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LA RIVISTA

L'idea e l'esigenza di creare la "Rivista Italiana di Antropologia Applicata – Analisi dei Processi Socioculturali nella società contemporanea", nasce dalla necessità di rendere di facile fruizione e di ampia diffusione, i risultati delle ricerche e degli studi in ambito socioculturale. Gli studi e le ricerche non saranno però le sole pubblicazioni presenti nella Rivista; infatti, la stessa, è pensata per essere luogo di incontro e di confronto per tutti gli studiosi del settore. Si auspica che tale confronto socio-antropologico, calato in una prospettiva multidisciplinare e multifattoriale, che consente di elaborare approcci di analisi dei contesti culturali, possa essere foriero di nuove iniziative di ricerca e di studio.

Le riflessioni con i diversi specialisti del settore consentono di avanzare proposte di studio e conseguimento di risultati attraverso l'esperienza vissuta e l'interpretazionismo dell'inevitabile cambiamento della società e del rapporto che l'uomo crea, attraverso i suoi legami sociali con essa.

Il progetto scientifico si propone quindi di convergere su obiettivi strategici attraverso l'acquisizione di modelli interpretativi applicati alle realtà, ai singoli contesti, all'uomo nelle sue più totali manifestazioni sociali e culturali.

La cadenza delle uscite è semestrale, con "Numeri Speciali" pensati per divulgare i risultati raggiunti al termine dei vari progetti in atto, o in caso di particolari contingenze.
È presente, inoltre, una "Rubrica Aperta" volta ad accogliere liberi contributi di particolare rilevanza scientifica.

Il Direttore Responsabile
Prof. Simone Borile

L'EDITORIALE

Questo è il primo numero dell'Anno X della Rivista Italiana di Antropologia Applicata dedicato a *I giovani e la socialità nelle nuove piattaforme digitali.* Si tratta dell'edizione semestrale, contenente articoli su differenti temi.
Gli autori di questo numero sono:

Elisabetta di Giovanni: Professore Associato nell'Università di Palermo, dove insegna Etnostoria, Antropologia dei processi educativi e Antropologia degli artefatti. I suoi ambiti di ricerca sono l'antropologia religiosa – con particolare attenzione al pluralismo religioso e alla rifunzionalizzazione del sacro, diversità culturale e migrazioni forzate. Ha condotto un'etnografia (dal 2005 al 2010) tra le comunità rom presso il campo-ghetto di Palermo, osservando le pratiche di sopravvivenza, di mimetismo sociale nel contesto urbano e di mendicità come economia informale. Dal 2006 è coordinatore scientifico della Summer School "Migrants, Human Rights, Democracy" promossa dall'Università di Palermo, volta all'approfondimento e alla formazione post-universitaria sul tema della "crisi migratoria" contemporanea. Dal 2015 è responsabile scientifico per la Sicilia dell'Osservatorio permanente sul pluralismo religioso con il Gris (Gruppo di Ricerca e Informazione Socio-Religiosa), in collaborazione con gli atenei di Bologna, Milano Cattolica, Torino.

Elisa Pelizzari: laureata in scienze politiche all'Università di Torino ed ha conseguito un Ph.D. in antropologia sociale e etnologia all'École des Hautes Études en Sciences Sociales di Parigi. Dal 1995 dirige la casa editrice universitaria L'Harmattan Italia (Torino). Fra il 1987 e il 2022, ha condotto ricerche in Somalia, Etiopia, Kenya, Mali, Senegal e Guinea. È stata docente a contratto di "antropologia della violenza" presso il CIELS (Istituto ad Ordinamento Universitario), sedi di Milano, Mantova e Padova (2015-2018). Ha tenuto lezioni al Master di I livello "Organizzazione e gestione delle istituzioni scolastiche in contesti multiculturali" dell'Università di Firenze (2017; 2021) e al Master di I livello "Migrazioni e Inclusione: diritti, culture e processi d'integrazione" organizzato dall'Università del Molise (2019). Presso l'Unimol ha effettuato due altre missioni come docente, nel 2016 e nel 2017, intervenendo su temi antropologici attinenti ai giovani dell'Africa saheliana.

