Lingue e Linguaggi
Lingue Linguaggi 40 (2020), 165-185
ISSN 2239-0367, e-ISSN 2239-0359
DOI 10.1285/i22390359v40p165

DIGITAL COMMUNICATION OF THE INTERNATIONAL HUMAN GENOME EDITING SUMMIT
Exploring the multimodal potential of conference presentations[1]

JEKATERINA NIKITINA
UNICAMILLUS

Abstract – This study investigates the multimodal potential of conference presentations for specialized knowledge dissemination purposes during the International Summit on Human Gene Editing. The methodological framework combines a genre perspective with a social semiotic reading of multimodal artefacts, focusing on the main canvas of analysis represented by the video recording of a PowerPoint-based conference presentation, with the parallel corpus of slides and commissioned papers. The study pursues the aim to assess how different semiotic codes interact in the resulting multimodal artefact, and, specifically, how video recording of conference presentations contributes to the dissemination of scientific knowledge on human gene editing in slides and papers. The findings pinpoint the disappearance of elements typical of dissemination and popularization from the papers and the PowerPoint slides, and at the same time confirm that videos provide adaptive choices for integrating different modes for the fullest knowledge dissemination attempt, with some minor technical shortcomings.

Keywords: conference paper presentations; multimodal meaning making; gene editing; knowledge dissemination; specialized communication.

1. Introduction

Specialized discourse on the human genome has attracted the attention of communication scholars for quite some time, and such attention reached its highest point with the conclusion of the Human Genome Project in the 2000s. Linguistic research in this LSP area focused mainly on popularization practices associated with knowledge of the human genome (Turney 1998;

[1] This study contributes to the national research programme "Knowledge dissemination across media in English: Continuity and change in discourse strategies, ideologies, and epistemologies", financed by the Italian Ministry of Education, University and Research for 2017-2019 (nr. 2015TJ8ZAS).

Petersen 2001; Calsamiglia, van Dijk 2004) and, since the abstract language of genetics has become strongly associated with metaphors, its translation into metaphors (Nelkin 1994, 2001; Pramling, Säljö 2007). The mysteries of our genetic code are far from being unravelled, and scientific research constantly produces new developments, such as the discovery of gene-editing technology in the mid-2010s. This technology allows geneticists to alter segments of the DNA – plant, animal or human – cutting out and replacing the unwanted segments. Linguistic research into gene editing discourse reflects the general line of research associated with the language of genetics. It has concentrated so far mainly on the terminology (Wells, Joly 2017), metaphorical representation (O'Keefe *et al*. 2015; Mattiello 2019) and popularization in mass media (Nikitina 2019).

The inception of this new technology of genetic manipulation occurred when most forms of scientific communication were becoming increasingly more digitalized and reliant on multimodal forms. For instance, modern scientific textbooks along with traditional textual resources use images, colours and different kinds of spatial arrangement (Bezemer, Kress 2016). Scientific lectures and presentations embody another knowledge dissemination channel which employs multimodal resources (Rowley-Jolivet 2002; Bucher, Niemann 2012). Research has also explored the dissemination potential of scientific conference presentations from a recipient's perspective (Bucher, Niemann 2012), yielding stimulating results on the way different forms of knowledge design and coordination contribute to facilitating knowledge transfer through the combined use of slides, spoken text and body language. In line with these general tendencies, gene editing has been communicated since the outstart not only through traditional linguistic code, but also through images, layout and video (Bateman 2008, 2011; Kress 2009, 2014; Forceville 2014), provoking academic curiosity as to how these different modes are combined to enhance the knowledge dissemination potential.

This chapter investigates the resulting multimodal artefacts – the combination of slides, commissioned papers and video recordings in the conference presentations at the International Human Genome Editing Summit, which are understood here as "a middle ground – a site of integration for the contributions arising from both mode and genre" (Hippala 2015, p. 5). The chapter first offers a conceptualization of the conference paper presentation as a genre, with a description of resources used for multimodal meaning making as applied specifically to conference presentations. Next, materials and study design are detailed in Section 3, with the findings and discussion following in Section 4.

2. Conference presentations and multimodal meaning making

Traditionally, research into scientific academic discourse has revolved around written genres; yet starting from the early 2000s there have been an increasing number of spoken academic discourse studies (Lynch 2011; Rowley-Jolivet 2002), focusing specifically on the multimodal aspects of conference paper presentations (Charles, Ventola 2002; Rowley-Jolivet 2002, 2004; Carter-Thomas, Rowley-Jolivet 2003). This section builds on genre theories (Swales 1990, 2004) to describe the multimodal artefact of a conference paper presentation and the underlying communicative situations, with their social and communicative purposes (van Leeuwen 2005; Baldry, Thibault 2005; Bateman *et al*. 2017). The framework of social semiotics and systemic functional linguistics (Halliday 1994 [1985]) is applied in that it has exerted a significant impact on multimodal research (Kress, van Leeuwen 2006; Jewitt 2014).

Conference presentations as a genre are placed against a broader conference background, including the communicative context and purposes – "the intangibles of the conference 'buzz'" (Swales 2004, p. 197) – and the (inter-)disciplinary nature of the conference. The International Human Gene Editing Summit ("Summit"), as any other international conference, is defined by a broad topic, here – human gene editing, which represents the *field* from the systemic functional perspective (SFL, Halliday 1994 [1985]). Although the composition of the Summit speakers is quite heterogeneous and interdisciplinary (geneticists, ethicists, lawyers, historians, philosophers, associations of people with genetic diseases), they are all united by the field of gene editing. Yet, their own specialization may have an impact on the multimodality of the presentation. While in the humanities the role of visual support may be nominal (Swales 2004), the biomedical field demands it either to explain abstract concepts or to illustrate laboratory work. Given the interdisciplinary nature of the Summit, this is an interesting starting point for an analysis, and it has been taken into consideration in the study design (see Section 3).

