the front page headline, the headline of the page or two-page spread, the subtitles and captions, as well as separate components.

Ex. 7

GMO – The Poisoned Debate (*Le Journal du dimanche*, 23 September 2012, online)

GMOs or Starvation? (*Libération*, 13 October 2001; p.39)

GMOs – True or False Arguments by Prof. Gilles-Éric Séralini (*Le Monde*, 26 September 2012; p.8)

For or Against GMOs? (NOUALHAT, *Libération*, 21 September 2012, p.18) (our translation).¹²

Finally, questions can be asked about the reasons for the evolving genericity of informative articles and their position within the different genres that are co-produced by a media organization for the same controversial event. This means broadening the discussion to the history of the press and the history of the society in which we live and evolve, not only from a technological point of view (which always has an impact – see below) but also based on the type of “democracy” that is built. When it comes to the history of the press, according to E.U. Grosse, a German university professor specialized in French press, the history of the development of a press in which opinion and debate go hand in hand with information in Europe can be explained by the “French Revolution and its influence on the Napoleonic era and later on the rebellions and revolutions that took place in neighbouring countries” (GROSSE, 2000, p.25; our translation).¹³ The current French press could also be compared to that of Northern European countries or Switzerland where the consensus culture is more prevalent than in France.

Might there not also be a culture of conflict dating back to the French Revolution that is specific to French society and that is expressed regardless of the reason for the conflict, which can even be seen in the use of the words “*droite*” (“right”) and “*gauche*” (“left”), as one of the authors recently showed? Indeed, although these words were originally only used to express laterality, they were later used to refer to the deputies in the Revolutionary Assembly who were confronting each other over the king’s potential right of veto: supporters of a strong monarchy were to the *right* of the session chairman,

¹² Text in the original in French: “OGM: le débat empoisonné”; “L’OGM ou la faim?”; “OGM: les vrais ou les faux arguments du Pr Gilles-Éric Séralini”; “Pour ou contre les OGM?”

¹³ Text in the original in French: “La Révolution française et son rayonnement dans l’époque napoléonienne et, plus tard, dans les révoltes et révolutions qui ont lieu dans les pays situés autour de la France crée une presse où l’opinion et le débat apparaissent à côté de l’information.”

whereas supporters of a constitutional monarchy were on the *left*. Over time, these words were imbued with the divisions and oppositions that coexisted within French society: in the 19th century, the opposition between the left and the right mainly reflected the fundamental opposition in society between returning to the values of the Ancien Régime and reinforcing the gains of the French Revolution. Once the Republic had been consolidated, the words referred to other divisions, such as the one between clericalism and secularity, or the one between economic liberalism and collectivism. Therefore, since 1789, the split between right and left has structured the French political arena. This can be explained by the capacity of these words to make the *conflict* between opposing parties and ideas visible. The importance of this opposition also seems to reveal one of the characteristics of French political culture: the fact that political life is divided into two adverse trends shows how members of French society feel the need to organize the field of politics using a democratic framework that involves conflicting – and necessarily adverse – positions (RIBEIRO, 2015).¹⁴ This gives the authors the authority to suggest that there could be a culture of conflict in France that turns every public debate – electoral and scientific events – into a contentious issue.

In any case, it seems as though the observations that can be made concerning the position of this new “genre” of information texts should be connected to the theories of Vološinov, who describe utterances as “a purely sociological structure” and wants to take “the phenomenon of reported speech” from a “sociological orientation” (1973, p.98, 113).¹⁵ Even though the conclusion Todorov draws from Bakhtin and Vološinov’s texts is that “intertextuality belongs to discourse and not language” (1984, p.61),¹⁶ it seems as though discourse genres do differ from each other through the degrees that can be seen in the presence of other people’s speech as well as the role they are given in the representation of relationships between different spheres of activity. It also appears that

¹⁴ Comparing articles from *Le Monde* on the French 2007 presidential elections with articles from *O Estado de S. Paulo* on the 2002 Brazilian presidential elections revealed a different use of the divisive words (*droite/gauche, direita/esquerda*) in the newspapers. Although in *Le Monde* words help make the electoral conflict clearer by referring to distinct rival categories, they do not have the same structuring role in the Sao Paulo newspaper as, in Brazil, it is not possible to limit the event to this opposition (RIBEIRO, 2015).