Giacomo Buoncompagni: PhD, è research fellow presso l'Università Lumsa di Roma. È docente di Sociologia del Giornalismo presso l'Università di Verona, di Potere, Informazione e Intelligence all'Università di Bologna e di Antropologia giuridica e dei processi culturali presso l'Università di Macerata. Precedentemente è stato anche docente di Politiche e misure europee contro l'estremismo all'Università di Siena e di Antropologia sociale e negoziazione di crisi al CIELS di Bologna. Nel 2019 ha vinto il Premio Pareto per la Sociologia; ha pubblicato diversi articoli e saggi sul tema dell'immigrazione, della sicurezza e dei media digitali ed è autore dei volumi "Forme di Comunicazione criminologica. Il crimine come processo comunicativo "(Aras edizioni), "Cybermigration. La dimensione digitale dell'immigrazione" (PM edizioni), "Digital Networks. Appunti di sociologia digitale" e "Infosecurity. Analisi comportamentale e sicurezza" (Postmediabooks).

Valeria Curcio: dottoranda di ricerca in 'Metodi di inclusione, mentoring e sviluppo delle competenze nei nuovi contesti del sapere e del lavoro' presso l'Università Telematica Pegaso. Sì è laureata in 'Culture e Letterature dei paesi di lingua inglese' presso l'Università 'L'Orientale di Napoli e ha un master in 'Linguaggi del turismo e comunicazione interculturale' conseguito presso l'Università di Roma Tre. Si interessa di antropologia dell'educazione e della relazione tra cittadinanza globale e educazione interculturale nei contesti di internazionalizzazione. Lavora come coordinatrice nei progetti di mobilità di breve durata, le vacanze studio, tra Londra e Barcellona, dove conduce osservazioni e ricerche sul campo.

CALL FOR PAPERS

L'uscita del secondo numero dell'Anno X della Rivista è programmata per Dicembre 2024 e avrà per titolo*: Progetti ed esperienze didattiche nell'ambito del multiculturalismo.*
Il termine ultimo per la consegna dei contributi viene fissato per il 18 Novembre.

The release of the first issue of the Year XI of the Journal is scheduled for December 2024 and will be entitled: *Projects and educational experiences in the field of multiculturalism*
The deadline for submitting contributions is 2024, November 18th.

Attendiamo i vostri contributi.
Buon lavoro

Il Direttore Responsabile
Prof. Simone Borile

RIVISTA ITALIANA DI ANTROPOLOGIA APPLICATA

Diretta da Simone Borile

Numero I – Giugno 2024

A cura di Simone Borile

Indice

SCIENCE COMMUNICATION. SCIENTIFIC EXPERTISE AND NEW PUBLIC

Giacomo Buoncompagni

Abstract: *The practice of communicating science to the public of 'non-experts' has a much longer history than its theoretical and empirical research. In fact, the first academic journal devoted to this topic was founded only in 1992 and was called Public Understanding of Science (Bucchi, 2008). On the other hand, if we think back to the publication of various popularisation books in the eighteenth century, the reports of various scientific discoveries in the daily press, and the exhibitions and fairs where all the advances in science were displayed, we can understand that the communication of scientific results to the public is an activity that is really far removed from the past.*

Keywords: science; communication; crisis of expertise; media; journalism; trust

Introduction

There are many areas in which communication is developing at the moment, but there is one that has been considered fundamental for addressing the public, especially in recent years, with the emergence of the pandemic caused by the SARS-CoV2 virus and the alarm that has accompanied it: scientific communication.

Never before have professionals been so aware of the importance of scientific communication that is not only efficient but, above all, effective, leading the public to trust the world of research, which, due to its constant evolution, is often viewed from the outside with fear, without understanding the processes. In this paper, therefore, we will not only talk about science, but above all about scientific communication and its evolution, also in the light of the democratisation of the knowledge society.