Normally, conference speakers tailor their presentations to the level of expertise, cultural and linguistic background of the audience in terms of its *ideational content* (what they are presenting), its *textual content* (how they organize the presentation) and its *interpersonal content* (how they relate to the topic and the audience), representing the *tenor* in SFL (Morrell 2015, p. 140). Moreover, conference speakers exploit a wide range of ways and channels of knowledge representation and/or their combination (i.e. *mode* in SFL) to facilitate communication and to build a logical structure for their discourse (Rowley-Jolivet 2002; Morrell 2015).

In the biomedical field, Dubois (1980) was among the first to report on the broader role of nonlinguistic visual devices (diagrams, charts, graphs, tables, photographs of laboratory animals and experimental procedures) and the use of slides (Morell 2015, p. 138). The visual mode either accompanied the speech to arouse more interest or was the main object of discussion. Frequently, speakers left the burden of decoding visual information to the attending public, without providing a verbal explanation (Dubois 1980).

Rowley-Jolivet (1999, p. 134) observes that "[i]n the scientific presentation, whatever the discipline, the visual channel of communication is a major resource for meaning making", reflecting a more general observation of the increasing visualization of modern scientific communication (Kress, van Leuween 2006, pp. 30-31). In a later study, Rowley-Jolivet (2002, pp. 20-21) posits that visual frames of PowerPoint presentations play a key role in distinguishing the genre of conference presentation among other research genres, or to quote Swales (2004) in the academic "genre chain". More recent studies reiterated the decisive role of the non-verbal mode in knowledge communication (Moreno, Mayer 2007; Rowley-Jolivet 2012; Bucher, Niemann 2012; Morrell 2015). Yet, in general scientific communication, Kress and van Leuween (2006, p. 31) advise against an over-reliance on a single mode, even in the shift from verbal to visual, so conference presentations need to be perceived multimodally and to combine the condensed expressions in slides with the extended presenter's commentaries (Rowley-Jolivet 2012).

Research on multimodality generally distinguishes between a number of different modes in conference presentations. Morrell (2015, pp. 140-141), building on previous research, identifies the following modes:

1) The spoken mode
   (1) *linguistic* (connecting words, meanings to express)
   (2) *paralinguistic* (tone, intonation, stress)
2) the written mode
   (1) *linguistic* (what is written on the slides)
   (2) *paralinguistic* (how the text is written: bold characters / different font colour / text organized in bullets, coming out simultaneously or consecutively)
3) the visual mode of non-verbal materials, that is pictorial representations of knowledge (Moreno, Mayer 2007), e.g., graphs, tables, bar charts, images or videos.
4) Body language, which stands for the omnipresent temporal and spatial distribution of the body (Morrell 2015), including facial expressions of the speaker.

It emerges that conference presentations, particularly those in the biomedical

field, have complex multimodal semiotics. A useful concept to navigate through the multimodal structure of conference presentations is that of *semiotic spanning* (Ventola 2002), i.e. the switching of modes between various sections or moves (Swales 1990) of the presentation, further developed by Charles and Ventola (2002) in their analysis of video-recordings of conference presentations. This concept is used here to analyze how the unfolding of a video-recorded PowerPoint presentation provides adaptive choices for integrating different modes, such as reading written text on a slide, listening to a commentary on a pictorial slideshow, watching the presenter, etc. In terms of the analytical possibilities of such complex materials, Bateman *et al*. (2017, p. 221) emphasize the need to apply a so-called selective perceptual *slicing*, i.e. to focus on separate aspects of a given multimodal artefact. Such artefacts are described using the concept of *canvas*, i.e. "anything where we can inscribe material regularities that may then be perceived and taken up in interpretation" (Bateman *et al*. 2017, p. 87). Bateman *et al*. (2017, p. 215) posit that actions are unfolding within different canvases, "each of which would then support its own idea of multimodal investigation" (Bateman *et al*. 2017, p. 216); hence, despite a myriad of different perspectives (and opportunities) for multimodal analysis, it is important to adopt a selective approach. Following Bateman *et al*. (2017), this paper will focus predominantly on the interaction between various modes within the canvas of conference presentation. Space limitations do not allow to adopt a detailed slicing into sub-canvases of images or film which in themselves would be worth a separate investigation; however, mention will be made of these slices, where possible and relevant to the general discussion.

Finally, as all talks were centered around a PowerPoint presentation, I draw on Rowley-Jolivet's (2002) classification of PowerPoint slides into graphical, figurative, scriptural and numerical. In her taxonomy, graphical slides are juxtaposed to figurative slides by their semantic charge: graphical visuals are monosemic, whereas figurative visuals are polysemic. In graphical slides – containing graphs, diagrams and maps – every element has a definite meaning fixed in advance, whereas in figurative visuals – such as photographs, X-rays, scans, MRI - "the different visual components are open to several interpretations" (Rowley-Jolivet 2002, p. 27). Slides featuring scriptural visuals, according to Rowley-Jolivet (2002, p. 27), are text visuals that serve various pragmatic and interactive functions, such as presenting the plan of the talk or the summary of the main conclusions. They "act as a form of textual metadiscourse which '[organizes] propositional information in ways that will be coherent for a particular audience and appropriate for a given purpose' (Hyland 1997, p. 7)" (Rowley-Jolivet 2002, p. 31). I do not treat slides with bullet-points as pictorial in this paper, but as textual slides that activate the paralinguistic features of the written mode. However, if

textual data are organized in graphical objects, such as tables or shapes, then I classify such frames as scripturals. Finally, there are numerical visuals that stand for mathematical formulae and numerical tables. Hybrid visuals are possible, too, for example, combining in one frame both graphical and figurative visuals, or figurative and scriptural elements.

3. Materials and study design

The possibility of editing the human genome has opened a large-scale public discussion, gathering together scientists, bioethicists, legal professionals and sociologists. In December 2015, an International Summit on Human Gene Editing was held in Washington D.C, with a view to creating a forum for discussion and dissemination of this information. As the international scientific community strived to disseminate this novel information to a vast public, the summit organizers employed a wide range of digital communication means. The summit featured a variety of conference paper presentations delivered by scientists (genetics, biomedicine) and academics (history, philosophy, ethics, law) for scientists and academics (the so-called intra- and inter-specialist communication) and for a wider public, i.e. with dissemination purposes. The digital communication of the event resulted in the creation of a specialized website presenting information through papers, conference proceedings, PowerPoint presentations and videos.

