

**SCIENCE ON TV**

**Forms and Reception of Science Programmes  
on French Television**

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## **Abstract :**

We report a study of the reception by adults of science programmes broadcast on French television. Long, semi-directive interviews were carried out during which a number of short fragments were shown. Part of a wider study (including children, scientists and professionals involved in the production of such programmes), this research shows that there are not one but several, very different, readings of science programmes. That implies that, in the view of the public, there is no unique, "ideal" form for a science programme and that, indeed, the term popularisation of science can have several very different meanings.

## **1. Introduction**

Science programmes have never been as common on French television as they are for instance in Great Britain or Canada. Yet the French public is apparently interested in the subject since a large number of science magazines thrive. There was a short burst of science on television, in prime time (8:30 PM) in 1982-83<sup>1</sup>. It only lasted a few years and once again science became fairly marginal. Since 1992, a new effort has been made, new programmes have begun, in particular for children and adolescents. New forms have also appeared. Classical documentaries or debates have been replaced by more complex structures, often with a mediator present assuring the "contact"<sup>2</sup> with the viewer. At the same time viewers' habits have changed. This is the situation we have undertaken to study.

Most of the research literature on the articulation between science and the media in fact concerns the written media. Television is almost absent from books on popularisation such as those of Shinn et Whitley<sup>3</sup>, Nelkin<sup>4</sup>, Friedman, Dunwoody and Rogers<sup>5</sup> or Evered et O'Connor<sup>6</sup> and science is absent from classical books on television. For example in the well known anthology by Newcomb<sup>7</sup> that presents the main texts of the "critical" approach to television, popularisation is completely ignored, except for a few remarks concerning "documentary". A number of articles or books have been nevertheless published<sup>8</sup>, but to our knowledge, none relate popularisation to television forms. An area that has perhaps been better explored is that of communication on Environment<sup>9</sup>.

In the French-speaking world, a number of publications are of interest to our field<sup>10</sup>. In Quebec, B. Schiele<sup>11</sup> was one of the pioneers in the study of science on television. In France the field of education science produced a lot of work on

the relations between science and television and the Belgian journal *Études de radiotélévision* carried a number of papers on science popularisation on television<sup>12</sup>.

The present research fits into a long-standing preoccupation with the theory of the production of meaning by the media. Media are the focal point of a number of constraints, both on the production side and on the reception side<sup>13</sup>. They are certainly not simply a transparent technical set-up. They do not only "transport" information, they propose a complex relation to their readers or viewers, through the enunciative device<sup>14</sup>, that is the manner in which things are said, the way in which the viewer is addressed, rather than the content of what is said. Only if this proposed relation is felt to be satisfactory will a viewer watch a given programme<sup>15</sup>. It is this relation that we have undertaken to explore, to determine the elements that make it up and the way viewers report the feelings it inspires them.

The present study was carried out between March 1993 and September 1994. The programmes tested were broadcast in the spring of 1993. Two years later half of them have disappeared, which illustrates the extreme instability of the field in France today. Commercial television was introduced in 1982, a cultural channel Arte appeared in 1988 and a more educational one, La Cinquième at the end of 1994. All these events affect television in general and popularisation in particular. Nevertheless, our concentrating on particular television forms allows us to draw conclusions beyond the specific programmes studied.

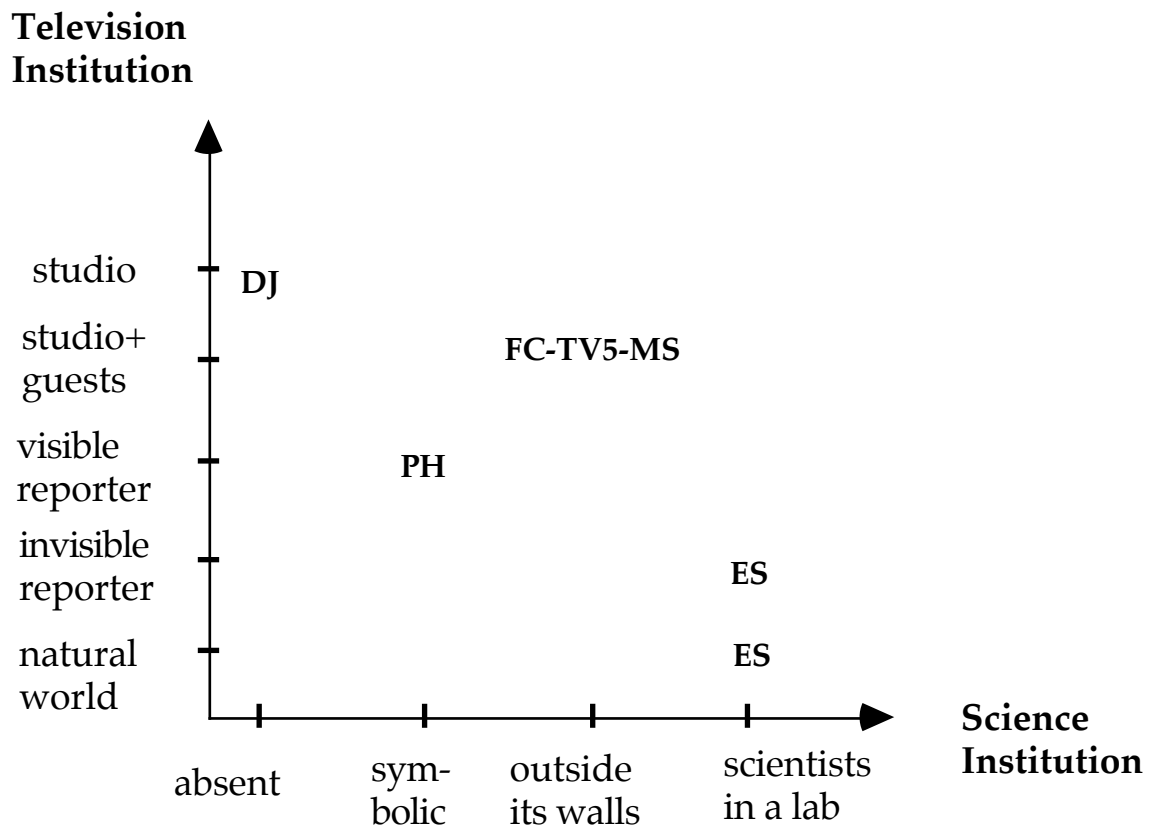
## **2. Identifying the forms**

By television forms, we mean types of organisation of time and space within a broadcast programme. One example is the classical documentary form, i.e. filmed out in a laboratory. There are various forms of discussion or demonstrations taking place in the television studio, in presence or not of a public, etc., forms that we shall take care to distinguish. In France, 10 or 15 years ago, a programme would be of one single form. Today, television programmes in general, and those used in science popularisation in particular, have changed. Shorter programmes have appeared, down to 5-minute "clips". The longer ones often have a hybrid structure, combining successively a short documentary, a discussion in the studio, a game, etc. This evolution is said to be related to the zapping habits that viewers have acquired. Whatever the reasons, we have chosen to work at the fairly "microscopic" scale of single forms rather than that of a whole programme.