In particular, the aim of the paper will be to understand the ongoing expansion of scientific communication towards multi-channel communication models, aimed at increasingly diverse audiences to be addressed and involved.

However, we cannot talk about scientific communication without mentioning the two models on which it has been based for years: the Public Understanding of Science (PUS), born in 1929, and the Public Engagement with Science and Technology (PEST), developed by British scientists since the 2000s. This change in the communication model involves greater attention to the general public, which is beginning to become the new reference point for scientists and science professionals.

We will analyse the reasons leading to this new communication model until we understand why public communication of science is beginning to become a necessity for people.

Furthermore, with the crisis of the deficient model of PUS, we realise that it is no longer enough to simply transfer information to the so-called "non-experts", but it becomes necessary to consider a new form of science communication, this time involving the real participation of the public.

1.An evolving 'field'

Over the years, science steeped in discoveries became more and more complicated, indeed, excessively complicated to be understood by a large and heterogeneous public, especially in the early 20th century with the developments in physics. To better understand how people were struggling to understand science and the new scientific discoveries in 1919, on the occasion of the confirmation of Einstein's theory of relativity, the New York Times newspaper gave prominence to a similar comment by Einstein: 'In the world, there are not more than a dozen people capable of understanding my theory' (Pais, 1982). Faced with such complexity in content, the need for mediation between scientists, the holders of knowledge, and the general public arises.

This is how science journalists, popularisers, but also museums and citadels of science began to establish themselves, all with one shared responsibility: to disseminate the progress of science and to do so in a simple way, as Bucchi says, through the "metaphor of linguistic translation" (Bucchi, 2008, p.378).

It is clear that this 'diffusionist' model is profoundly simplistic in that it seems that to effectively convey a concept to the public it is enough to simply transport it from a specialised to a popularised context. This view derives from the ideologies of two categories of actors involved in this communicative process: on the one hand, the 'mediators', the popularisers and science journalists who

are the most obvious component in the mediation, and on the other hand, the scientists who define themselves as totally uninvolved in the public communication process and therefore - especially in the past - often critical of it.

The media are beginning to be perceived as channels of distortion or entertainment rather than the dissemination of science, even as a "dirty mirror, an opaque lens that is unable to adequately reflect and filter scientific content" (Bucchi, 2008:378). This consideration of the media as inadequate and approximate is also perceived by the public who, by being hostile towards them, struggle to understand the results of science and appreciate them.

This way of communicating science therefore has major limitations and shortcomings, which is why it is referred to as the 'deficit model', a model that lacks something, first and foremost interaction with the public, which is regarded as a group of 'non-experts', i.e. a homogeneous block of people who are ignorant and disinterested in the subject matter in question (Bucchi, 2008). To sum up, such a model, which thus represents the traditional and 'diffusionist' conception of science, includes the following features:

1. The media are entrusted with the task of sharing scientific content, but it is realised that due to a lack of certain skills and/or other priorities (e.g. commercial interests) they are often incapable of fulfilling their task effectively;
2. The public, as stated earlier, is seen as passive, hostile to science and ignorant 'by default'. It is thought that this ignorance can be countered simply by communicating science to people in a simplified way.
3. The communication of science is seen as a simple process of 'transferring' knowledge from one subject (or group of subjects) to another, so-called knowledge translation;
4. Knowledge seems to be able to be transferred from one context (scientific community) to another (general public) without alteration.

Of the various notions described above, it is above all the second one that fully represents this deficient model. Added to this is also the fact that when the media selected scientific experts to comment on certain topics, these often did not coincide with people belonging to the actual scientific communities, but were people who were simply passionate about science and scientific phenomena. Not only that, as far as the mediators and communicators of scientific content (i.e. generalist journalists) were concerned, they often disagreed that their expectations should correspond to those of the scientists as they felt themselves to be 'spokespersons for the doubts rather than for the messages of science' (Hansen 1992; Peters 1995). Such an approach justified the communicators' attitude of indifference towards the priorities of scientific research.