¹⁵ VOLOŠINOV, V.N. *Marxism and the Philosophy of Language*. Translated by L. Matejka and I.R. Titunik. New York; London: Seminar Press, 1973 [1929].

¹⁶ TODOROV, T. *Mikhail Bakhtin, The Dialogical Principle*. Translated by W. Godzich, UK: Manchester University Press, 1984 [1981].

they are formed and transformed under the joint influence of social, political and technological evolution.

Nevertheless, one sphere seems under-represented when compared to the others: that of audiences who are not authorized to speak. Glimpses of this can be seen in the press and the media through a few interviews and letters from readers or when they are contacted on the phone or by email, or through social networks and tweets. How is the new media (Internet and Web 2.0) changing the landscape of the dissemination of science and relationships between different spheres of activity, particularly when audiences go from being a strictly passive interpretive body to an interpretive/participatory body and a producing body? This is what this paper will attempt to explain below.

3 Popular Science Online – New Discursive Configurations?

Several arenas for popular science can be identified online, as journals available in print have created websites¹⁷ and websites without a print version were created and designed to be digital.¹⁸ At the time, it seemed as though, by involving new players (see above) and by being available online through websites, popular science had explored all the linguistic spheres. However, an unexpected development came about as a new arena helping to disseminate knowledge transfer was identified. Popular science emerges from this arena, that of “science blogs,”¹⁹ as does a new player: the amateur.

¹⁷ At first, these websites were just an online version of the paper copy, but then they evolved: *Ciel et Espace*, 1945; *Cosinus*, 1999; *Pour la Science*, 1977; *La Recherche*, 1970 [1946]; *Science et Avenir*, 1947; *Science et vie*, 1913, etc.

¹⁸ *Futura sciences*, le savoir s’invite chez vous; *Universcience.tv*, weekly scientific webTV from the Cité des sciences and the Palais de la découverte, etc.

¹⁹ Some French blogs:

{Sciences}², <http://sciences.blogs.liberation.fr/>

Chroniques de l’espace-temps, <http://espace-temps.blogs.nouvelobs.com/>

Science étonnante, <https://sciencetonnante.wordpress.com/>

Pascal Lapointe, <http://www.sciencepresse.qc.ca/users/plapointe>

Le cosmographe, <http://www.lecosmographe.com/blog>

La galaxie de Florence Porcelle, <http://www.florenceporcel.com/>

Culture volcan, <http://laculturevolcan.blogspot.com/>

Le dinoblog, <http://www.dinosauria.org/blog>

Pourquoi le ciel est bleu, <http://pourquoileciel.estbleu.cafe-sciences.org/>

Guy Doyen, <http://guydoyen.fr/>

Nowadays, there are more science blogs that are ranked²⁰ according to many parameters (network of links to the blog from other blogs, posts shared on Facebook, Twitter, etc.).

3.1 New Contributors to Popular Science: Amateurs

In the early 2000s, the study of Internet discourse (MOURLHON-DALLIES; RAKOTONOELINA; REBOUL-TOURÉ, 2004) helped highlight the increase of personal pages on the Internet, pages where some Internet users took the floor and wrote about their interests. In line with this and thanks to the resources available to create websites, came the appearance of blogs, “website run by an individual or a community that expresses themselves regularly through a log and posts.”²¹ As these posts appear in reverse chronological order, a certain regularity is expected, along with writing imbued with a certain rhythm. Hyperlinks are visible and discussions are expected; indeed, readers are no longer merely readers but are invited to react and leave comments.