	Type of presenter	n. people	n. videos	n. slides	n. papers
DAY 1	moderators	4	4	1	2
	speakers	15	15	12	5
	discussants	5	5	3	1
	total	24	24	16	8
DAY 2	moderators	5	5	1	0
	speakers	20	20	15	2
	discussants	2	2	1	0
	total	27	27	17	2
DAY 3	moderators	2	2	0	0
	speakers	7	7	7	2
	discussants	0	0	0	0
	total	9	9	9	2
TOTAL		60	60	42	12

Table 1
Materials available from the Summit's website.

The data available on the Summit's website comprise 60 video recordings of 15-30 minutes each, 42 PowerPoint presentations and 12 commissioned papers (see Table 1). In other words, conference presentations delivered at the Summit are available through the video canvas in 100% of cases, through slides in 70% of cases and through papers in 20% of cases. The data shows

that the Summit organizers relied on different semiotic codes for the dissemination of knowledge on human gene editing, yet a strong preference of the audiovisual canvas of video recording is evident.

Driven by the data available, this study aims to assess how different semiotic codes interact in the resulting multimodal artefact, and, specifically, how video recording of conference presentations contributes to the dissemination of scientific knowledge on human gene editing in slides and papers.

In order to answer these research questions, I downsampled the materials and selected for further analysis eight talks from different days. The downsampled corpus consists of eight videos for a total of 172 minutes, eight slide shows totaling 201 frames and seven papers with 18,391 words (Table 2). The latter contain text only, and no images, and generally do not follow the structure of a classical research article with subdivisions into Introduction – Method – Research – Discussion (Swales 2004). The commissioned papers, as it emerged from the close reading and comparison with videos, represent polished versions of talks delivered at the Summit, with the exception of one paper, where the author submitted a similar paper originally published elsewhere. Consequently, deletions and omissions – and generally any divergences between the commissioned papers and video transcripts are particularly interesting.

Slides	8 PowerPoint presentations	201 frames
Commissioned papers	7 papers	18,391 words
Videos	8 videos	172 minutes

Table 2
Corpus composition.

In the downsampled selection, attention was paid to maintaining the heterogeneous composition of Summit speakers in terms of their native or non-native command of the Summit language (English) and in terms of their gender. The downsampled talks[2] were delivered by two non-native speakers of English (one of French origin and one of German origin) and six native speakers of English (1 UK, 5 USA). Four speakers were male (3 native and 1 non-native) and four speakers were female (3 native and 1 non-native). As previous research suggested that the domain or discipline might exert some influence on the use of visuals (see previous section), the talks downsampled

[2] International Summit on Human Gene Editing. http://nationalacademies.org/gene-editing/Gene-Edit-Summit/. Reproduced with permission from the National Academy of Sciences, Courtesy of the National Academies Press, Washington, D.C.

were chosen from different domains. Five presentations were chosen from the scientific domain (biomedical-genetic) and three presentations were selected from other domains: one historical, one legal and one societal.

With a view to unveiling the multimodal interplay and meaning-making strategies in the artefacts, the analysis follows a bottom-up approach, starting from close reading of texts and a social semiotic close reading of multimodal artefacts (slides and videos). In order to facilitate the comparison between different semiotic codes, videos were partially transcribed and manually annotated to mark correspondences and divergences.

4. Findings and discussion

The structure of conference presentations analyzed follows a standard pattern, composed of

a) expressing gratitude to the organizers and acknowledgments (if any);
b) contextualization, consisting in putting one's work against the general conference background;
c) paper delivery, following the traditional IMRD structure (Introduction – Method – Results – Discussion; Swales 1990) in most cases;
d) thanking the audience at the end.

Interestingly, because of the montage, the focus shifts to different positions and shooting angles throughout the presentation. Different shooting angles show different information to the viewers. As Figure 1 shows, the initial move of thanks and acknowledgments is shot using a so-called long shot, when the camera takes the whole stage, showing the speaker(s), the slides and any co-speakers if it is a panel discussion. Alternatively, a master shot is used, which provides a closer yet still general picture, showing the stage and everyone on it. During the contextualization phase master shot changes into a close-up on the speaker, where the camera zooms on his/her bust, typically showing the speaker from head to waist. Close-ups are also used during the conclusions part and finally for thanking the audience.

Remarkably, the central part of the presentation offers a hybrid solution, alternating camera angles between close-ups on the speaker and zooming on the slides. Whenever the speaker is visible, the online viewer cannot see the slides and whenever the slides are shown the viewer can only hear the speaker's voice without seeing him or her. In the latter mode, the video resembles the genre of soundslide (Engebretsen 2014), which features a combination of a slideshow with a voiceover.

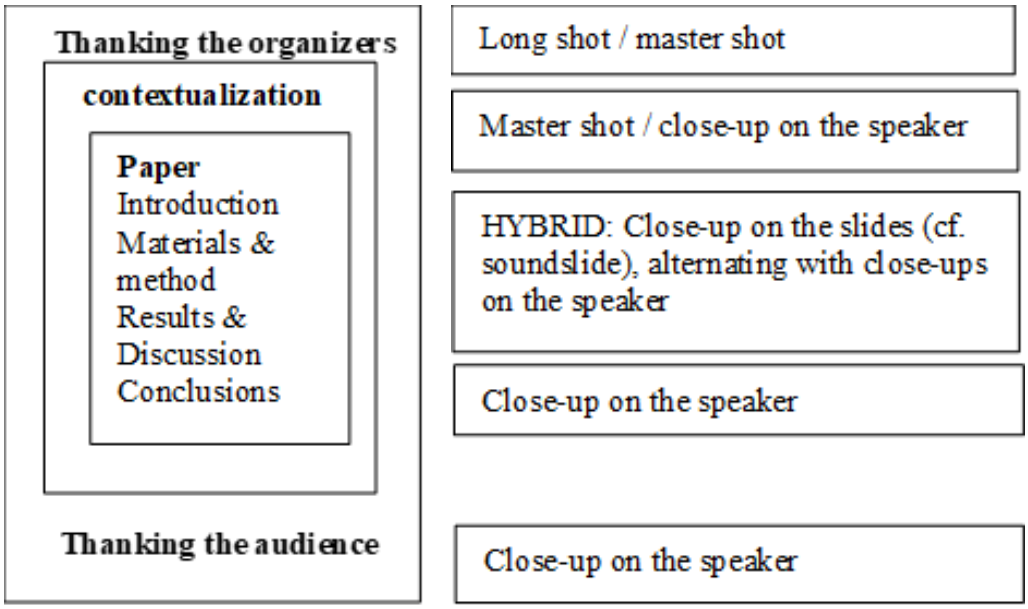

Figure 1
Generic structure of conference presentations and video recording.