Faced with an attitude such as the one just described, therefore, it was realised that the characteristics of this type of science popularisation, being ineffective, needed to be revised. It was thus decided to quantitatively increase and qualitatively improve the public communication of science. Especially since the 1980s, in fact, both public and private institutions began to launch initiatives to stimulate interest and raise public awareness of scientific topics.

This is how the so-called 'open days' began, which concerned and still concern laboratories and research institutions, but also science festivals and training courses on science journalism (Glazer 2013; Pitrelli 2021).

2. Identikit of the communication of science

The diffusionist ideology of science communication just described is based on the principle of 'transfer'. For scholars, this notion has been the dominant paradigm for describing communication for more than sixty years as it represents the transfer of knowledge from one subject or group of subjects to another subject or group of subjects (Panarese, Pievani 2018). Such communication is defined as 'successful' when the transfer of information from one party to another is successful and is therefore considered 'successful' if some of the knowledge available in the scientific community is acquired by a certain target audience.

Even this definition, however, takes for granted aspects such as the 'non-alteration of the message', which states that since the passage of knowledge from one context to another is not altered in any way, it becomes rather automatic to 'take' a concept from the scientific community and 'transport' it to the public. Another element taken for granted is the fact that the same knowledge present in different contexts is able to produce the same attitudes or even behaviour in the public (Stocking 2012).

It was in the 1950s, however, that these elements were reviewed and called into question since, precisely in these years, some research highlighted how, during the transfer of the message, certain filters such as the selective perception of media messages, the motivations of audiences and intermediaries such as opinion leaders can make this process rather selective.

Therefore, summarising what has been described so far, standard science communication includes the following aspects:

- The lack of linearity in communicative processes; science communication does not always develop from specialised contexts rather, on the contrary, it may originate in non-specialised situations;
- The reception of science communication is not a passive process, but includes a series of dynamics that can affect and have an impact on the entire scientific debate (Wynne 1989; 1995; Epstein 1996);
- The source of the transfer cannot be clearly separated from the popular exposition (the recipient of the transfer) (Hilgartner 1990);
- The process of communicating science can be described as a series of expository levels that gradually slide into each other, influencing each other (Cloître and Shinn 1985; Hilgartener 1990; Lewenstein 1995; Bucchi 1996; 1998).

The communication of science, therefore, seems to be characterised by a series of multiple interactions between specialist and popular discourse. Thus, instead of being seen as a 'transfer', communication can be regarded as a form of 'short-circuiting' or 'interference' (cross talk)14 between two discourses that occurs under certain circumstances (Bucchi 2008). This view not only assumes the communication of science as 'interference' (and thus as the cause of changes in opinions and attitudes on the part of the public), but also as the effect of developments in both discourses, which allow a zone of intersection to form (Bucchi, 2008:388). Another advantage of this view of science as 'interference' can be found in the assumption of communication as a 'process' rather than a starting point, a process that sustains the interactions between the various actors

2.1 Beyond the traditional model

In recent years, despite considerable efforts on the part of science communicators to improve public perceptions of certain techno-scientific issues, audience concerns about them have persisted.

It seems that it is no longer acceptable for people to be considered all equally 'passive recipients': part of society demands to be involved in certain scientific issues. Moreover, the fact that more and more non-experts are contributing to the research agenda leads to a revision of the definition of science communication in different contexts.

It was in 2000, in fact, that the House of Lords recognised that standard top-down science communication has limitations as it is based on an overly paternalistic relationship between science and the public and lacks a sensitivity to dialogue (Tognaccini 2014).

Only two years later, in 2002, COPUS15[1] is disbanded by its own founders precisely because it states that "the top-down approach that COPUS exemplifies is not appropriate to the broader agenda with which science communication is now confronted" (Copus, 2002).

This is a real wake-up call on the way science is communicated to citizens, in fact, from now on, in several countries in Europe and beyond, new words are starting to appear in new funding plans and policy documents on which new science communication projects must be based. From public awareness of science to citizen engagement, from simple 'communication' to 'dialogue', but above all from 'science and society' to 'science in society' (Bucchi, 2008).