These new bloggers contribute to the “growing power of amateurs” (RIEFFEL, 2014) who take part in the process of broadening knowledge and skills based on a form of self-study since, unlike academic hierarchies, no diplomas are required.

A highly complex world is thereby revealed, one that is built using original methods of knowledge learning and that is comprised of networked discussions within hybrid communities, as well as of extremely varied hybridization and poaching processes that either shake the traditional knowledge acquisition processes or are completely alongside or on the sidelines of activities that are traditionally considered to be the most legitimate. This is a typical case of bottom-up innovation coming from the people and not the elite, which is hailed by all the Internet founders (RIEFFEL, 2014, p.128; our translation).²²

²⁰ Teads, <http://fr.labs.teads.tv/top-blogs/sciences>

²¹ Text in the original in French: “Site Internet animé par un individu ou une communauté qui s’exprime régulièrement dans un journal, des billets,” *Le Petit Robert* (2011).

²² Text in the original in French: “On découvre ainsi un monde pour le moins complexe, forgé selon des modalités inédites d’apprentissage des connaissances, constitué d’échanges en réseau au sein de communautés virtuelles, de procédures d’hybridation et de braconnage très variées qui soit ébranlent les processus traditionnels d’acquisition des savoirs, soit se situent carrément à côté ou en marge des activités traditionnellement les plus légitimes. Nous sommes ici typiquement dans le cadre de l’innovation ascendante, venue du peuple et non plus des élites, célébrées par tous les fondateurs du web.”

Thereby, the blogosphere contains science bloggers who transfer their knowledge to other Internet users, which is illustrated by the reflexive loop in Diagram 3.

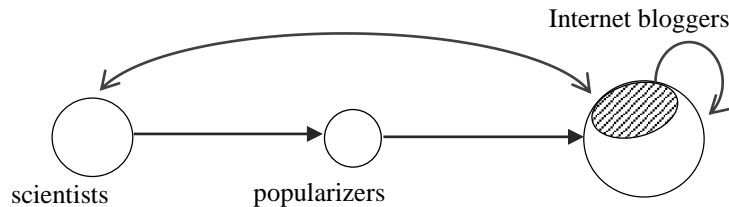


Diagram 3 – The Further Dissemination of Popular Science through the Internet.

It seems as though the freedom granted by the Internet allows amateurs to become “participants” in popular science by addressing themselves to other Internet users, as P. Flichy highlighted in 2010:

Ordinary people have taken over the Internet. [...] In France, Wikipedia gathers one million articles, and ten thousand blogs have been created. One quarter of Internet users have already signed an online petition. These figures illustrate a key phenomenon: the modern Web belongs to amateurs. [...]

Following the dual democratization – both political and educational – that has been taking place over the last two centuries, we are now entering a new era of democratization, that of skills (FLICHY, 2010, p.7; our translation).²³

Thereby, official popularizers disappear as they can be replaced by amateurs. This could be described as a redistribution of the hubs of popular science through the appearance of “disintermediation.”

The new digital technologies lead, to varying degrees, to the loss of traditional points of reference in cultural matters, which supports the emergence of a major phenomenon: the end (or at least the weakening of the influence) of mediators and intermediaries (“disintermediation” being the specialized term). [...] As soon as anyone can theoretically experiment and create using new mediums and digital tools [...], the

²³ Text in the original in French: “Les quidams ont conquis Internet. [...] En France, Wikipédia réunit un million d’articles, et dix millions de blogs ont été créés. Un quart des internautes a déjà signé une pétition en ligne. Ces quelques chiffres illustrent un phénomène essentiel : le web contemporain est devenu le monde des amateurs. [...] De même que nous avons vécu depuis deux siècles une double démocratisation, à la fois politique et scolaire, de même nous entrons dans une nouvelle ère de démocratisation, celle des compétences.”

role of professionals and experts becomes less important. [...] However, is it really possible to imagine a democracy without intermediary bodies? Can a culture be passed on without contextualization or a real hierarchical organization? (RIEFFEL, 2014, pp.265-266; our translation).²⁴