The first phase consisted in identifying the repertoire of forms in use on French television (in spring of 1993). As our hypothesis was that fairly subtle differences in forms could change the manner in which they were received, we had to elaborate criteria for comparing and classifying them, then for choosing as wide a range as possible for the tests. In science programmes, two institutions meet, the television institution and the scientific institution, and traces of the negotiation between the two are visible in the different forms. We chose to classify the forms according to the relative strength of the visible presence of one institution or the other. This is of course not the only way they can be distinguished, and we will discover in the viewers' discourse that other elements also play an important role.

We have schematically represented the "visibility" of either institution, within each excerpt, in the figure below. The vertical axis indicates the increasing hold of the television institution, through the presence on the screen of its members (reporters, hosts) or its equipment (visible cameras, TV screens, microphones). With increasing intensity, we come across :

- the "natural" world, with people going about their business apparently without noticing that a camera is present. One hears noises and voices. The exchanges that take place between protagonists do not seem to be aimed at the viewers and may not be sufficient for them to understand what is going on. In that case a voiced-over explanation is added<sup>16</sup>. This is the canonical model of the documentary.



*(The abbreviations refer to the excerpts described below)*

- various forms of interviews, where scientists, in their own environment, as identified by books, apparatus, etc. answer a reporter's questions. The reporter may be visible or not, audible or not, but his or her presence can be guessed from the direction of the scientist's look and manner of speech.

- an interview or discussion taking place in a studio, on the television institution's territory. A presenter can be seen, as well as artificial scenery, and sometimes cameras or monitors. The role television plays as an intermediary is particularly stressed here.

- a sequence completely taken over by the television institution, for example a demonstration of apparatus made by a journalist in the studio.

The horizontal axis "measures" the increasing degree of presence of the scientific institution :

- It can be completely absent. There was such a programme (we tested it on children only) a 5-minute clip called "Dis, Jérôme" (**DJ**). The scientific

institution was replaced, in Jérôme's discourse, by his grand-mother, who asked questions, did experiments, often with everyday material such as pizza dough, then drew conclusions ! Members of the scientific institution had disappeared, but the scientific method was scrupulously respected. The programme, which has unfortunately stopped, was very much appreciated both by children and by scientists.

- The scientific institution can be represented symbolically by a piece of apparatus, manipulated, in a studio, by someone belonging to the television institution.

- Scientists may speak, but outside their laboratory, often in a television studio. The negotiation between institutions then goes via the dialogue between the host and the scientist, and viewers may consider that one gets the better of the other.

- Finally scientists may be seen at work within a laboratory, creating knowledge and explaining it, upheld by the symbolic value of the equipment and books surrounding them.

Two tapes were made of 5 sequences of about 2-3 minutes each (one tape in inverse order of the other), around the theme of the brain, memory, etc. The excerpts were chosen to cover the plane we drew above as completely as possible. Three different talk-shows were chosen :

- "Savoir Plus" presented by François de Closets, on France 2. A fairly animated discussion about the nature of conscience takes place between the host, a neurobiologist, and a catholic writer, who plays the role of the non specialist "Candid" (Fig 1). The three men are seated around a small table, with a fourth who does not take part in the discussion. There is a public present, seated well away from the table. The host often looks at the camera and the frames change at a very rapid rate. **(FC)**.

- "Connaissance de la Science" presented by Paul Amar who questions a neurobiologist about his research on brain cells, on TV5. The two men are seated on benches, no public is present (Fig 2). At one point, the scientist shows the host a picture of a cell, that then appears full screen. The frames last longer than in the previous case. Neither of the men look at the camera during their discussion, but at the end the host turns toward it to briefly summarise and announce the next sequence. **(TV5)**.

- "La Marche du Siècle" presented by Jean-Marie Cavada, on France 3. A scientist explains how memory works, taking his watch as an example ("I can

remember where I bought it ..."). His image is also projected on a large screen, back and to the right of the host. Other guests are present, as well as a public seated immediately behind them. The host is alone, seated in the centre of the semi-circle of guests. (Fig 3) He does not look at the camera during the sequence. **(MS)**. Contrary to the two preceding programmes, "La Marche du Siècle" is not specifically a science programme. It is broadcast at prime time, and treats various social or political issues (one issue per programme)

Two sequences filmed in laboratories were also selected :

- a second sequence from the programme "Savoir Plus", filmed in a hospital, where images are taken of the brain of the reporter, Patrick Hester, with a PET camera. The host, in the studio, first announces the experiment as if it were taking place simultaneously, and is back on the screen at the end of the sequence. The reporter, seated on the desk of a man in a white coat, first explains how the camera works (Fig 4). He is then settled into the camera chamber (Fig 5), has radioactive water injected into his arm and pictures of his brain appear during a long (almost 1 minute) silence. Figures in white coats can be seen at the edges of the picture. Both host and reporter speak directly to the camera. **(PH)**.

- "Envoyé Spécial" presented by Paul Nahon, on France 2. The sequence is in the form of a classical documentary and presents experiments on babies' visual perception. It starts with the scientist driving up to her laboratory in a maternity hospital (Fig 6). We then see her preparing her experiments (Fig 7) (explained, off, by a male voice) and hear her talking to nurses and mothers. At one point, she is seated in her office and explains her work to an invisible reporter (Fig 8). Like La Marche du Siècle, Envoyé Spécial is a weekly, generalist, prime-time programme. It treats 3 unrelated subjects each time, and from time to time one concerns science. **(ES)**

### **3. The interviews**

The aim of this study was to explore the way in which different people reacted to the five television forms we selected. Of course, we only have access to these reactions via the discourse of the viewers. That is why we conducted long interviews (1 1/2 to 2 hours) around the five excerpts each time. Allowing people to speak lengthily about the subject means that they explore it, so to speak, come back to certain points, repeat and develop their appreciations. That allows us to see the internal coherence of their discourse, for instance when a given criterion is repeatedly invoked to explain like or dislike of the excerpts. This method also allows us to work by comparison in two ways : compare what

a given person says about different forms, and compare what different people say about a given form. The interviews were semi-directive, i.e. we had a list of themes to be discussed, but did not stop the interviewee if her or she spontaneously spoke of something else or in a different order. Quotes are exactly transcribed from audio tapes of the interviews.

Twenty interviews were carried out, roughly half in focus groups of 4-5 persons and half individually. The interviewees were adults, chosen from as wide a spectrum as possible in terms of age, sex and socio-professional characteristics. The number is determined by saturation, i.e. when all new interviews resemble ones previously carried out. That gives a sufficient number to explore the field of possible responses. It is of course too small a sample to produce statistics, but that was not our aim - we wanted to identify the pertinent parameters in the problem. In such studies, it is important to conduct individual interviews as well as focus groups because while the latter give access to the main themes, they also tend to amplify them. Individuals reply in a more reflective manner.

The interviews had the following structure :

- the interview began with questions on the *a priori* vision of science, popularisation and of television as a source of knowledge,
- a first excerpt was shown, then the form, the behaviour of the different participants, the relations between them, etc. were discussed. The 5 excerpts were shown successively, each followed by the same discussion.
- a comparative conclusion was requested : best and worst sequence, or ideal programme.