Thus, initiatives aimed at stimulating direct public input on scientific and technological issues and decisions began to spread. Not only that, some experts also introduce the concept of 'knowledge co-production' as well as knowledge co-production, which indicates 'new intense forms of participation of non-experts in the definition and accreditation of scientific knowledge' (Bucchi, From deficit to dialogue, from dialogue to participation - what next? Models of interaction between science and the public, 2008:389)16. These new notions represent a real change not indifferent to the outdated deficit model, but also to its sociological criticism.

Thus, there is a shift from a public that is seen as totally illiterate on the subject and that needs to be educated, to a public that can make a contribution through active participation in the discussions and choices made by scientists, since ordinary people also have knowledge that can complement and supplement that of scientists. This new perception of the public of non-experts represents the transition from the PUS - Public Understanding of Science model to PEST - Public Engagement with Science and Technology, a truly innovative view of the public that will be described in the following section.

It all happened in October 2002 when the community of British scientists through a communication published in the journal Science decided that the term used up to that point to describe the relationship between science and society, i.e. Public Understanding of Science (PUS), was outdated and outdated (Pitrelli, 2003; 2021). Those who notice the increasingly strong assertion of this strong crisis and mistrust of science are precisely the category of scientists, especially British scientists, as Great Britain has always been the country most involved in the dissemination of scientific culture.

Not only that, Great Britain is the European reference country most interested in the science-public relationship and the latter's understanding of science. Evidence of this is the publication in 1985 of

[1] *Committee for the Public Understanding of Science.*

the report by the Royal Society known as the Bodmer Report17 (Bodmer 1985). With this report, PUS was formalised and institutionalised and in about twenty years this became the reference term used in the various European programmes to refer to the activity of disseminating science to the public. It is only in the last few years, however, that in the UK, the cradle of PUS, calls from politicians, scientists and scholars as well as media practitioners to reconsider the presence and usefulness of the public are beginning to spread overwhelmingly.

With this proposal, therefore, British scientists are spearheading a crisis that sees the standard model of communicating science to the public, and the one that has been most popular in recent years, at risk. The term PUS - Public Understanding of Science absolutely must be replaced with a new notion that includes a more active participation of the public and above all a special involvement of the latter.

It thus becomes necessary to start introducing the PEST model: Public Engagement with Science and Technology. It is immediately clear how, in this new definition, the science-public relationship is totally revised, as we no longer speak only of 'understanding of science', comprehension of science, but of 'engagement with science', i.e. true involvement with it.

In addition, the word 'technology' also appears in the above terminology, therefore, we no longer consider only science, but also technological disciplines since, as stated earlier, we begin to understand that science is not and never has been a discipline in itself.

The real turning point, however, is given by the introduction of a new term, which is precisely 'engagement', i.e. involvement of the public, or rather of the 'publics', through dialogue, open and partisan discussions between scientists and non-experts in which citizens become precisely the main protagonists in decisions related to scientific issues that have repercussions in society (Pitrelli, 2021). However, limiting everything to a mere question of terminology is rather reductive, as this shift from the simple understanding of scientific facts to the need instead for the active participation of the public is considered an increasingly necessary aspect to be taken into account in the face of an ever more widespread loss of trust in science.

What prompted the House of Lords to make itself heard in this context was the fact that, after dozens of years of attempts to increase the scientific literacy of the recipients and to promote a greater understanding and appreciation of science in Great Britain, this proved to be a complete failure (Miller 2001).

The British population, contrary to popular belief, was not at all sensitised towards a variety of scientific topics, remained low in scientific literacy, but not only that, the appreciation towards certain topics in the field even generated an aversion towards research.

Before proceeding and understanding how the PEST model came about, however, it is good to define what were the reasons that led to the failure of the PUS model. As already mentioned, the latter was based on the Bodmer Report, which made it clear that the reasons why it was necessary to invest in science were both individual and collective in nature; the nation's prosperity, in fact, depended precisely on science and technology having an ever-increasing impact on social reality (Pitrelli, 2003).