“Disintermediation” can be seen in science blogs but also in websites where Internet users can directly ask questions to an expert. Although these new contributors to the sphere of scientific knowledge transfer combine pre-existing forms of language (articles, letters from readers, discussions/debates), these forms take on another dimension through the digital medium (multimedia, hyperlinks, a component of letters from readers that can be a simple click, a “like”) or when the article is transferred to another network for further dissemination. Thereby, amateurs offer new combinations of writing and reading by participating themselves and by combining discursive forms that had been separate until then. They are therefore the founders of new discursive channels that help create original forms while contributing to the transfer of knowledge. According to Flichy:

In the skills democratization process that is at the heart of the activity of amateurs, there is no separation between scholars on the one hand and information gatherers on the other – science and scientific expertise are built together. It is therefore a matter of developing what the interactionist trend of the sociology of science calls a “border-object,” suited to amateurs and experts (2010, p.79; our translation).²⁵

Therefore, amateurs have their own role to play in the transfer of knowledge.

²⁴ Text in the original in French: “Les nouvelles technologies numériques engendrent à des degrés divers, une perte des repères traditionnels en matière culturelle qui conforte l’émergence d’un phénomène majeur: la fin (ou du moins la diminution de l’influence) des médiateurs et des intermédiaires (la ‘désintermédiation’ dans le jargon des spécialistes). [...] A partir du moment où tout le monde peut *a priori* expérimenter et créer grâce aux nouveaux supports et outils numériques [...], le rôle des professionnels et des experts perd de son importance. [...] Or peut-on véritablement imaginer une démocratie sans corps intermédiaires, peut-on transmettre une culture sans contextualisation et sans véritable hiérarchisation?”

²⁵ Text in the original in French: “Dans le processus de démocratisation des compétences qui est au cœur de l’activité amateur, il n’y a pas d’un côté, les savants, et de l’autre, les ramasseurs d’information ; il y a une construction commune de la science et de ses savoir-faire. Il s’agit donc d’élaborer ce que le courant interactionniste de la sociologie des sciences appelle un ‘objet-frontière’, adapté aux amateurs et aux experts.”

3.2 The Increase of the Discourse of Others

The participation of amateurs in the popular science cycle through blogs gives birth to specific discursive channels. This paper will discuss the dual dialogism that was already identified in the 1980s as well as the “traceability” of reported speech in posts using linguistic markers that can clearly be identified at the level of the blogger. The post gives birth to new forms of discourse from readers/writers through comments replying to posts as well as the sharing of posts on other networks so they can be more broadly disseminated.

3.2.1 Two Forms of Dialogism

Moving from scientific discourse to popular discourse, from a source discourse to a secondary discourse, leads to discursive heterogeneity. Popular discourse lets the voice of scientific discourse filter through. Indeed:

In V.S.’s texts, double quotes are simultaneously used for “scientific words” (I am using specialists’ words but I know very well that these are not the words that you use, my readers) and for common words (I am using your everyday words, but I know very well that these are not the words that science uses). [...]

At times, the scientific word is marked as a foreign entity in the language attributed to the receiver, whereas at others, on the contrary, familiar words need to be separated from scientific “language” (AUTHIER, 1982, pp.41-42; our translation).²⁶

This linguistic characteristic of popular discourse is found in posts on science blogs. It is therefore possible to go from with champagne bubbles to carbon dioxide:

Ex. 8

The first thing to know is that, just like most fizzy drinks, champagne bubbles are made of *carbon dioxide*, the famous CO₂. This carbon dioxide is directly produced by the reaction that turns sugar into

²⁶ Text in the original in French: “Dans les textes de V. S. c’est une double ligne de guillemets qui court parallèlement, sur des mots ‘scientifiques’ (je parle avec les mots des spécialistes, sachant bien que ce ne sont pas vos mots à vous, lecteurs) et sur des mots courants (je parle avec vos mots de tous les jours, sachant bien que ce ne sont pas les mots de la Science). [...] C’est donc tantôt le mot scientifique qui est désigné comme corps étranger relativement à la ‘langue’ supposée du récepteur, tantôt, à l’inverse, les mots familiers qui suscitent une prise de distance par rapport à la ‘langue’ scientifique.”