Through cross-cutting between different camera angles without the possibility of maintaining both aspects, the video producers decide for the online viewer what mode should prevail and what kind of information is more important. This differs from the real life experience of the conference attendees, who make this decision on their own. It seems advisable to address this dichotomy for future productions of this type to increase the informational potential of multimodal meaning making in the video materials produced. Currently, the online viewer, who could be a lay person in need of clear and structured information, would be forced to look for supplementary data in other documents – papers and slides – uploaded to the Summit's website. The following sections address what data are available in different documents (videos, slides and papers) and how they are communicated from a comparative point of view.

4.1. Thanks and acknowledgments

Expressing gratitude and acknowledgments to the organizers is the expected politeness move at the beginning of scientific conferences. However, besides the conference etiquette, it conveys important information by establishing the interpersonal meaning in the SFL sense. This initial move shows the closeness or distance between the organizers and the speaker. For instance, in (1) the speaker refers to the members of the organizing committee by their first names, indicating a potentially close relationship with them. Similarly, in

(2) the speaker identifies himself as a member of the organizing committee during the thanks and acknowledgments stage.

> (1) [looks at the audience] It's an honour for me to start this session by talking about [looks at the screen to his right, with the title of his presentation] this subject. It was given to me by [while speaking, finds the clicker] David Baltimore and Ann Marie.
>
> (2) [looking at the notes] So, I am going to introduce our last speaker, which is me [looks at the audience, half-smile]. I am Eric Lander, I'm a member of the Organizing Committee, so I get to introduce myself. [looks at the audience; some people laugh] But I do want to thank other members of the Organizing Committee and our chair David Baltimore for all of the work he has done for this meeting and for a great set of sessions today.

In contrast to the last move – thanking the audience at the end – which meets the politeness requirements and marks the end of the talk, the interpersonal data of the initial acknowledgments stage may translate into a greater or lesser degree of trust towards the contents of the presentation. The online public, including the journalists who might want to quote some of the scientists when covering the event, will presumably rely on the sources that are "accredited" by their close link to the scientific community (Nobel Laureates, such as David Baltimore) and to the organizing committee. All talks in question start with this move, which is present in videos only, without any mention in papers or slides, thus confirming that the audiovisual canvas effectively conveys additional data in this part of the presentation.

4.2. Contextualization

Contextualization is the second move identified in all talks analyzed. It is used to put one's talk against the general context of the Summit, foregrounding relevant links to other talks and legitimizing one's work. Contextualization is typically achieved multimodally in this corpus and through a variety of canvases. In videos, contextualization is realized through the spoken mode, with emphasis given by means of voice and body language. The speakers usually make verbal (by such contextualization cues as "here", "this", etc.) or non-verbal (hand gestures) reference to slides. The frames at this stage are typically textual, where the cover slide with the talk's title is shown (see (3a) and (3b)).

> (3a) Human interest in genetic improvement has a very long history. For example, in the *Book of Genesis in the Bible* there is a reference to […] [Paper]

> (3b) It was given to me by [while speaking, finds the clicker] David Baltimore and Ann Marie. They didn't specifically say [points the clicker and looks at the big screen] from *biblical times*, [looks down to his notes] but that is where, where the things started [looks up to the screen, clicks, slide changes – "*Book of Genesis"* written on the slide] [video]

Contextualization is found also in commissioned papers; however, it is significantly reduced in comparison with the video (see (4a) and (4b), where the coinciding information is italicized).

> (4a) My assignment today from the organizing committee is *to look at the genetic basis of human disease and to ask how does it inform our thinking about germline editing*. [Paper]

> (4b) I am gonna wrap up today by just providing scientific background which could be used in some of the discussions over the next two days. So… I am gonna… [speaks quickly] as member of the Organizing Committee, not attempt to take any policy position. [looks at the audience from right to left]. We've heard a lot of really thoughtful and diverse policy positions But I'd really like to *look at the genetic basis of human disease*. And I ask: *how does it inform our thinking with respect to human germline editing?*... I'll just dive right in… Sorry, I need that [takes and tries the clicker]. [Video]

In terms of semiotic spanning, at the contextualization stage several modes of information transmission are activated. These include the spoken mode, both linguistic (the actual words) and paralinguistic (voice modulation), the written mode, both linguistic (written on the slide) and paralinguistic (writing appears simultaneously with speech), the non-verbal mode, including body language (looking at the screen, hand gestures, using and referring to the use of the clicker), voice modulation and the visual support of the slides. As the contextualization stage is quite brief, typically all these modes are activated simultaneously.

As it emerges from the comparison between the papers and the transcript of the respective videos, (see (3a) and (3b), (4a) and (4b)), contextualization has a more prominent role in oral conference presentation than in the written text. It seems to belong to the conference "buzz" (Swales 2004, p. 197), i.e. those implicit rules that govern scientific conferences. Interestingly, the speakers felt confident in saying what they said during the conference presentation, yet they chose to omit or significantly reduce contextual information in the commissioned papers, probably because the mere inclusion of such papers in conference proceedings served the contextualization function.

4.3. Paper delivery

While acknowledgments and contextualization represent the fringes of a conference presentation, paper delivery is at its core. In all cases under analysis speakers made use of slides to deliver their talks. Consequently, the slides permanently accompanied the speaker's monologue. In contrast to the purely textual commissioned papers, slides exploited different semiotic codes and spatio-temporal organization of data.