Here it was thought that all that was needed was an improvement in the communication of science to make citizens appreciate science and, above all, to make them make more informed decisions.

This is because, especially in the rhetoric of the mid-1980s, certain principles19 returned that the creation of a modern, industrial and self-critical society derives precisely from a greater public understanding of science.

The ways of improving public understanding of science in the public included in the PUS model that science was a 'privileged perspective on the world, and the public is ignorant of science' (Pitrelli, The Crisis of Public Understanding of Science' in Britain, 2003) were based on the 'top-down' or 'deficit model' in which the exchange of information between science and the public was one-way. The public was regarded as a homogeneous group of people who could only passively take in the knowledge produced by experts (Pitrelli 2003) and it was the media, on the other hand, who were in charge of translating the findings derived from the world of research into simple terms.

The latter, however, focus their communication activities more on the public's needs than on their supposed cultural and cognitive gaps and this causes scientific communication to begin to be seen as banal or excessively approximate (Milano, 2016)

Communication between scientific expertise and the public in the deficit model is divided into two levels: the first is called "mediated science" and includes the part of production, formulation, and reception by the public of scientific news (Borgna, 2001), the second includes the part of comprehension of the news by the public (Pitrelli, 2003).

After years, it was also realised that the ineffectiveness of the top-down model was due to the fact that its application was mainly based on the interests of science and much less on the actual interests of the public.

From this point on, in fact, the so-called engagement model would develop, as indicated in the aforementioned House of Lords report Science and Society and another British document called Excellence and Opportunity - a science and innovation policy for the 21st century. The science-public relationship in Great Britain based on the PUS model has undergone over the years several moments of crisis, among them the BSE20 debacle in which several assumptions of the PUS turned out to be totally unsuccessful and ineffective so complex was the affair.

3. The public communication of science as a necessity

According to what has been said so far, the relationship between science and society has profoundly changed. The society that is beginning to assume an increasingly central and participatory role in the communication of science, in fact, can be defined as a "knowledge society" (Greco, Pitrelli, 2009:80). Public communication of science is also changing, not only in its form, but also in its role. There are at least four processes that have taken place and led to a review of the role and function of the public communication of science, namely:

1. The separation between the so-called 'Republic of Science' and the
rest of society that characterised the entire academic era;
2. Communication between scientists and non-expert publics is no longer an optional extra, but becomes a (dual) necessity;
3. The science communication system becomes more complex;
4. More and more 'rights to scientific knowledge' are asserted and thus the social necessity of the formation of a 'scientific citizenship' (Greco, Pitrelli, 2009).

It must be admitted, however, that the knowledge society is also affirmed thanks to the relations between science and society that have changed over the years. It was in fact after the Second World War that, especially in the United States, academic science began to be regarded not only as knowledge with intrinsic value, but also as a real lever of economic development.

The state no longer 'suffered' the results deriving from the private work of science experts, but rather became the latter's patron, beginning to invest resources in scientific disciplines because, as already stated in the previous chapter, it began to realise that this investment favoured the welfare of the nation.

Thus, the world of academic research begins to become richer, even if it loses a small part of its freedom and autonomy. This increasingly central presence of the state causes the relationship between science and politics to change. The scientific community, in fact, found itself having to deal with an ever wider and more varied variety of non-scientific social groups with which to negotiate important decisions concerning its own development. Researchers, at the same time, increasingly feel the need to obtain from outside the 'social consensus' that is only possible by establishing a correct balance between 'research autonomy' and 'research support'.

This means that we begin to talk about and define the so-called "responsibility of science", and that we begin to establish fluid channels of communication with non-expert audiences.

A consideration that has recently led universities to institutionalise a third necessary line of work alongside teaching and research, called the "third mission" to distinguish it from the other two. These are all the initiatives that bring research into society and which include communication and dissemination activities.

At the same time, however, society also perceives the presence of science as more imposing, so that the relationship between science and society becomes something to be managed, an aspect at the basis of democracy.