As mentioned above, the interviews were precisely transcribed. We then looked for recurrent themes or reactions. Some we had expected and found, for instance strong criticism of television. Others though expected were not found, such as an explicit expression of fear of science. Some were initially a surprise to us, such as reference to a school situation. We found a number of recurrent sets of themes - we shall call each set a reading. That means that there wasn't a single reaction (everyone liking the first excerpt, disliking the second, etc.). Nor was there an apparently unlimited series of combinations. As we shall see below, we found four (plus one variant) sets of coherent reactions (i.e. readings), several interviewees responding in a very similar manner. Out of our series of 20 interviews, one was unclassifiable. All the others fitted into one of the readings, that we shall interpret and describe below.

We wish to emphasise the fact that these are readings of a series of televisual texts. That means that they aren't inscribed in the texts and they aren't characteristic of the people : they are produced by the meeting of the two. That is why we shall not identify the speakers individually.

#### **4. Two essential variables**

Television was a familiar institution for all of the adults interviewed and they had clearly structured reactions toward it. Judgement of television in general, and of television reporters or hosts in the excerpts were one of the recurrent themes in the interviews. We made a first classification of the readings according to whether the interviewees expressed *a priori* favourable or unfavourable opinions of television, and more precisely, in the context of this study, whether they considered it a legitimate source of scientific knowledge or not.

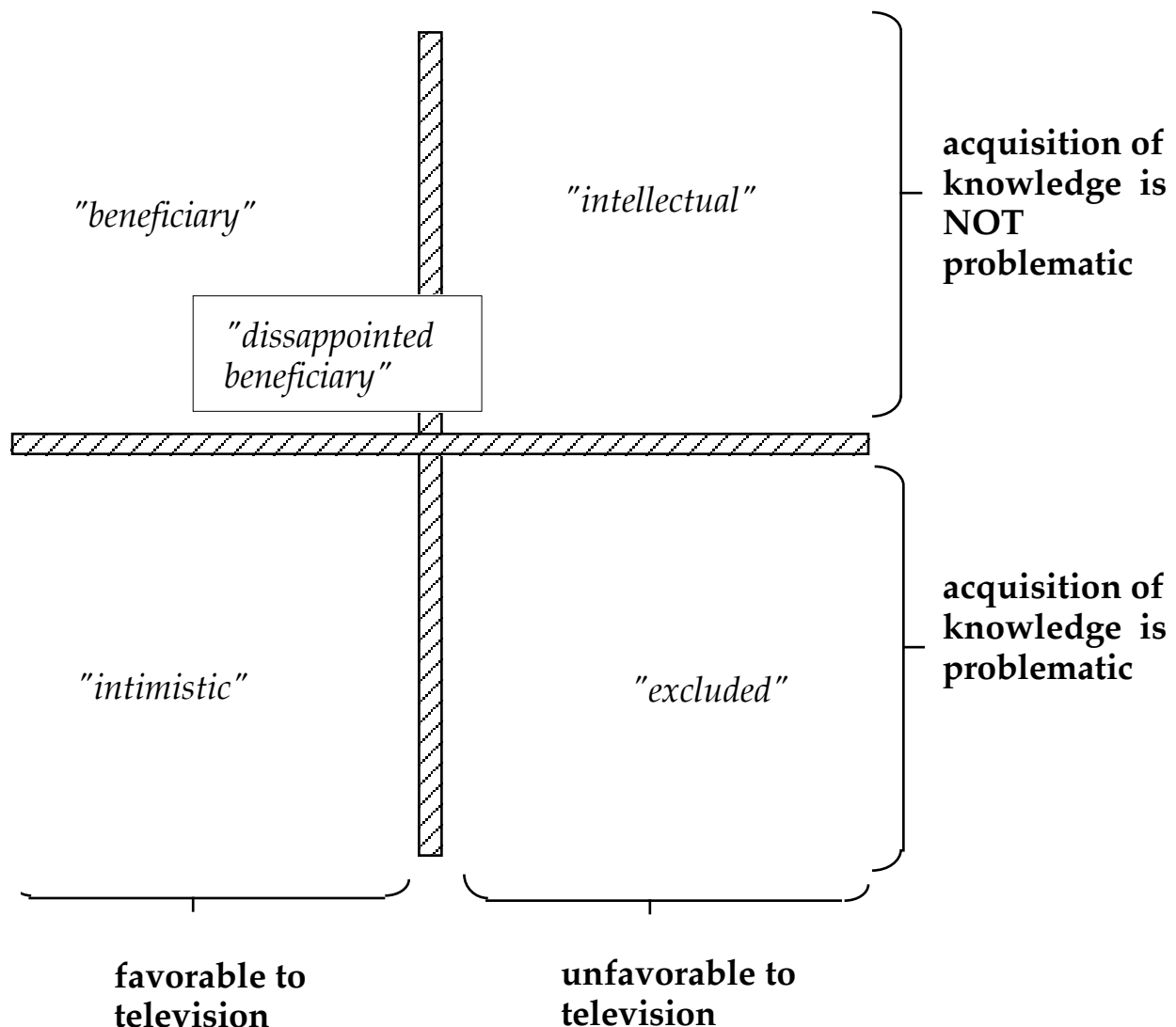
The scientific institution appeared less clearly to the general public. It was often perceived as distant and even mysterious. On the other hand, people have clear, and very different, visions of the accessibility of the knowledge it produces. Those visions strongly depend on their appreciation of the limits of their own knowledge and of their capacity to learn and understand, and on the memories that school had left them. Two attitudes clearly appeared. Some people did not mention any worry about the learning process (though it was not necessarily understood in the same manner by all). For others, it provoked very painful associations with school, lessons insufficiently learnt, etc. The same people often felt that their competence or intelligence was being questioned.

This last point may be strongly culture-dependant. A large proportion of the French population has had access during the past 30-40 years to a higher education, an opportunity that their parents did not have. Children on such ascendant social trajectories were no doubt under strong pressure to succeed. Moreover, the French school system is very selective and selection is mainly based on mathematics and science. This set-up may well be responsible for some of the responses made.

The two criteria, attitude towards television and attitude towards acquiring knowledge are independent : taken together they give four possible positions, represented below. The reactions used to classify the readings are very robust : for instance, in the "intimistic" reading, the interviewee remarks over and over again on the way his or her competence is judged, and sees school-like situations that are never remarked upon in a "beneficiary" reading. In each reading, we found a coherent set of reactions, remarkably similar from one

person to another. As we said above, there are not as many readings of this material as individuals, in which case no analysis could be carried out. Nor does everyone react in the same way : there are several general publics for science programmes, not just one.

Of course each reading is more complex than a set of yes/no answers to our two criteria. We shall describe them below, try to find elements that may explain them, either in the viewers' discourse, or in what we know of their socio-professional histories.



