

Science in Audiovisual Media

Production and Perception in Europe

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Audio Visual Science Audiences



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Preliminary remarks

Wherever you look, the presence of science in the mass media is usually judged negatively by observers: what there is in radio and television, also in newspapers and magazines, is too little, too superficial, too distorted and reaches only small audiences. The prevalent view on the current state of science in media was - and is - focused on its shortcomings, often coupled with gloomy predictions regarding its future development. The disbandment of entire science departments (as happened recently with the American news broadcaster CNN) is cited as an example to illustrate or even to document the expected decline (de Semir: 2010).

A good example of this attitude from the past is a welcome for a new TV programme from the editor of the journal "Science", who - after mocking some former science TV programmes - hoped that the new coloured broadcast programme would find "a way to interest and entertain a mass popular audience without distorting the aims and spirit of science" (DuS 1956: 963).

This spirit has also influenced how research about science in media has been conducted. The search for, and analysis of, several kinds of distortions in media representations has been a topic of media research since its beginning in the USA at the end of the nineteen sixties and remains influential today (see Kohring 2005 for a survey). For instance, León (2006; 2008) analysed the share of science content in the evening news in Germany, Spain, Italy, France and Great Britain. He found an average share of 2.37 per cent of science news was broadcast in prime time news, and questioned whether or not this could be considered to be low when taking into account the expressed interest of the audience as indicated by the latest Eurobarometer survey, where 45.3 percent stated that they wanted more information about science.

Regardless of whether or not the expressed wish for more information about science and technology can be linked to the coverage of science in prime time news shows, and regardless of whether or not TV producers really need help from academic researchers to assess what their publics want, it is decisive that the reasoning around the question, "how much science is enough?", leads the author away from explaining the differences between the countries in the share of airtime dedicated to science news. These differences may shed light on the variation between "news cultures" or may facilitate a better understanding of what actually determines the selections made by mass media in a specialised area like science on a macro level. León's approach is science centred, he is not interested in illuminating factors from within the media system that enable and influence media representations of the world in general and science in particular. Such approaches, which dominated the whole research branch until the middle of the nineteen nineties, have been criticised as being theoretically misled - or even misguided. The criticism stems from the sense that media research has seldom tried to study science journalism from a media perspective, in order, for instance, to illuminate systematic structural constraints in the reconstruction of science by the mass media (Kohring 2005: 222).

The problem with accounts and predictions, which we referred to above, is not that they might be wrong. Rather the problem is that it cannot even be assessed how accurate these appraisals and fears are. How much science is enough? How much distortion is tolerable? How many science departments should there be? How big should the audience be? There is no acceptable point of reference to answer these and similar questions that would enable a discussion of their appropriateness. Those who would like to see at least two science items daily in the main television newscast, would not evaluate the situation positively anywhere in Europe. But those with that expectation would need to state what reference the evaluation was based on, that there ought to be two news items, and not three or one.

Attempts have been made very rarely to first gain an understanding why mass media treat science the way they do. However, it is difficult to provide a well-founded appraisal of the current state and the future of science in audiovisual media, if what actually influences the presence of science in the public is unknown.

Comparisons across countries can provide insights into the reasons for the volume and structure of science coverage and its reception by European audiences. If you saw two science news item in a prime newscast in Great Britain every day, but none in Bulgaria, Germany or Sweden, you would have a suitable initial point of reference that allows you to say that the number of science news item in the British newscast is *relatively* large. If you find meaningful differences in the size of the audience, science in audiovisual media reaches, you had a reason first of all to wonder. That then provides a starting point to question why this happens to be so.

The assessments that follow are based on such comparisons. Because only through a comparison between countries, analysing their similarities and differences, can an assessment finally be made about the decisive factors in the further development of science in audiovisual media. Before this can be addressed in more detail, it is necessary to make important distinctions that are able to differentiate the wide field of science in audiovisual media in an appropriate way.

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Chapter 1

Profiles of specialised programmes on science in audiovisual media in Europe

Summary

This chapter attempts to outline the overall structure of specialised science programmes in radio and television in selected EU member states. First, 661 programmes in 13 EU member states are categorised in six programme types: Information, Popularisation, Edutainment, EduPop, Advice and Advocacy programmes. The contents of 235 television and radio programmes in nine EU countries are further analysed according to some basic characteristics. Some of the key findings of each programme type can be summarised as follows.

29 percent of the 661 programmes are categorised as Popularisation (typically documentaries) which make this programme type the most common in our sample. The share of lengthy productions within this category is much higher than in other programme types. Productions focus more on humanities subjects and they are more often co-produced or traded than programmes in other categories. Programmes in this category are not as often integrated into a fixed programme format as the ones in other categories.

Advice programmes (17%) which, for example, give advice on healthier living or how to save energy, include more “ordinary” people than all other programme types. Selection of the topics is guided by the necessity to provide audience with practical tips. Topics are prompted by the everyday experiences of the audiences.