There are therefore three key elements that can be summarised to describe the new relationship between science and society, namely

- Scientists need a social consensus that was previously completely absent and unnecessary;

- Politicians can no longer consider the scientific world as a world of its own, but must include scientific issues as priorities in their agendas;

- Citizens, too, can no longer think independently and exclude themselves from science; on the contrary, in order to make decisions concerning their daily, individual and collective lives, they are forced to relate to science and increasingly to take it into account. Just think of how, in recent years, science has contributed to changing people's opinions on some archetypal concepts such as life and death.

But that is not all. In recent years, the scientific world has really been evolving, so much so that in the last quarter of the twentieth century a new element has entered science, which significantly changes the frame of reference and requires a complete reformulation: we are talking about private research26 (Greco, Pitrelli, 2009).

The latter is new in this context because it represents a new way of producing knowledge that favours the birth of new types of scientists, researchers, but also entrepreneurs. It is also defined as "entrepreneurial science" and is active in new sectors not previously considered, such as information technology and biotechnology. At this point, scientific knowledge is no longer seen as a global public good, but rather as a private and appropriable good. Science therefore finds itself in a new "research space" and must rethink its objectives, while society (politics, public opinion and the economy) must begin to look to the future by taking science into account.

3.1 Science and public engagement

Before going into detail about the specific characteristics of PES, it is important to clarify what is meant by the term 'engagement', which literally means 'involvement'. Particularly in the context of informal science education, this word is used to describe the involvement of the public in learning science (McCallie, Ellen, et al, 2009). However, it is important to clarify that this term, used in relation to literature and scientific practice, has an even more specific meaning, as it is characterised by 'mutual learning', i.e. mutual learning on the part of the public and scientists and, in some cases, policy-makers as well; an aspect that is in complete contrast to the one-way transmission of knowledge from experts to the public.

In addition, it is more accurate to speak of "publics" in the plural, rather than "public" in the singular, as this recognises all the different identities and backgrounds of the people who make up the public. To be clear, there is no single and unified public, but there are many ordinary people who make up that public and who may or may not have a scientific background (McCallie, Ellen, et al, 2009).

For this reason, from this point on, we will refer to publics and audiences in the plural rather than the public, as these are conceptually more appropriate terms for the issues we will address later.

Returning instead to the term PES, i.e. Public Engagement with Science, this refers to an approach that has developed in the world of science over the last twenty years and involves a series of experiences that allow people with different scientific backgrounds and skills (i.e. the so-called 'public' mentioned above) to contribute to scientific issues or controversies with their ideas, values and/or any prior knowledge. Moreover, the fact that PES is characterised by a multidirectional dialogue between the different people who make up the public allows all participants to acquire new knowledge in the field and to become more involved in certain issues.

All public engagement activities, especially in the context of informal science education, may, but do not necessarily, influence the direction of scientific research, institutions and/or science policy (McCallie, Ellen, et al, 2009:12). The PES aims to seek input from the public by involving them in decisions concerning the application of science and technology in society.

In particular, public engagement with science in informal science education contexts takes place through a series of activities, events or interactions that are not characterised by a "unidirectional" transfer of concepts and ideas from experts to the public, but rather by a multidirectional one, i.e. it takes place between people with different backgrounds, scientific knowledge and life experiences.

However, as already mentioned, on the one hand, the transformation of the scientific communication process and, on the other hand, the inclusion of public engagement in the scientific context is not only linked to a terminological issue, but, above all, in informal contexts of science communication, has well-defined objectives, including

- mutual learning between the public and scientists, allowing both to develop a new and deeper understanding of the problems but also of the opportunities offered by the world of science and technology;
- Empowerment and the development of specific skills to ensure people's active participation in civic activities;
- Raising public awareness of the cultural importance of science as a
of science both as a cultural practice and in relation to society;

- Recognise the importance of multiple perspectives and domains of knowledge, including scientific understanding, personal and cultural values, and social and ethical concerns, to better understand decision-making processes related to science and the relationship between science and societal issues (Federici 2016).