#### 4.1 The intellectual reading

This is one of the two readings in which television is not a legitimate source of knowledge. This is expressed as criticism of television in general :

*One follows this programme after another programme, it follows on. You become an alienated viewer. You **are** an alienated viewer.*

*On suit cette émission après une autre émission, c'est un enchaînement. On devient un spectateur aliéné, on **est** un spectateur aliéné.*

and of TV as a source of knowledge in particular :

*I am not persuaded that it brings us knowledge. Because knowledge is something that has to be thought about, and that one has to ask for. I don't think television brings us knowledge.*

*Je ne suis pas persuadé que cela nous apporte la connaissance. Parce que la connaissance c'est quelque chose qui doit être réfléchi et pour lequel on est demandeur. Je ne pense pas que la télé nous apporte la connaissance.*

This may be because the mediator is considered incompetent :

*You get the impression that a guy is there to interview other people and he doesn't necessarily have the competence to do it.*

*On a l'impression qu'il y a un type qui est là pour interviewer d'autres gens, qui n'a pas forcément les compétences pour le faire.*

For this reading the only role of the journalist should be to guide the discussion, certainly not reformulate the scientist's words :

*He knows how to recenter the debates. He is someone who lets the others express themselves, perhaps a little more easily, who doesn't fall into the trick of reformulating every time.*

*C'est quelqu'un qui sait recentrer le débat. C'est quelqu'un qui laisse aussi aux autres la possibilité de s'exprimer peut être un peu plus facilement, qui ne tombe pas dans le biais, à chaque fois, de la reformulation.*

The intellectual<sup>17</sup> wants a **direct** view of scientists, of their environment and their work, with no apparent mediation :

*[about the documentary] It's a programme filmed in the field. (...) At a limit, I prefer this kind of programme*

*C'est une émission de terrain (...) A la limite je préfère ce genre d'émission.*

The intellectuals differentiate themselves from other viewers :

*That's what I have gathered, because what **people** have gathered...*

*Voilà ce que j'en ai retenu, parce que ce qu'on en a retenu...*

They can dissociate their personal tastes and the evaluation they make of a given performance, for instance dislike the reporter in the PET camera and admit that his explanations are clear. Clear for the "others" ?

In summary, in this reading, the television mediator is unnecessary and undesirable, and TV is a not source of scientific knowledge. Distance is expressed with "the others" and there is no identification with the mediator. No particular worry about the acquisition of knowledge is expressed.

#### **1.4 The beneficiary reading**

In this constellation of responses, contrary to the preceding one, television is considered a legitimate source of knowledge, and science is thought to be accessible. The beneficiaries are not troubled by their ignorance : they recognise and accept it. They are curious, and optimistic about their capacity to collect information, as long as they make an effort. Note however their agregative model of knowledge :

*[What does this programme bring you ?] The same any science programme, when you're not a scientist - that is an enrichment, information that you wouldn't necessarily go to look for in a book.*

*Comme toute émission scientifique, quand on n'est pas scientifique, c'est à dire un enrichissement, une information, qu'on n'irait pas forcément chercher dans un livre.*

*Science doesn't necessarily address a minority of people, it's easy to understand the basics of science.*

*La science ne s'adresse pas forcément à une minorité de personnes, on peut comprendre aisément le b.a. ba scientifique.*

*To watch this kind of programme you must concentrate. But anyhow, how ever little you retain, it's always worthwhile.*

*Pour regarder ce genre d'émission, il faut être concentré. Mais quoi qu'il en soit, le peu qu'on en retient, c'est toujours bon à prendre.*

Some programmes are criticised because they are not seen to be clearly aimed at the general public :

*You get the impression that in this programme, science is only for a certain category of people and that, well there is no place for the average Frenchman sitting on his couch watching this programme.*

*On a l'impression que dans cette émission la science s'adresse à une certaine catégorie de gens et que bon, le français moyen n'a pas sa place dans son canapé en regardant cette émission.*

The mediation of the journalist is not only accepted but requested :

*He's the intermediary between the scientist and the viewer, so he has to put the scientific discourse on the viewer's level (...) to aim the questions at what can interest the viewer in his daily life.*

*Il est intermédiaire entre le scientifique et le téléspectateur, donc il faut qu'il mette le discours scientifique au niveau du téléspectateur (...) cibler les questions sur ce qui peut intéresser au quotidien le téléspectateur.*

The beneficiary in fact identifies with the journalist :

*The host asks questions in place of the viewer [Q: Is that a good thing ?] Of course, he doesn't necessarily ask all the questions that we ask ourselves, but at least ... in fact, he **is** the viewer, he represents the viewer. Anyhow, that's what he **should** do.*

*L'animateur pose les questions à la place du téléspectateur. [Q: Et c'est bien ?] Bien sûr, il ne pose pas forcément toutes les questions qu'on se pose mais au moins... en fait il **est** le téléspectateur, il représente le téléspectateur. Ou en tout cas, c'est ce qu'il **doit** faire.*

Pictures are considered helpful :

*A cell can seem quite abstract for someone, whereas showing it there on a screen, even if it's done artificially, OK, but visualising it, to my mind, has a very beneficial effect. (...) Visualising the thing makes it closer to us.*

*Une cellule ça peut sembler assez abstrait pour quelqu'un, alors que là de la visualiser sur un écran, même si c'est fait artificiellement, on est bien d'accord, mais le fait de la visualiser pour moi ça a un effet tout à fait bénéfique (...) Le fait de visualiser la chose ça la rend plus proche de nous.*

The beneficiary does not reject spectacular aspects of the programmes :

*[the sequence in the PET camera] It is all set up in a manner that makes us very interested.*

*Il y a toute une mise en scène qui fait qu'on est très intéressé.*

In other words, the television institution and specially the mediation of a journalist or host is completely accepted, even if a given performance can be criticised.

There is no rejection of the elements that remind the beneficiary of school :

*[about La Marche du Siècle] For me, it's not an amusement. It's like school, we were taught theory. Well there, TV is an intermediary. The scientist teaches us a number of things.*

*Pour moi, c'est pas un divertissement. C'est comme à l'école, on nous a appris la théorie. Bah là, la télé c'est un intermédiaire. Le scientifique nous apprend certaines choses.*

Nevertheless, the possibility of identifying with the teacher is appreciated :

*[Again La Marche du Siècle] They aren't all seated at the same table, it's less like a conversation. It's more like questioning. It can give the viewer the impression that he's the one who put the guest on the bench and that he is asking him the questions. Whereas when the people are seated around a table, they give the impression of being on their own. And here we are, looking through the keyhole.*

*Ils ne sont pas assis à la même table, ça fait moins conversation. Ça fait plus interrogatoire. Ça peut peut-être donner l'impression au téléspectateur que c'est lui qui a mis l'invité sur le banc et qu'il lui pose des questions. Alors que quand les gens sont autour d'une table ils donnent plus l'impression d'être entre eux. Et puis nous, on est là, on regarde par le trou de la serrure.*

The world of science is very distant for these people. Scientists seem to have a way of thinking of their own :

*Scientists are people who are confronted with a problem and (...) they go round and round it until they find a solution, not **one** solution but **several** solutions, and they never finish circling around the same subject. That is not the usual way people do things. So they are people who may have a way of thinking that is different from others, it has to be.*

*Les chercheurs sont des gens qui sont confrontés à un problème et (...) ils tournent autour jusqu'à ce qu'ils trouvent **une** solution, non pas une solution mais **des** solutions, des réponses et qu'ils n'ont jamais fini de tourner autour du même sujet. Ce qui n'est pas la démarche habituelle des gens. Donc ce sont des gens qui peuvent avoir une façon de réfléchir qui est différente des autres, c'est obligé.*

So it is found reassuring when the scientist seems accessible :

*He doesn't have the physical aspect, the way of dressing that a scientist can have (...) with glasses, completely dishevelled, on his own planet, so to speak (...) We feel closer.*

*Il n'a pas un physique, une façon de s'habiller qui ressemble à ce qu'on peut avoir d'un scientifique, quoi, (...) avec des lunettes, complètement débraillé, sur sa planète quoi (...) On se sent plus proche.*

*[The scientist in Envoyé Spécial] You see this scientist arrive in her car just like we could, at our work. (...) That doesn't give the impression of a scientist always shut up in her laboratory, completely cut off from reality.*

*On voit arriver cette scientifique en voiture comme nous on pourrait le faire pour notre travail (...) Ça ne donne pas l'impression d'un scientifique toujours enfermé dans son laboratoire, totalement en marge des réalités.*

According to the beneficiaries, science should worry about down-to-earth matters, that concern them personally.