Edutainment programmes (16%) typically provide scientific explanation for everyday phenomena like why one gets wet more quickly in the rain when running. However, scientific explanations are typically only a minor part of the programme and personalities such as artists or sportsmen often dominate the scene. The agenda is not guided by the observations of sciences but by the aim to educate and entertain the audiences.

Typical examples of Information programmes (12%) are science news broadcasts which are characterized by short preparation time and specialization in observation of current event within the science system. The thematic focus is on a scientific discipline more often than in other programme types.

Advocacy programmes (8%) do not typically focus on happenings within the science system, but on those stemming from other social systems, especially politics. Compared to all other programme types, advocacy programmes are characterised by a higher share of politicians, members of interest groups and economists as main social actors. Environmental protection is a central topic in this programme type.

17 percent of all science programmes in the sample cannot be classified to any of the mentioned categories. These EduPop programmes are typically characterised by a combination of the elements of popularisation and edutainment.

Classification of programmes on science by type

It is notable that attempts at categorisation of science in media – if undertaken at all – consist of classifying what image of science is depicted or what type of science is prevalent. Michael Haller (1999; 2008) and Hans Peter Peters (1994; 1998) have presented such typologies. According to these, science reports can be differentiated into:

- those in which science is the real subject matter and in which scientific findings are popularised,
- those that use scientific insights to explain everyday phenomena or social problems, or offer orientation in a complex situation (how big is a risk of infection, or how to eat healthily etc.), in which science appears as a service provider,
- those that problematise scientific findings or the pursuit for scientific findings, in which the focus is on scientific methods.

These suggestions for classification are characterised by their science-centricity, in the sense that the classification are guided by a picture of science or a “type” of science. There is less focus in these classification attempts on journalistic constraints that arise from the dependency on a large, non-specialist audience for journalism. They are therefore ill-suited to structure the variety of journalistic perceptions of science, because journalism does not organise its perceptions according to the image of science that develops, or with regard to the prevalent type of science (Kohring 2005).

Mass media in general are guided by the necessity to gain attention for their products (Luhmann, 1981: 318). Attention given to statements depends on their informational value. A statement is only then informative if it is “new”, i.e. if it was previously unknown to the recipient (Ott, 2004). Attention also depends on the relevance to the recipient. Only that which is informative and relevant can gain attention (Merten, 1973). The particular functionality of science in media for recipients, which the term relevance in this context refers to, is fairly ill defined. The functionality of science in media for recipients has certainly more than just one single dimension. We will discuss this again later, and clarify what European media users regard as relevant for them in regard to science in audiovisual media, especially in regard to science in TV.

Accordingly, all science programmes face the task of regularly sending informative and relevant messages to their audience. The word “regularly” is of vital importance here. It refers to the fact that science in media must be understood as outcome of an *organised* production of informative and relevant messages on science.

We distinguished empirically five different ways to produce such messages regularly. The distinctions were mainly led by two categories, which set the relevant frame of how to organise the regular selection and production of informative and relevant messages on science:

- A) The time between when a topic became publicly known and its actual appearance in the media. The preparation time of a media product can be short and counted in minutes or it can be long, as much as one year. The shorter the preparation time, the more likely the topic is to be informative, i.e. unknown to recipients. Accordingly, we distinguish programmes whose contents are characterised by short preparation times from those with comparatively long preparation times.
- B) The second category is more complex. It refers to how mass media actually get the topics they want to report on. We distinguished between two types of programmes: *input oriented programmes*, which mainly observe and process events from certain societal subsystems - in this context predominantly from science - and *output oriented programmes*, which do not primarily focus on happenings of a respective environment, but strive to fulfil certain functions like education or advice and to achieve certain effects like getting recipients entertained (Meier 2002: 23). The difference is fundamental and affects selection and – to a certain extent - also reconstruction of what has been selected for publication. This can be illustrated by using an example taken from word of mouth communication about movies. Imagine somebody wanted to know from his friend, who is usually well informed about interesting movies, what is being shown in the cinema these days. The friend will certainly refer to movies he watched recently and tell him briefly about those, which he thinks are most relevant for his friend. The selection is input oriented, i.e. the friend gets the topic from his observation of what is going on in the cinema and report on it without having a clear idea why his friend needs this information. This influences the way he is talking about a selected movie. Imagine instead somebody fell in love recently and wanted his friend to tell him what was the most moving love story ever told by a movie, his selection of a movie and the way he responds are guided by fulfilling a function and achieving a specified effect, in this case getting his friend emotionally involved in a story told by a good love movie. Both the selection and the way the selection is communicated are output-oriented. It has to be accentuated that the different orientation of programmes has to be understood as *primary orientation*. The occurrence of exclusively one type of orientation within a programme is not generally to be expected. That means that this category distinguishes programmes, which can be assessed to be primarily input oriented from those, which can be assessed to be primarily output oriented.