alcohol, which is known as *alcohol fermentation*. This reaction is produced by the yeast and sugar that is added to champagne wine (which isn't fizzy to start with!) (*Science étonnante*, 23 December 2013; our translation).²⁷

Two forms of dialogism can be seen here, as J. Authier explains:

The numerous analyses of Bakhtin's Circle reveal how much the discourse of "I" is always influenced by "the voices of others." [...] The idea of "speaking for others," which is mentioned in V.S.' texts, is none other than these two forms of dialogism, magnified through the mirror of systematic explanation: popularizers speak for – replacing a speaker, the scientist, and speak for – in the direction of the other public, thereby using words from both sides in a discourse that is characterized by this dual determination. (1982, p.44; our translation)²⁸

3.2.2 The Traceability of Reported Speech

The expression "layered discourse" could be used, as there are several "layers" of reported speech. Firstly, when bloggers quote scientists, they can use hyperlinks to place the reported speech in its proper context. This specificity granted by digital mediums allows the "traceability" of discourse from the outside while guaranteeing its scientific nature (quoting sources but without bibliographic references or citations by making the entire text available). There are therefore several "layers" as it is necessary to leave the page hosting the post to read the context of the reported speech on another level of the Internet. Hyperlinks can be found for various forms of reported speech, such as the modalization of secondary discourse (according to X...):

Ex. 9

However, oceanographers were not entirely correct as another factor had intervened to create this "hiatus," a slight warming shown by

²⁷ Text in the original in French: "La première chose à savoir, c'est que comme pour la plupart des boissons gazeuses, les bulles du champagne sont des bulles de *gaz carbonique*, le fameux CO₂. Ce gaz carbonique est un produit direct de la réaction qui transforme le sucre en alcool, ce qu'on appelle la *fermentation alcoolique*. Cette réaction se produit grâce aux levures et au sucre que l'on ajoute au vin de champagne (qui initialement ne pétillait pas!)."

²⁸ Text in the original in French: "Ce que dégagent les nombreuses analyses du cercle de Bakhtine, c'est combien le discours du 'je' est toujours marqué par la 'voix de l'autre' [...] Le 'parler pour les autres' proclamé dans les textes de V.S. ce sont ces deux formes du dialogisme, vues dans le miroir grossissant de l'explicitation systématique: le vulgarisateur parle pour – à la place de l'un, scientifique, et parle pour – à l'intention de l'autre, public; avec les mots des deux, donc, dans un discours marqué par cette double détermination."

statistics. Create, because, as the [analysis published](#) in the *Science* journal showed [...] (HUET, {Sciences}², 6 June 2015; our translation).²⁹

or speech verbs:

Ex. 10

CNRS senior management was contacted by *Arrêt sur Images* at the time but does not seem to have implemented measures that could have prevented the disclosure of a document that was supposed to be confidential in a timely fashion, as the Commission d'Accès aux Documents Administratifs (CADA) [confirmed](#) in early November of the same year (*La science au XXI^e siècle*, 6 June 2015; our translation).³⁰

or the adverbs *ici* (here) and *là* (there) (REBOUL-TOURÉ, 2004 and forthcoming). It is possible to read the speech that is quoted in its entirety. This traceability is presented as a way to guarantee reliability. Bloggers not only quote their sources, they can show them.

3.2.3 “Commented” Discourse

The structure of the blog invites readers to leave a comment after the post. From then on, any situation is possible. There could be no answers, a few responses, or the post could create controversy with over one hundred exchanges as “commentators” talk among themselves and no longer directly to the initial blogger. For example, on the {Sciences}² website, which is managed by Sylvestre Huet, a science journalist for *Libération*,

²⁹ Text in the original in French: “Mais les océanographes n’avaient pas entièrement raison, car un autre facteur était venu fabriquer ce ‘hiatus’, un moindre réchauffement apparent dans les statistiques. Fabriquer, car, *comme le montre l’analyse publiée dans la revue Science* [...].”