*Science is something concrete. They talk about something concrete in an abstract manner. I am not interested.*

*La science, c'est quelque chose de concret. On parle de quelque chose de concret de façon abstraite. Ça ne m'intéresse pas.*

Whereas intellectuals didn't mention the practical applications of science, the optimism of the beneficiaries goes along with pragmatic requirements of science : they are ready to learn about things that concern everyday life. In general, the beneficiaries have less than university level education. Their idea of knowledge is an accumulation of facts, for which television is an excellent source, and that doesn't seem to have any painful connotations.

### **4.3 Disappointed beneficiaries**

One of the focus groups, basically close to the beneficiaries, was far more critical of television. Here, to begin with, are some reactions to La Marche du Siècle, similar to those of the beneficiary reading :

*It's more human because there is the public in the back, it's less cold.*

*C'est plus humain parce qu'il y a le public derrière, c'est moins froid.*

*[The host, in relation to the viewer] He respects him a lot. He wants to teach him something. He considers him more like someone he wants to teach something to, rather than someone who will earn him a living if he turns on the right channel.*

*Il le respecte beaucoup. Il veut lui apprendre quelque chose. Il le regarde plus comme quelqu'un à qui il veut apprendre quelque chose plutôt que comme quelqu'un qui va le faire vivre s'il met la bonne chaîne.*

*[What does the scientist think of the viewer ?] He thinks : I leave enough information for the person who is really interested to get into it, with more scientific language, then, more ... There. You've got a trace of that. Even if you don't want to go into it, nor become a scientist, at least you know that much, how you work, how your head works.*

*Il se dit: je laisse assez d'information pour que celui qui est vraiment intéressé puisse rentrer dedans, alors là avec un langage plus scientifique et plus.... Voilà, vous avez une trace de ça. Même si vous ne voulez pas rentrer, ni devenir un scientifique, vous savez au moins ça, comment vous fonctionnez, comment votre tête fonctionne.*

The attitude of this group towards television was ambivalent, words of exasperation mixing in with a positive appreciation. As can be seen in the quotes above, they were very sensitive to the signs of preparation, to the quality of the welcome that was given to them, and given to the scientists. This group could be far more critical of the television institution than the beneficiaries. About the sequence in the PET camera :

*I don't believe it (...) You see him, he gets into it, he talks, and then it's not him. It's someone else's arm (laughter). Frankly, it's clear, you don't hesitate a second. He shows how you are placed. You can see that it's not him. It's obvious to me. Well, I don't mind at all, he's not there for that, he's there to explain.*

*Moi j'y crois pas (...) On le voit, il rentre, il parle, puis c'est pas lui. Après c'est le bras de quelqu'un d'autre [rires] Franchement c'est net, ça pose pas une seconde d'hésitation. Il montre comment on se met. On voit bien que c'est pas lui. Pour moi*

*c'est clair. Bon, mais ça ne me gêne absolument pas, il n'est pas là pour ça, il est là pour expliquer.*

*[He] fools us a bit, because he make us believe it's on direct and it's not.<sup>18</sup>*

*[Il] nous trompe un peu, parce qu'on nous fait croire que c'est du direct alors que ça ne l'est pas.*

The scientists are considered victims of the television institution too. Another comment on the sequence in the positron camera :

*And the picture of a white coat bringing the cart with I-don't-know-what. She looks just like a maid. There's the reporter there and the white coats look like floor-sweepers.*

*L'image aussi d'une blouse blanche qui vient apporter le chariot avec je ne sais quoi. Elle fait vraiment boniche. Il y a le journaliste qui est là et les blouses blanches font vraiment balayeuses.*

Contrary to the beneficiaries and even more so to the intimists - our next reading - this group violently rejects the sequence from *Connaissance de la Science* (the interview in a studio with no public present), from which they feel completely excluded :

*You get the impression you are a little mouse, they aren't talking to us.*

*On a l'impression d'être une petite souris, qu'ils ne s'adressent pas à nous.*

*Before [La Marche du Siècle] you had the impression you were invited to the programme and here you feel you are bothering them. You want to go away and leave them.*

*Tout à l'heure on avait l'impression d'être invités à l'émission et là on a l'impression de déranger. On a envie de partir et les laisser.*

*[Science] is not for us and they don't want to tell us about it. (...) There is a clear barrier. You can feel the barrier. They don't mind making you understand a little, but not too much, it's not really for us.*

*[La science] n'est pas pour nous et on ne veut pas nous la communiquer (...) Il y a une barrière nette. On sent la barrière. On veut bien vous faire comprendre en gros, mais on ne veut pas trop, ce n'est pas trop pour nous.*

These disappointed beneficiaries find the host "stressed", "uncomfortable", think he has not played his role, that the camera "surprised them while they

were preparing the programme". The following sentence, referring to the scientist, expresses remarkably strong anxiety.

*What he says is interesting too but you get the impression that in the studio, the words fly and there is no one to stop them, no reporter, no camera, nothing.*

*Ce qu'il dit, c'est aussi intéressant mais on a l'impression que dans le studio, il y a les mots qui partent et qu'il n'y a personne pour les arrêter, ni journaliste, ni caméra, ni rien.*

The host in *La Marche du Siècle* that the "disappointed beneficiaries" so much appreciated always insists on how much his programme was prepared : he looks at his notes, recalls statements made by the guests during the preparation, etc. On the contrary, the host in the sequence from *Connaissance de la Science* that they criticised so bitterly is seen to be learning something new himself from the person he is interviewing. This will be interpreted extremely positively by the next category, the intimists, as being a sign of his concentration and of his interest. But the present group of disappointed beneficiaries rejected the same behaviour, interpreting it as a lack of preparation, a lack of mediation : an example of two radically different readings of the same sequence.

A reception study of science programmes somewhat similar to this one was carried out in 1984 by one of the authors<sup>1</sup>. No such attitude was observed then, although in general the findings were similar. French television (and probably that of many other countries) went through a strong legitimacy crisis in the early 90's, after the Gulf War and the errors committed in reporting on Roumania<sup>19</sup>. The crisis seems to have affected the contract between the "disappointed beneficiaries" and television, in spite - or because - of the fact that that beneficiaries are the "ideal" public for popularisation on generalist television. But beneficiaries need the mediation of the journalist, hence the anguish of this group when they perceived it to be lacking.

#### **4.4 The intimistic reading.**

The people in this category had an positive attitude towards television, similar to that of the beneficiaries, though a little more critical. Nevertheless, the intimist is less curious, more passive, less prepared to make an effort than the beneficiary.