Simplifying and summarising the above points, it can therefore be stated that public engagement in the informal science context can contribute to achieving the following objectives: widening access to the world of science and science education, making people understand the importance of science and increasing science education in people's lives, improving scientific literature, increasing the participation of people and society as a whole in the world of science, building relationships with experts in science and technology, and providing new models for learning and research (McCallie, Ellen et al, 2009).

Having defined the objectives that scientists set for themselves using the communication model involving public participation, we now look in detail at the mechanisms implemented by the PES. The maximum expression of public engagement in informal scientific contexts is achieved through activities, events and interactions characterised by mutual learning, which is a fundamental part of the whole experience (Panarese, Pievani 2018).

The involvement of audiences from different social contexts and with different levels of prior knowledge occurs above all through first-hand experiences in which they can actively participate, each according to their own role and competence in the process. This includes, for example, participation in community decision-making by contributing points of view, participation in live events involving direct interaction with experts, and specific activities, forums or exhibitions. In these contexts, the audience listens, shares and interacts with the experts and what they present. But let's not forget that all of this can also happen in a less direct way, for example through channels that involve calls, emails or messages that are appropriately designed for the end goal (McCallie, Ellen et al, 2009).

The added value of this type of public engagement lies in the fact that it is possible to convey scientific concepts, which are often very specific, in completely informal and non-academic contexts, such as: science centres, museums, zoos, aquariums, botanical gardens or nature centres, where adults and children can participate and interact with scientific content conveyed through digital media, games, films, installations, as will be discussed in more detail in the following chapters (McCallie, Ellen, et al, 2009). Let us therefore define how the public is involved in science communication activities that take place through the PES model:

1- The public receives information from different sources and, above all, in different formats. Learning takes place not only by watching, listening and attending conferences, exhibitions or events, but also by interacting with experts and with any installations specifically placed in these contexts;

2- People who participate in the types of opportunities described above actively interact with the sources of information in order to get what they really want to know. Active audience participation includes, for example, asking questions of a speaker or interacting with interactive media. Genuine participation, on the other hand, occurs when people, having experienced what has just been described, are driven by curiosity and voluntarily delve into certain topics, for example on the Internet;

3- The audience can share their opinions and newly acquired knowledge with other participants and industry experts27 by contributing their points of view, knowledge and values or acquired data.

This relationship can be face-to-face or online, synchronous or asynchronous, and in these cases the flow of information is multidirectional (McCallie, Ellen, et al, 2009).

Conclusion

With the advent of the new communication paradigms, newspapers have seen their reference universe expand and are moving into a multi-channel dimension, typical of an ecosystem vision of communication, without limiting themselves to being present only on printed paper. In the light of the aspects analysed in this article, other conclusions can be drawn, which will be described in more detail later.

Today, we look at communication on paper with a certain amount of fear, seeing it as a world in deep crisis, in danger of being overwhelmed by the current multimedia. But the point of my work is that, at present, no current method of scientific communication, even if more effective, has the aim of replacing the historical one on paper. The hope for the future is that the transmission of scientific information through journals will never cease to be a point of reference for the public, but also for the scientific community. The hope for the future is that the transmission of scientific information through magazines will no longer be the main point of reference for the public, but that the numerous festivals, as containers of multiple events, including sensory ones, will constitute a new mode of communication in addition to the magazine, in order to disseminate scientific knowledge to a wider, but also heterogeneous, public. What we want to show by analysing the various forms of scientific communication that exist today is that, in order to be truly effective, they must be multichannel and therefore create a network between: paper, multimedia and events, in which these three modes support each other in terms of content.

There are many areas in which communication is developing at the moment, but there is one that has been considered fundamental for addressing the public, especially in recent years, with the emergence of the pandemic caused by the SARS-CoV2 virus and the alarm that has accompanied it: scientific communication. Never before have professionals been so aware of the importance of scientific communication that is not only efficient but, above all, effective, leading the public to trust the world of research, which, due to its constant evolution, is often viewed from the outside with fear, without understanding the processes.

In this paper, therefore, we will not only talk about science, but above all about scientific communication and its evolution, also in the light of the democratisation of the knowledge society.

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