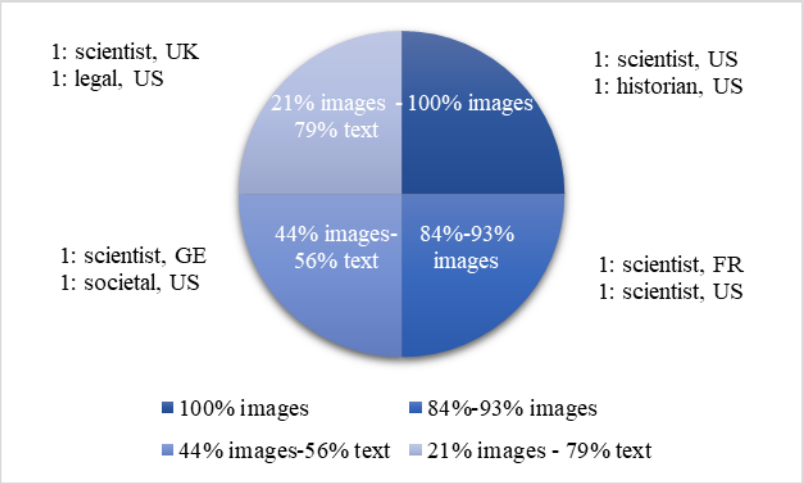

Figure 2
The use of verbal and pictorial materials in the slides.

Figure 2 shows the distribution between pictorial and textual slides, indicating the speaker's background aside. It emerges that in 50% of cases analyzed, the visual composition prevailed over the textual one, with 84% to 100% of slides being images (including all pictorial frames; for the distinction between different frame types, see Table 3 below). The prevalence of visual frames over the textual ones could be tentatively explained by the domain-specificity of presentations, confirming the hypothesis that presentations belonging to different domains or disciplines exhibit a different text-image balance. Three of these presentations were delivered by scientists-geneticists and one by a historian. The latter talked about eugenics and showed images referring to the early 20th century when the eugenics movement was active. The images used by the historian were all of the figurative type and offered an illustration rather than a different knowledge structure, whereas scientists used graphical, figurative and hybrid frames, relying on a different knowledge structure. Three were native speakers of English (US) and one was a non-native speaker of French origin with an excellent command of English. Rowley-Jolivet (2002, p. 38) stated that "[t]he English language is not the only international 'language' of science: the visual mode of discourse also fulfils this role". This statement applies to this

corpus, too, as most scientists relied heavily on visual modes of knowledge dissemination. This tentatively confirms previous research on the dominant character of visualization in scientific intra-specialist communication.

In a quarter of the cases analyzed the distribution between images and text was almost equal, with a slight predominance of the textual "slice". These speakers were a non-native scientist of German origin with a good command of English, and the only non-academic in the sample: the chairwoman of an association for people with rare genetic diseases, advocating their point of view on the possibilities to treat such diseases with gene editing. The former seemed to rely on the textual slides due to some language-related constraints, and the latter reported on a survey, which envisages the use of the verbal mode. As concerns semiotic spanning, these speakers, especially the scientist, used different modes consecutively: first reading the texts on the slides, and then showing an image. Typically, if the image required extensive commentary, the camera showed the speaker, who commented on it using simultaneously the spoken mode, body language and voice modulation.

Only two speakers opted for the predominantly textual format of their presentations. The first was a scientist from the UK, who acted as a moderator of a panel discussion and read out statements (verbal mode, written on the slides, 79% textual frames and 21% figurative-scriptural) by other discussants. The second was a lawyer from the US, who compared legislative situations across various countries with regard to gene editing (62% textual frames; 15% graphical frames; 23% figurative or figurative-scriptural frames). Although she did not read the text on the slides, but commented on them, the slides themselves had to be textual in light of the data discussed. It has to be specified that those slides that used the verbal channel, through a combination of the written and the spoken modes, conveyed additional information exploiting the semiotic possibilities of spatio-temporal visual composition of the slide (e.g. bullets popping up, organization in tables or columns) and used colour coding to underline the most important items. Although Rowley-Jolivet (2002) defines such slides "scriptural" or "text visuals", in this paper I treat them as textual, acknowledging that they perform a range of pragmatic functions and pursue interactive or organizational purposes, and call "scriptural" only those slides that contain text in graphical shapes. Had I adopted fully Rowley-Jolivet's (2002) classification, all frames in the sample would have been classified as pictorial.

The prevalence of pictorial representations of knowledge in biomedical speeches in this corpus confirms earlier findings (Dubois 1980; Moreno, Mayer 2007; Rowley-Jolivet 2012; Morrell 2015). However, the knowledge dissemination potential of pictorial slides alone is quite limited, as graphs and

images used by scientists have to be explained to a non-specialist public in order to be understood. Table 3 below shows different types of frames in the PowerPoint presentations analyzed. Cover frames and end frames containing contact information, if any, were discarded for this part of the analysis.

Type of frame	No. of frames	% out of total
textual	62	32%
graphical	66	35%
figurative	39	20%
graphical-figurative	8	4%
figurative-scriptural	6	3%
scriptural	9	5%
numerical	1	1%
total	191	100%

Table 3
Types of frames in the PowerPoint presentations analyzed.

Figurative frames, although undoubtedly bestowed with some iconographic value, functioned predominantly as attention-drawing devices. In fact, often they were used to mark various presentation's parts together with a short heading. In this study figurative frames are understood as those containing a photograph and a slide title, if any. If any further text is added, such slides are categorized as figurative-scriptural. In reality, the number of figurative slides was slightly skewed because one speaker – the historian – used only this type of frame in his presentation. Otherwise, figurative frames would have accounted for 8% only of all frames, and this number would have corresponded to their function: marking various presentation parts, where they were used to signal the beginning of a new subtopic.

Frames with a graphical element were categorized as such independently of a textual legend present on the slide. These were the most widespread category and the most enigmatic from the layman's standpoint, as they typically conveyed highly specialized knowledge. Consequently, graphical frames required a verbal explanation. The commissioned papers, peculiarly, did not contain any pictorial elements; therefore, it was challenging to draw a parallel between what was depicted on a slide and what was written in a paper.