*It is true that I have an appetite, a desire to learn certain things. But, all the same, I won't make the effort to go and find out about them. But if I*

*happen onto an interesting programme or an interesting book that discusses scientific things, I can easily be interested.*

*Il est vrai que j'ai un appétit, une soif d'apprendre certaines choses. Mais je ne vais pas pour autant faire l'acte d'aller me renseigner. En revanche, si je tombe sur une émission intéressante ou sur un bouquin intéressant qui parlent de choses scientifiques, je suis facilement intéressé.*

For the intimists, the journalists are not just intermediaries, the interface between the scientist and the viewer that they are for the beneficiaries. They engage in a conversation with the scientists and should allow them to speak without "translating" their words. Here, they praise the host from *Connaissance de la Science*, the one that received such strong criticism from the disappointed beneficiaries :

*The scientist is telling something to someone who seems to be listening carefully, who seems to be listening to what he says and not just to be waiting until he finishes before asking him another question.*

*Le scientifique raconte quelque chose à quelqu'un qui semble toute ouïe, qui semble écouter ce qu'il dit et non pas simplement attendre qu'il ait fini de parler pour poser une nouvelle question.*

*The host was playing his proper role. He was asking questions, they were being answered, he didn't have to reformulate the answers.*

*L'animateur tenait son vrai rôle. Il posait des questions, on lui répondait, il n'avait pas besoin de retranscrire les réponses .*

The host should step in, though, "if the scientist's discourse gets off the course", he should "bring the debate back"<sup>20</sup>. The intimist can identify with the journalist.

*He is the one who guides the debate where he want's it to go. He asks the questions that everyone can ask.*

*C'est lui qui mène le débat comme il veut le mener. Il pose les questions que tout le monde peut se poser...*

*I think the viewer identifies more with the host than with the scientist, and so, since the host was in the conversation and had no trouble understanding, that helps the viewer.*

*A mon avis le téléspectateur s'identifie plus à l'animateur qu'au scientifique et donc à partir du moment où l'animateur dialoguait et n'avait pas de problème pour comprendre, ça aide le téléspectateur.*

The intimists, like the beneficiaries are very attentive to the journalists' performance. But in the intimate reading, the journalists should not get in between them and the scientist, not be "an intermediary between the scientist and the viewer" as in the beneficiary reading. Hence this criticism of the host in *Savoir Plus* :

*You get the impression that he is there to make us understand, a sort of translator for us, when in fact he doesn't answer the questions. It goes via his mind and his thoughts and I think he transforms things. He interprets what he feels like interpreting.*

*On a l'impression qu'il est là pour nous faire comprendre, un espèce de traducteur à notre adresse alors qu'en fait il ne répond pas aux questions. Ça passe par son intellect et sa pensée et pour moi, il transforme... Il interprète ce qu'il veut interpréter.*

The very important point that distinguishes the intimist reading from the beneficiary, or the intellectual one is a far greater sensitivity to anything that can be interpreted as a suggestion of ignorance :

*[Science] makes me think of something I am very interested in but that makes me feel tiny. (...) It makes me think of "Science et Vie Junior" because the normal "Science et Vie" is too tough for me<sup>21</sup>*

*Ça évoque quelque chose qui m'intéresse fortement mais où je me sens tout petit (...) Ça m'évoque "Science et Vie Junior" car le "Science et Vie" normal, il est trop costaud pour moi..*

*Science : the study of phenomena I don't necessarily master.*

*La science : étude de phénomènes que je ne maîtrise pas forcément.*

*[The host in La Marche du Siècle started by saying that the aim of the programme is to popularise science] Saying so at the beginning maybe means : "anyhow, we can't speak like we do among ourselves because you wouldn't understand". I don't know if it is very positive to say so.*

*Le dire d'entrée ça veut peut-être dire aux gens : de toute façon on ne peut pas parler comme on parle entre nous, parce que autrement vous ne comprendriez pas. Je ne sais pas si c'est très positif de le dire.*

*I don't like the cliché "look, she's a woman just like you" and then no, in fact, she's much more intelligent than you are. And you say "shucks". You almost end up saying "I've got a nicer car."*

*Je n'aime pas le cliché, regardez c'est une femme comme vous et puis après non en fait, elle est beaucoup plus intelligente que vous. Et on se dit "Mince!". On en est presque à se dire "J'ai une plus belle voiture".*

This sensitivity to the limits of their knowledge makes intimists reject anything that reminds them of school. La Marche du Siècle again gets most criticism from that point of view.

*[The host] is a little like an inspector in the amphitheatre, with trophies handed out at the end of the school year.*

*[JMC] est un peu inspecteur dans l'amphi, avec remise des trophées en fin de scolarité.*

*It gives me the impression that they're going back over what I didn't revise when I was at school, but that their telling me, well, there I people who do research on those subjects.*

*Ça me donne l'impression qu'on revient sur ce que je n'ai pas révisé quand j'étais à l'école, mais qu'on me dit, voilà il y a des gens en train de chercher sur ces sujets là.*

The public seated just behind the guests in La Marche du Siècle bothers the intimist :

*I, personally, prefer intimacy in science to having things spread out in front of a lot of people, so the public behind bothers me.*

*Moi, de façon personnelle, je suis plus sensible à l'intimité dans la science qu'à un déballage devant beaucoup de personnes, donc le public derrière me gêne.*

The public in Savoir Plus is much further away from the guests and does not cause the same reactions. Intimists oppose public situations to intimate ones (hence the name we gave them). What they want is a personal, face to face conversation with the scientist - the type of set-up that G. Bateson<sup>22</sup> would have called symmetric (as opposed to a complementary knowledgeable-teacher/ignorant-pupil situation). The excerpt from *Connaissance de la Science* (so criticised by the "disappointed beneficiaries") comes closest to satisfying these expectations.

*You could have been his pal, if he'd been here, and you could have asked him questions.*

*On aurait pu être son pote, s'il avait été là et on aurait pu lui poser des questions.*

*You could perfectly well be there. I think you could even take part in the discussion if you had things to add.*

*On pourrait très bien y être. Je pense qu'on pourrait même prendre part au débat si on a des choses à rajouter.*

For the intimists, it does not matter if the vocabulary used is obscure. In fact, over-simplifying is considered offensive :

*Clear, while still using scientific terms. Which means that they don't take the viewer for a fool by trying to replace one word by another. Because there are words that can't be replaced. And even if we don't know them off hand, we are quite capable of understanding them. It's a manner of respect for the viewer to say a simple sentence using scientific words.*

*Clair, tout en utilisant des termes scientifiques. C'est à dire qu'on ne prend pas non plus le téléspectateur pour un idiot en essayant de mettre un mot à la place d'un autre. Parce qu'il y a des mots qui ne se remplacent pas. Et même si a priori on ne les connaissait pas, on est tout à fait capables de les comprendre. C'est quand même avoir du respect pour le téléspectateur que de dire une phrase simple en utilisant des mots scientifiques.*

This category does not appreciate debates, considered sterile.

*What we want to know is why they got there and not the final point of divergence that means that there are different schools.*

*Ce qu'on voudrait savoir c'est un peu pourquoi ils en sont tous arrivés là et pas le point de divergence final qui fait qu'il y a différentes écoles.*

Unlike the beneficiaries, the intimists dislike what they consider to be artificial and spectacular set-ups in the programmes filmed outside the studio (except for interviews with scientists). The television institution should not be too visible.