³⁰ Text in the original in French: “Contactée à cette occasion par *Arrêt sur Images*, la direction du CNRS ne semble pas avoir adopté en temps utile des mesures de nature à arrêter la divulgation d’un document censé être confidentiel comme la Commission d’Accès aux Documents Administratifs (CADA) [l’a confirmé](#) début novembre de la même année.”

RÉAGIR

Postez votre commentaire
Si vous disposez d'un compte
Typekey ou TypePad, [veuillez](#)
[vous identifier](#)

votre nom

e-mail

votre commentaire

VOS RÉACTIONS (8)

mar. 9 juin 2015
à 19:48:44
par *olivetree*

@mon oeil

Désolé je n'en ai aucune idée! J'ai parcouru l'article dans PlosOne mais n'ai pas trouvé d'explication chimique ou physique, si ce n'est que les coquilles ont subi un traitement à l'eau de Javel (ce qui aurait tendance à oxyder les espèces si ce sont bien des restes de pigments organiques...)

mar. 9 juin 2015
à 12:43:13
par *carlos*

Tchaf

""""""Le seul impact du CO2 est sur le niveau d'énergie présent dans le système climatique terre.""""""

D'emblée vous commettez une grossière erreur ; le CO2 n'est pas une source d'énergie ; sa présence plus ou moins importante ne peut que changer la répartition de la chaleur dans le système climatique Terre (ou vénusien si vous voulez)

La seule chose qui peut changer le niveau du système climatique ce sont les fournisseurs d'énergie: le soleil et si vous voulez pinailler , les variations du gradient géothermique

a form of dialogue is thereby created, a dialogue with the author or a “dialogue” or even a conversation between commentators.

3.2.4 The “Dissemination” of Discourse

The flow of discourse follows new paths, and certain posts can have a considerable impact given all the features of the new freedom of writing developed by Internet users. A post can be shared on Facebook, Twitter, Tumblr, etc. Each blogger uses networks for dissemination. Readers can share the post which, as it enters new networks, meets new readers, showing how fluid the community is.

3.3 Science Blogs – A New Genre?

The Internet has undoubtedly led to the appearance of new spheres of human activity. According to Bakhtin, spheres are the first aspect of genre (GRILLO, 2007, p.24). Furthermore:

If, as Bakhtin asserts, each sphere of human activity has its own range of genres and its own rules, it is normal that, as new activities appear or certain professional practices evolve – which is often linked to the evolution of mediums (in the media, with the Internet, with the

appearance of “free newspapers,” etc.) – a rebuilding of ranges of genres can be seen. This is why a language community (concept that replaces that of sphere) has a range of genres that is not set but evolving. This is the case for professional language communities that belong to the social world of media (MOIRAND, 2007, pp.92-93; our translation).³¹

New genres are expected in a sphere like this, and “the issue of the medium has become a key component of genre research” (BRANCA-ROSOFF, 2007, p.137; our translation).³² Blogs can belong to this sphere, particularly through their new nomenclature, which gives a name to a reality that had not existed until then. The lexical creation of “blogger” to refer to the Internet user who writes the posts is a linguistic confirmation of a language community, as is the act of “blogging” that “solidifies the awareness of this new language activity” (BRANCA-ROSOFF, 2007, p.132; our translation).³³ Until now, this type of log did not exist. This paper has therefore identified the external markers of determination of genre.