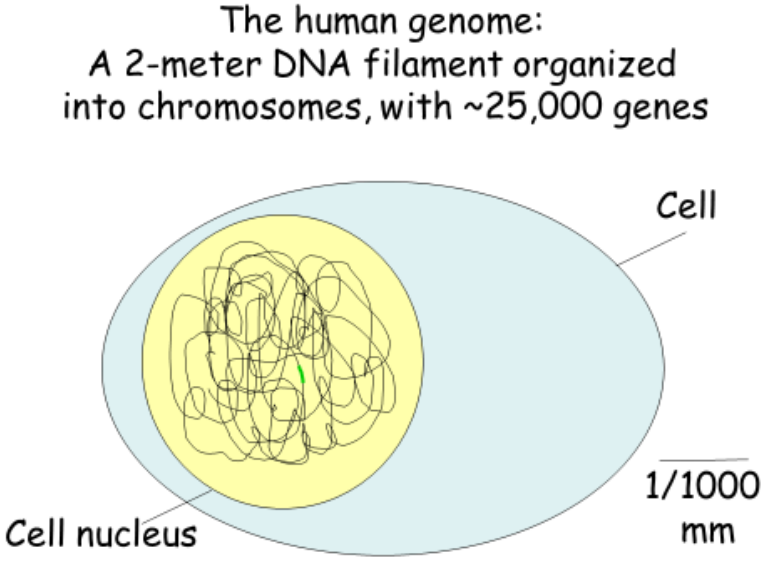

Figure 3
Example of the missing correspondences between the slides and the paper.

For instance, the graphical frame in Figure 3 does not find a straightforward correspondence and explanation in a paper. While it is quite easy to understand that the image represents a cell and a cell nucleus, the relationship between them, the human DNA filaments and changes introduced by gene editing remain unclear. The paper does not provide an explanation (5a), which could be easily understood by the lay public, stating merely that these are some basic notions of genetics and repeating the legend written on the slide (in italics). In other words, the expectation that "the accompanying verbal text explains what is not made clear visually" (Kress, van Leuween 2006, p. 61) is not met in the written text. By contrast, the video (5b), which shows just the slide and functions thus as a soundslide at that particular moment, adds a crucial element for the decoding of this specialized item: it explains that the DNA filament is situated within the cell nucleus and indicates – using the pointer – where the segment to be modified is placed (underlined). Consequently, the conference presentation genre – here more closely represented by the video recording – tends to have a higher popularization and dissemination potential than the paper or the standalone slides. This dissemination purpose is stressed by the speaker himself (5b in bold).

(5a) I want to review some of its basics. *The human genome is a 2-meter DNA filament organized into chromosomes* in the cell nucleus and encoding about *25,000 genes*. [Paper]

(5b) Now **I was told to talk to lay people**, so I apologize to the experts here, but I will be, **I'll try to very simply explain** some of the things we have just

> discussed. This is a cell, with a, with a nucleus that is of this size. In the nucleus [th th th th th,] *the DNA filament organized in chromosomes with about 25,000 genes* aligned on this filament. And here's one of those genes which we want to modify. [Video]

Remarkably, albeit 100% of presentations delivered at the Summit were available as recorded webcast, the videos alternated between the recording of the speaker and the soundslide format. Both regimes are multimodal: the former activates only the body language mode and the spoken mode, and the latter activates the spoken mode (a voiceover explaining slides under the form of the speaker's monologue) and either the visual or the written mode of data presentation on the slides. The soundslide allows the viewer to listen to the explanation in simpler terms and to look at the pictorial / textual slide simultaneously; however, it deprives the viewer from perceiving additional meanings, typically conveyed by the speaker's body language.

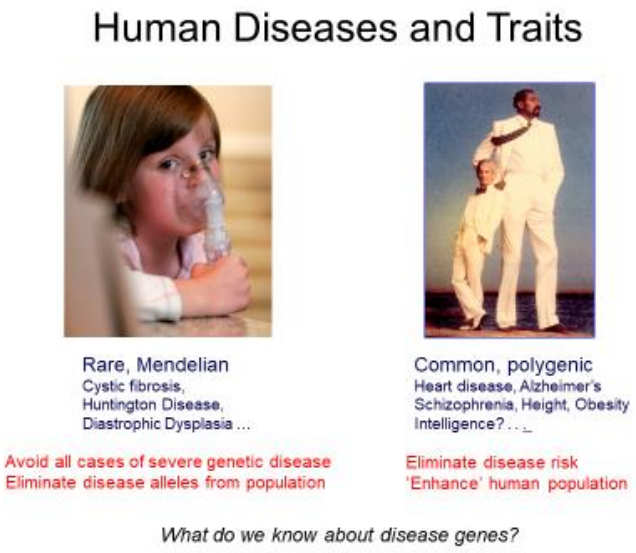

Figure 4
Slide that explains the differences between different genetic diseases.

Figure 4 above shows the slide "Human Diseases and Traits" from one of the scientific talks delivered at the Summit. The frame is classified as figurative-scriptural because it contains two photographs meant to illustrate "Rare, Mendelian" and "Common, Polygenic" diseases and lists of examples below with different colour-coding. This slide was projected for three and a half minutes, as the speaker explained its meaning. In the video, after a minute and ten seconds showing just the slide with a voiceover explaining the former category of genetic diseases, the camera shifted towards the speaker for the explanation of the second category – common polygenic diseases. Examples (6a) and (6b) below refer to the explanation of this category in the paper and

in the video. As can be seen, the paper (6a) presents the list of diseases from the slide and a commentary (italicized).