*As long as they let her talk, explain, as long as they let her work and that the journalists are at a distance and film her, it's interesting. As soon as they make her get out of her car, take the scene a second time, it's like a school video. I find it really afflicting.*

*Tant qu'on la laisse parler, qu'elle s'explique, tant qu'on la laisse travailler et que les journalistes sont à distance et la filment, c'est intéressant. Dès qu'on commence à la*

*faire descendre de la voiture, on réessaie une deuxième fois, ça fait vidéo de collègue, je trouve ça vraiment affligeant.*

The intimists dislike what they consider to be a lack of respect for the scientists. Contrary to the intellectuals, they do not want too direct a view into the world of science. Television should be discrete.

*I don't see how they can send such badly behaved people to interview people like that;*

*Je ne vois pas comment on peut envoyer des gens aussi mal élevés interviewer des gens comme ça.*

The sequence in the PET camera is particularly criticised :

*I would have preferred to have someone explain it to me (...) I don't need to see the experiment (...) It's like a live report (...) Shorter and with fewer unnecessary things, I would have found it more interesting.*

*J'aurais préféré qu'on m'explique (...) Je n'ai pas besoin de voir l'expérience (...) ça fait reportage (...) En moins de temps et avec moins de superflu, ça m'aurait plus intéressé.*

*Science isn't a game, a box of magic tricks, you don't do tricks like that.*

*La science ce n'est pas un jeu, ce n'est pas une boîte de magie, on ne fait pas des petits tours, comme ça.*

If intimists are so sensitive to the border between ignorance and knowledge, it is because they know, through their own experience, the effort and investment that it requires to cross it. Most of them are on an ascendant social trajectory, a common situation in France where access to a higher education has become much more open over the past 30-40 years. They have probably undergone considerable social and family pressure. They know that it is not easy to acquire knowledge, nor to master the stakes of a new professional or a scientific domain. That may be why, although they are not hostile to television, they are not as optimistic about the knowledge it can bring as beneficiaries are.

At any rate, for them, the only genuine situation is direct contact with a scientist, with the person who knows what he or she is talking about. Hence their insistence that the mediator should not be an obstacle between them and the scientist. Their strong valorisation of knowledge and competence requires that the limit between what is scientific and what is not should not be erased, that scientists be shown respect. That is also why difficult technical terms are

not a problem for them : the difficulty only serves to better underscore the limit between knowledge and ignorance.

This group clearly preferred the intimate conversation between host and guest. Nevertheless, La Marche du Siècle still managed to let them relate to the scientist - in spite of the presence of a public and what they saw as a classroom set-up. In fact this programme was reasonably well accepted by all the categories, but for different reasons ! This may be in part due to the particular set-up of the studio, that can be interpreted in a number of manners. The host is alone in the centre of a semi-circle of scientists with the public forming a circle around them all. (Fig 3) It is interesting to note that the interviewees (including professionals) sometimes had trouble describing the studio and explaining who is talking to whom, since the public is behind the guests and the cameras are of course in front of them :

*[The scientist] wants to be direct with the viewer, not with the journalist. He answers the viewer. And yet, paradoxically, he turns his back. [silence] The viewer, that's us. It's television. It's the listeners.*

*[Le scientifique] a un souci d'être direct avec le téléspectateur, pas avec le journaliste. Il répond au spectateur. Alors que paradoxalement quand même, il est de dos [silence] Le spectateur c'est nous. C'est de la télé. C'est les auditeurs.*

#### **4.5 The excluded**

One person in this study and one in the 1984 one<sup>1</sup> reacted this way. First, a negative attitude towards television, accused of generating false beliefs :

*I don't think people are more interested in science than before. But because of the media and of popularisation, they **think** they are interested. They think that what television or magazines explain to them is science (...). It's not a square approach, it's popularisation.*

*Je crois qu'ils [les gens] ne s'y intéressent pas plus qu'avant [à la science] mais qu'à cause des médias et de la vulgarisation qui en est faite, ils croient qu'ils s'y intéressent. Ils croient que ce qu'on leur explique à la télé ou dans les magazines, c'est de la science (...) Ce n'est pas une approche carrée, c'est de la vulgarisation.*

But popularisation does not reach its destination, in spite of the efforts made :

*[The scientist] seems to take himself terribly seriously. That's typically the kind of fellow I really don't want to hear making theories. He seems to think he's very superior. He annoys me. The other one [the host] is always*

*playing his role, trying to put things within people's reach with his comparisons and his explanations.*

*Il a l'air de se prendre terriblement au sérieux. Moi c'est typiquement le genre de type que je n'ai pas du tout envie d'écouter théoriser. Il a l'air de se croire très supérieur. Il m'énerve, quoi. L'autre joue toujours son rôle d'essayer de mettre les choses à la portée des gens avec ses comparaisons et ses explications.*

The excluded have a characteristic way of reasoning, in a sort of logical loop, as though they were saying : "I can't understand science so if ever I do understand, it's not really science". If something is simple, it will be denied all pertinence. That is what happened with the fragment with the sequence from *Connaissance de la Science* that the intimists had liked so much. After the discussion with the scientist, the host summarised at the end of the interview :

*It's hyper-complicated, you really don't know what they are exactly talking about. (...) The conclusion he [the host] made to introduce the next part, I think it absolutely didn't summarise what I heard before. I find it so general that you get the impression that he's not talking about anything.*

*C'est hyper compliqué, on ne sait absolument pas de quoi ils parlent exactement (...) La conclusion qu'il vient de faire avec son enchaînement, je trouve que ça ne résumait absolument pas ce que j'avais entendu avant. Je trouve ça tellement général qu'on a l'impression qu'il ne parle de rien.*

The public is of some help : science is found less haughty in *La Marche du Siècle*. The public in *Savoir Plus* is thought to have been badly treated :

*Something bothered me there too, it's the people in the back in that sort of window, there. You wonder, they're just four miserable-looking ... If they're there to look pretty, they could have done without them. (...) They look bored stiff too ...*

*Il y a un truc qui m'a un peu gênée aussi, c'est les gens au fond dans l'espèce de fenêtre, là. Tu te demandes un peu, ils sont quatre pelés... S'ils sont juste là pour faire joli on aurait pu s'en passer (...) Ils ont l'air de s'emmerder aussi....*

The spectacular side of things helps too. The sequence in the positron camera was the one this person preferred, "*interactive between the studio and elsewhere*". But the spectacular aspect is appreciated in itself, independent of any efficiency in popularising science. No possible applications of science were mentioned

## **5. Conclusion :**

Among members of the general public, we have found four different readings of science programmes (plus one derived). Each one forms a coherent and recognisable constellation of very similar reactions, coming from different people. We did not find one single set of reactions, nor as many as persons questioned. These reactions depend mainly upon :

- the legitimacy recognised to television as a source of knowledge ;
- the type of memories left by their school experience.

Let us summarise schematically the principle elements of the four main readings :

1 The intellectual reading :

- television is not a legitimate source of knowledge about science
- a mediator is not desirable.

Documentary that gives an apparently unmediated view of the scientific world is the preferred form.