On another level, by combining external markers of determination of genre with certain internal linguistic forms, it is possible to isolate what a science blog is:

Trying to connect linguistic forms and social mechanisms means moving to a smaller level of genres [...] The list is renewed with social practices as modifying the aim of the discourse, the status of the partners, the time or the place of the communication, the tangible medium, the learning environment for textual forms, etc. ultimately leads to modifying the routines implemented by speakers to perform their tasks. The analytical approach [is] to favour categories that stabilize forms of association between forms of action (discourse roles, cognitive tasks), contents and ways of speaking (enunciation devices, new nomenclatures [...], etc.) (BRANCA-ROSOFF, 2002, p.282; our translation).³⁴

³¹ Text in the original in French: “Si, comme le dit Bakhtine, chaque sphère de l’activité humaine a son propre répertoire de genres, avec ses normes de fonctionnement, il est normal qu’au fur et à mesure du surgissement de nouvelles activités ou de l’évolution de certaines pratiques professionnelles, liées souvent à l’évolution des supports (dans les médias, avec l’internet, avec l’apparition des ‘gratuits’...), on assiste à une reconstitution des répertoires. C’est ainsi qu’une communauté langagière (notion que l’on substitue à celle de sphère...) dispose d’un répertoire générique non pas fixe mais évolutif, et c’est le cas des communautés langagières professionnelles qui appartiennent au monde social des médias.”

³² Text in the original in French: “la question du support est devenue une composante essentielle de la réflexion sur les genres.”

³³ Text in the original in French: “cristallise la prise de conscience qu’il s’agit d’une nouvelle activité langagière.”

³⁴ Text in the original in French: “Si l’on cherche à articuler des formes linguistiques et des fonctionnements sociaux, on se situe au niveau de genres plus petits [...] La liste s’en renouvelle avec les pratiques sociales : une modification de la finalité du discours, du statut des partenaires ou du temps et du lieu de la communication, du support matériel, des conditions d’apprentissage des formes textuelles... entraîne à

Indeed, science blogs use specific linguistic forms, in particular regarding restatements (REBOUL-TOURÉ, 2014), which is a characteristic of popular science discourse. There are also definitions and questions concerning scientific nomenclature. Nevertheless, beyond the forms of popular science, blogs can move outside of this framework by using different sequences, such as a catchphrase relating to the news or a little humour, among others. Then, comments come from readers/writers, ordinary discourse mingling with specialized discourse – an invitation to question the “permeability of borders between ordinary and specialized” (RAKOTONOELINA, 2014). Could it not then be described as a hybrid genre?

Conclusion

The intermingling of discourse in these new spheres goes beyond the splitting of the utterance, and the increase of discursive exchanges is an invitation to review the concept of “discursive hybridity” by grouping together all the types of discourse that form a network around posts from a science blog, for example. This concept, which is less technical than that of “discursive heterogeneity, [...] highlights the diversity of voices found in a genre that is a monologue” and allows “the multimodality of certain productions or interactions” to be incorporated (MOIRAND, 2014b, p.144; our translation).³⁵ This concept also allows the notion of “discursive technology” to be integrated, i.e. “all the processes through which language becomes discourse in a technological environment [...], a system in which discursive production is intrinsically linked with technological tools” (PAVEAU, 2013, p.2; our translation).³⁶ Therefore, the technological innovation of the Internet gives birth to new linguistic spheres within which

terme une modification des routines mises en œuvre par les locuteurs pour accomplir leurs tâches. La démarche d'analyse [...] [consiste] à privilégier les catégories qui stabilisent des formes d'association entre des formes d'action (rôles discursifs, tâches cognitives), des contenus et des manières de dire (dispositifs d'énonciation, nouvelles dénominations [...], etc.).”

³⁵ Text in the original in French: Ce concept “moins technique que celui d'hétérogénéité énonciative, [...] rend compte de la diversité des voix présente dans un genre monologique” et permet d'intégrer “la multimodalité de certaines productions ou interactions.”

³⁶ Text in the original in French: “La technologie discursive est l'ensemble des processus de mise en discours de la langue dans un environnement technologique. C'est un dispositif au sein duquel la production discursive est intrinsèquement liée à des outils technologiques.”

new genres – that are probably hybrid – develop, like the “science blog,” which is more of a popular science blog.

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