> (6a) Second, we have a large number of common diseases, which are, for the most part, polygenic. These include heart disease, Alzheimer's disease, and schizophrenia. *We have identified genetic factors that play a role in these conditions, but each is only one of many factors that contribute to these conditions, and they are by no means determinative. There is a locus that has a significant effect, although by no means determinative, of Alzheimer's*. [Paper]

> (6b) They're just the opposite of the rare Mendelian inheritance pattern [rhythm as if dictating, gesture as if drawing the pattern] that you've learned about in high school. [hand in the air, looks above the glasses at the audience]. Heart disease [hand up to stress, rise-fall pitch] falls into that category [looks down at his notes] Alzheimer's disease [again at the public, stress] There is all [hand gesture] locus that has a significant factor, but by no means [looks at the audience from right to left, then to the center] determinative of Alzeheimer's. And then [hand gesture to indicate continuation of the list] a bunch of other things [hand up with fingers moving like a crawling spider], a long tail. *Schizophrenia that clearly [rising pitch, inverted commas sign with a hand, raising eyebrows] "runs in families", but does not Mendelize in any particular way.* [Speech]

In the video, however, extra information is conveyed through the body language of the speaker, in addition to his voice modulation. When the speaker explains that polygenic diseases are the opposite of the rare Mendelian diseases, he uses a dictating voice and a gesture imitating drawing the pattern on a blackboard to stress the idea that this knowledge is basic, the one that "you've learned about in high school" (6b). He uses further on a rise-fall pitch that indicates a continuation of the list of diseases, stressing this idea with a hand gesture. However, the real difference between the slides, the paper and the video commentary showing the speaker can be perceived looking at the segment italicized in (6b). All three documents mention schizophrenia among common polygenic diseases. The slides mention it as part of the list, and the paper provides a brief commentary. However, only in the video can we see the speaker's attitude towards information available about the disease and, consequently, possibilities to treat it with gene editing: he makes a sign of inverted commas with his hands when saying that schizophrenia "runs in families", raises his eyebrows and his tone to stress the impossibility to apply gene editing to this disease. All this information is not present in the slides or in the paper.

5. Conclusions

The analysis confirmed the shift from the textual monomodal communication of science to the prevalently audiovisual and multimodal knowledge dissemination effort during the International Summit on Human Gene Editing, with 70% of all slides and 100% of all videos rendered available to the public at large compared to only 20% of commissioned papers. As a result, the video recording of conference presentations confirmed to be the "most inclusive canvas" (Bateman *et al*. 2017, p. 214) to represent and spread knowledge on gene editing, with the canvases of slides and papers embedded in it. The semiotic spanning between different modes occurred simultaneously in 75% of downsampled cases, while in the rest of the sample different modes were used consecutively, e.g. first the text was read, then an image was shown, then it was commented using the possibilities of body language and voice modulation.

Remarkably, interpersonal information contributing to the popularization purposes appeared mainly in the videos. The speakers shifted tenor in order to attribute different interpersonal meaning to their statements, and this information was accessible through the video canvas solely. Surprisingly, interpersonal markers were often absent from the commissioned papers, when compared to the transcript of the video. This effectively reduced the disseminating and popularizing potential of papers. In addition, no images were present in the papers to illustrate the abstract concepts discussed. One can hypothesize thus that the papers did not pursue popularization goals, but rather were meant for inter-specialist discussion. Similarly, the PowerPoint slides, especially those dealing with topics of genetics and biomedicine, were not readily comprehensible to an outsider on account of their pictorial nature. The graphical slide frames conveying specialized meanings using graphs, maps and diagrams often required extensive verbal comment to decipher the pictorial content and to enable the participation in the discussion of lay public and specialists from other fields.

In general, attempts to get information on the Summit only through PowerPoint slides (predominantly visual canvas for scientific slides) or only through papers (textual canvas), without the combined multimodal input of videos would leave the online user with many details unclear for a layperson. This stresses the importance of multimodal communication of science relying on multiple semiotic codes and their simultaneous or consecutive spanning.

As such, audiovisual communication of specialized knowledge seems to take on great prominence in international science conferences – and, in general, in the dissemination of scientific knowledge – on account of its versatility and all-encompassing nature. This multimodal way of communication is particularly well suited for linguistically and scientifically

heterogeneous global audience. However, the videos manifested a limit as they gave the online viewers no possibility to watch the speaker and the slides simultaneously. It is advisable to address this limitation for the next summit editions. Further research into the combination of verbal (spoken and written), pictorial, non-verbal (kinesics) and paraverbal (intonation, voice) elements will help evaluate how these multimodal resources enhance the dissemination of scientific knowledge.

Bionote: Jekaterina Nikitina holds a PhD degree in "Linguistic, literary and intercultural studies in European and extra-European perspectives", received in 2017 from the University of Milan. Currently, she is a Research Fellow at the Saint Camillus International University of Health and Medical Sciences (UniCamillus, Rome), where she lectures in Scientific English. Her academic interests include specialized discourse and translation studies, with a particular insight into specialized phraseology and its translation in the legal and bioethical contexts. Her recent research revolves around LSP theories and applications, knowledge dissemination dynamics, legal discourse, discourse of healthcare, medicine and bioethics, with application of qualitative and quantitative, specifically corpus linguistics, analytical approaches. Her published academic work includes publications on legal translation, dissemination of bioethical knowledge, popularization of scientific topics through a range of channels, with a focus on medically assisted procreation and gene editing.

Author's address: Jekaterina.nikitina@unicamillus.org

References

Baldry A. and Thibault P. 2005, *Multimodal Transcription and Text Analysis: A Multimedia Toolkit and Coursebook*, Equinox, London.

Bateman J.A. 2008, *Multimodality and Genre: A Foundation for the Systematic Analysis of Multimodal Documents*, Palgrave Macmillan, London.

Bateman J.A. 2011, *The Decomposability of Semiotic Modes*, in O'Halloran K. and Smith B. (eds.), *Multimodal Studies: Multiple Approaches and Domains*, Routledge, London, pp. 17-38.

Bateman J.A., Wildfeuer J., Hiippala T. 2017, *Multimodality: Foundations, Research and Analysis – A Problem-Oriented Introduction*, de Gruyter Mouton, Berlin.

Bezemer J. and Kress G. 2016, *The textbook in a changing multimodal landscape*, in Klug N.-M. and Stöckl H. (eds.), *Hanbuch Sprache im multimodalen Kontext*, de Gruyter Mouton, Berlin-Boston, pp. 476-498.