2 The beneficiary reading :

- television is a good source of knowledge, that is accumulated bit by bit.
- a mediator is essential and should be very present.

3 The intimistic reading :

- no particular criticism of television as a source of knowledge.
- an extreme sensitivity to what is interpreted as a reminder of school or as a suggestion that the viewer may be ignorant or unable to understand.

4 The excluded reading :

- science cannot be understood
- television is no help

That means that there is no single, ideal way of presenting science. Different strategies must be adopted for different publics. For some people, the mediation of a television host or reporter is essential, protecting them from an unfamiliar world. For others it is unacceptable. A clearly defined didactic situation where the knowledge differential between the viewer and the scientist or the TV host is underscored can be happily accepted by one category, rejected by another. Behind these differing reactions to form, we can see different relations to the media, different expectations of science, and even different ideas about what the popularisation of science can mean : transmission of practical, every-day knowledge, or the chance to meet a scientist close-up. All these different expectations, different relations to knowledge must be taken into account to understand the success - or failure - of science on television.

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<sup>1</sup> One of the author's took part in a study of their reception, in 1984. Eric Fouquier et Eliséo Véron, *Les spectacles scientifiques télévisés. Figures de la production et de la réception*, Paris, La Documentation Française, 1985.

<sup>2</sup> Véron, E. "Il est là, je le vois, il me parle", Paris, *Communications*, 38 : 98-120, 1983.

Véron, E. "Le séjour et ses doubles : architectures du petit écran", Paris, *Temps Libre*, 11 : 67-78, 1985.

<sup>3</sup> Shinn, T. et Whitley, R. (eds.) *Expository science : forms and functions of popularisation*, Reidel Publishing Co., Sociology of the Sciences Yearbook, 1985.

<sup>4</sup> Nelkin, D., *Selling science. How the press covers science and technology*, N.Y., Freeman & Co., 1987.

<sup>5</sup> S.M. Friedman, S. Dunwoody and C. Rogers (eds.), *Scientists and Journalistes*, The Free Press, New York, 1986

<sup>6</sup> Evered, D. et O'Connor, M. (eds.), *Communicating science to the public*, Chichester, John Wiley & Sons, Ciba Foundation Conference, 1987.

<sup>7</sup> Newcomb, H., (ed) *Television : The Critical View*, New York, Oxford University Press, 4th ed., 1987.

<sup>8</sup> Weiner, J., "Prime time science", *Sciences*, septembre : 6-13, 1980 ; Gerbner, G. et al., "Scientists on the TV screen", *Society*, mai-juin : 41-44, 1981 ; LaFollette, M. "Science on Television : influences and strategies", *Daedalus*, fall 1982 : 183-197.

<sup>9</sup> A. Hansen (ed.), *The Mass Media and Environmental Issues*, Leicester University Press, Leicester, 1993. See in particular the chapters by Simon Cottle, Mediating the environment : modalities of TV news and by John Corner and Kay Richardson, Environmental communication and the contingency of meaning : a research note.

John Corner, Kay Richardson and Natalie Fenton, *Nuclear reactions : Form and response in public issue television.*, John Libbey, London, 1990.

In C.J. Hamelink and O. Linné, (eds.) *Mass Communication Research : on Problems and Policies. The Art of Asking the Right Questions*, Ablex, Norwood, 1994 a chapter by Anders Hansen and Olga Linné : Journalistic Practices and Television Coverage of the Environment : An International Comparison .

<sup>10</sup> Allemand, E. "L'information scientifique à la télévision", *Anthropos*, 1983, Berdot, F., "Le spectacle des sciences à la télévision", *Éducation et Société*, 5 : 168-173, 1984, Jacquinet, G., "Des images et des sons pour faire savoir, ou les formes audiovisuelles de la vulgarisation scientifique", dans : Daniel Jacobi et Bernard Schiele, *Vulgariser la science. Le procès de l'ignorance*, Seyssel, Champ Vallon, 1988, Leblanc, G. "La science comme fiction : l'audiovisuel scientifique", *Bulletin du CIRTEIC*, Lille, n° 10, "L'information télévisée", 1989

<sup>11</sup> Schiele, B., *Incidence télévisuelle sur la diffusion des connaissances scientifiques vulgarisées*, Université de Montréal, Thèse, 504 p., 1978.

<sup>12</sup> Devèze-Berthet, D., "L'information scientifique et technique à la télévision française : quelle fonction sociale ?", *Études de radiotélévision*, RTBF, n° 33, 1984 ; Leicheitner, L. "Science et télévision, bilan d'une expérience", *Études de radio-télévision*, RTBF, n° 38, 1986 ; Neil, R. "La science à la télévision : comment brancher le téléspectateur", *Études de radio-télévision*, RTBF, n° 33, 1984.

<sup>13</sup> Véron, E. *La sémiologie sociale. Fragments d'une sociosémiotique*, Paris, Presses Universitaires de Vincennes, 1988.

<sup>14</sup> The Nobel on First Page : The Nobel Physics Prizes in French Newspapers S de Cheveigné and E. Véron, *Public Understanding of Science* 3 (1994) 135

<sup>15</sup> Veron, E., 1985, L'analyse du contrat de lecture : une nouvelle méthode pour les études de positionnements de supports presse, in *Les Médias. Expériences, recherches actuelles, applications*, (Paris : IREP), pp. 203-230 and Véron, E., 1988,

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Presse écrite et théorie des discours sociaux : production, réception régulation, in La presse. Produit, production, réception, (Paris, Didier Erudition), pp. 11-25

Veron, E., 1992, Reading is doing : Enunciation in the Discourse of the Print Media, Marketing Signs, 14-15

<sup>16</sup> Metz, C. "L'énonciation impersonnelle ou le site du film", Meridiens Klincksieck, 1991

<sup>17</sup> For brevity, we sometimes "personnify" the attitude. It must be remembered though that a given person could have different attitudes to other objects, that we are describing readings of a set television texts, not people.

<sup>18</sup> The interviewee was right, the sequence in the PET camera was pre-taped and presented as though it was on direct, with the reporter in the hospital "answering" F. de Closets. No-one else made the remark.

<sup>19</sup> French and, I believe, international reporter were taken in by a false massacre in Timisoara

<sup>20</sup> si " le discours des scientifiques s'éloigne", il doit "ramener le débat"

<sup>21</sup> "Science et Vie Junior" is the version for children (from about age 10 up) of "Science et Vie", a popular science magazine.

<sup>22</sup> Where the two partners have equivalent status, as opposed to a complementary exchange such as the pupil-teacher relation. G. Bateson, 1973, Steps to an Ecology of Mind, (London : Paladin Granada).

Bateson considered true exchanges, but the same distinction can be applied to the relation between enunciator and addressee in the media. See E. Véron, "Quand lire c'est faire : l'énonciation dans le discours de la presse écrite", *Sémiotique II*, Paris, IREP, 1984, pp. 33-56, and "L'analyse du contrat de lecture : une nouvelle méthode pour les études de positionnements de supports presse", *Les Médias. Expériences, recherches actuelles, applications*, Paris, IREP, 1985, pp. 203-230 ; The Nobel on First Page : The Nobel Physics Prizes in French Newspapers S de Cheveigné and E. Véron, *Public Understanding of Science* 3 (1994) 13