Bucher H.-J. and Niemann P. 2012, *Visualizing science. The reception of PowerPoint presentations*, in "Visual Communication" 11 [3], pp. 283-306.

Calsamiglia H. and van Dijk T. 2004, *Popularization discourse and knowledge about genome*, in "Discourse and Society" 15 [4], pp. 369-389.

Carter-Thomas S. and Rowley-Jolivet E. 2003, *Analysing the scientific conference presentation (CP), A methodological overview of a multimodal genre*, in "Asp" 39-40, pp. 1-20.

Charles C. and Ventola E. 2002, *A multi-semiotic genre: The conference slide show*, in Ventola E., Shalom C. and Thompson S. (eds.), *The Language of Conferencing*, Peter Lang, Frankfurt, pp. 169-210.

Dubois B.L. 1980, *The use of slides in bio-medical speeches*, in "English for Specific Purposes" 1, pp. 45-50.

Engebretsen M. 2014, *The soundslide report: Innovative journalism or misplaced works of art?*, in "NORDICOM Review: Nordic Research on Media and Communication" 35 [1], pp. 99-113.

Forceville C. 2014, *Relevance Theory as model for analysing visual and multimodal communication*, in Machin D. (ed.), *Visual Communication*, de Gruyter Mouton, Berlin, pp. 51-70.

Halliday M.A.K. 1994 [1985], *An Introduction to Functional Grammar, Second Edition*, Edward Arnold, London.

Hiippala T. 2015, *The Structure of Multimodal Documents: An Empirical Approach*, Routledge, London.

International Summit on Human Gene Editing. http://nationalacademies.org/gene-editing/Gene-Edit-Summit/. Reproduced with permission from the National Academy of Sciences, Courtesy of the National Academies Press, Washington, D.C.

Jewitt C. 2014, *Different approaches to multimodality*, in Jewitt C. (ed.), *The Routledge Handbook of Multimodal Analysis*, Routledge, London, pp. 31-43.

Kress G. 2009, *Multimodality: a Social Semiotic Approach to Contemporary Communication*, Routledge, London.

Kress G. 2014, *What is mode?*, in Jewitt C. (ed.), *The Routledge Handbook of Multimodal Analysis*, Routledge, London, pp. 60-75.

Kress G. and van Leeuwen T. 2006, *Reading images. The Grammar of Visual Design*, Routledge, London.

Lynch T. 2011, *Academic listening in the 21st century: Reviewing a decade of research*, in

"Journal of English for Academic Purposes" 10 [2], pp. 79-88.
Mattiello E. 2019, *"Designer Babies" and "Playing God": Metaphor, Genome Editing, and Bioethics in Popular Science Texts*, in "Languages, Cultures, Mediation" 6, pp. 65-88.
Morell T. 2015, *International conference paper presentations: A multimodal analysis to determine effectiveness*, in "English for Specific Purposes" 37, pp. 137-150.
Moreno R. and Mayer R. 2007, *Interactive multimodal learning environments*, in "Educational Psychology Review" 19, pp. 309-326.
Nelkin D. 1994, *Promotional metaphors and their popular appeal*, in "Public Understanding of Science" 3 [1], pp. 25-31.
Nelkin D. 2001, *Molecular metaphors: the gene in popular discourse*, in "Nature Reviews Genetics" 2 [7], pp. 555-559.
Nikitina J. 2019, *Representing Gene-Editing in Newspapers: between Science Dissemination and Fantasy*, in Garzone G., Doerr R. and De Riso G. (eds.) *Representing, Disseminating, and Debating Controversial Bioethical Issues in Literature and Popularised Discourse*, Special issue of "Anglistica AION" 23 [1], pp. 43-57.
O'Keefe M. *et al*. 2015, *"Editing" Genes: A Case Study About How Language Matters in Bioethics*, in "The American Journal of Bioethics" 15 [12], pp. 3-10.
Petersen A. 2001, *Biofantasies: Genetics and medicine in the print news media*, in "Social Science and Medicine" 52 [8], pp. 1255-1268.
Pramling N. and Säljö R. 2007, *Scientific Knowledge, Popularisation, and the Use of Metaphors: Modern Genetics in Popular Science Magazines*, in "Scandinavian Journal of Educational Research" 51 [3], pp. 275-295.
Rowley-Jolivet E. 1999, *The pivotal role of conference papers in the network of scientific communication*, in "Asp" 23/26, pp. 179-196.
Rowley-Jolivet E. 2002, *Visual discourse in scientific conference papers: A genre based study*, in "English for Specific Purposes" 21, pp. 19-40.
Rowley-Jolivet E. 2004, *Different visions, different visuals: a social semiotic analysis of field-specific visual composition in scientific conference presentations*, in "Visual communication" 3 [2], pp. 145-175.
Rowley-Jolivet E. 2012, *Oralising text slides in scientific conference presentations: A multimodal corpus analysis*, in Boulton A., Carter-Thomas S. and Rowley-Jolivet E. (eds.), *Corpus-informed research and learning in ESP: Issues and applications*, John Benjamins, Amsterdam-Philadelphia, pp. 137-166.
Swales J. 1990, *Genre analysis: English in academic and research settings*, Cambridge University Press, Cambridge.
Swales J. 2004, *Research Genres: Explorations and Applications*, Cambridge University Press, Cambridge.
Turney J. 1998, *Frankenstein's footsteps: Science, genetics and popular culture*, Yale University Press, New Haven.
van Leeuwen T. 2005, *Multimodality, genre and design*, in Norris S. and Jones R.H. (eds.), *Discourse in Action: Introducing Mediated Discourse Analysis*, Routledge, London, pp. 73-94.
Ventola E. 2002, *Why and what kind of focus on conference presentations?*, in Ventola E., Shalom C. and Thompson S. (eds.), *The Language of Conferencing*, Peter Lang, Frankfurt, pp. 15-50.
Wells S. and Joly J.S. 2017, *The trouble with collective nouns for genome editing*, in "Mammalian Genome" 28 [7], pp. 365-366.