The application of these categories to programmes broadcast by TV and Radio leads firstly to a definition of what we call a science programme in this context. It is a programme, which is

- a) specialised on the observation of research findings or events related to the natural and social sciences, humanities or to applied sciences such as engineering and medicine (Bauer et al. 2006; Bucchi 2003) **and/or**

- b) specialised on fulfilling specified needs of their audience by linking scientific expertise or scientific findings related to the natural and social sciences, humanities, or applied sciences such as engineering and medicine with societal, political, economical or everyday topics (Hijmans et al. 2003).

The term “specialised” refers to the extent of the processing of scientific information. A specialised programme in this respect mainly or exclusively selects and processes science contents in one of the mentioned ways. A programme like an evening newscast, in which research findings may also be broadcast from time to time, cannot be categorised as specialised on the observation and timely processing of science as news. Hence, it is not a specialised programme.¹

By applying this definition, we have identified 661 radio and TV programmes in 13 European member states², which can be categorised as specialised on science. These programmes were broadcast between April 2007 and May 2008 on channels, which together reach a national market share of 85 per cent.³

Secondly, the two mentioned categories enable an empirical distinction between five different ways for programmes to be specialised in the production of informative and relevant science content. The distinctions are based mainly on an assessment of the primary orientation of a programme and the preparation time, but these main categories were supplemented by a thematic specialisation where applicable. The categorisation was based on descriptions and/or topic lists of programmes available in the internet.⁴ In order to validate and qualify the classification by type further, we conducted in addition a content analysis of a sample of 235 TV and radio programmes (36 per cent of all programmes) that were broadcast in nine⁵ of the 13 countries. Two typical episodes of each sampled programme were analysed in detail and this approach resulted in the analysis of 1370 individual items. This enables us to profile the programme types further by describing characteristics of the ways these programmes organise their observation of relevant environments and the selection of topics and how they reconstruct their observations into media products.⁶

In Table 1 the findings of the content analysis are summarised. The first column shows the mean share of features of all sampled programmes in each category. To facilitate the understanding of what is listed in the table, we will give an example of how to read it. Row 2 reports the average number of items in all science programmes within the sample. On an average, the 235 programmes in our sample consist of 2.85 individual items. The first programme type we named “Information Programme” on science. To qualify, if and how much the mean differs from type to type, we used a scale of seven points, ranging from triple plus to triple minus. Zero was used to express, that the mean within a programme type category conforms to the mean of all programmes. The first row accordingly documents that information programmes, advice programmes and especially advocacy programmes on environment consist on average of more than three items per episode.

Table 1.1: Comparison of characteristics of different programme types (item level) specialised on science (N=235)

	Mean	Information (N=55)	Popularisation (N=39)	Edutainment (N=40)	EduPop (N=32)	Advice (N=52)	Advocay (N=17)
Length of programmes (in minutes)	42	o	o	o	+	o	--
Number of items per episode	2.85	+	--	o	o	++	++
Lengths of items							
Number of items 0-7 min	.4789	++	--	o	-	++	+++
Average in %							
Number of items 8-20 min	.1389	o	--	-	o	o	--
Number of items longer than 20 minutes	.3822	--	+++	o	+	-	---
Thematic focus							
Science	.6830	+	+++	o	o	o	---
Related areas	.2144	o	--	---	o	+	+++
Other than science	.1025	-	---	+++	+++	o	o
Number of features with link to methodology	.4775	o	+++	---	-	o	o
Specification of scientific theme							
Natural sciences	.7115	o	+	-	o	++	--
Engineering	.1056	o	o	o	o	++	-
Medicine	.2538	-	-	-	-	+++	---
Other natural sciences	.3521	+	++	o	+	---	o
Social sciences and humanities	.2703	+	+++	o	o	--	--
Social Sciences	.1310	o	o	+	o	-	o
Humanities	.1393	+	+++	--	-	---	---
Main Actors							
Scientists	.6542	+	+++	---	o	o	--
Members of interest groups	.0514	o	-	--	o	o	+++
Politicians	.0599	o	--	-	o	--	+++
Economists	.0450	-	o	-	o	o	++
Ordinary people	.3036	--	-	+	-	+++	--
Other	.0803	o	++	++	--	--	---
Genres							
News Reports	.2666	++	---	--	-	++	++
Interviews	.2393	++	-	---	--	+++	-
Colleague talks	.0553	+	+	--	+	--	+
Comments	.0232	-	o	---	o	---	+++
Documentaries	.2448	--	+++	+	++	---	--
Lectures/Monologues	.0278	o	+	+	-	-	--
Other genres	.1340	-	--	+++	-	o	o
Prompts							
Everyday experience	.2379	--	---	++	+	++	-
Known Societal problems	.0829	o	+	--	o	o	++
Series/own investigation	.0697	-	+++	o	o	---	o
New Events from Science	.1301	+++	---	---	--	o	---
New Events others	.1595	+	--	o	---	+	+++
New societal problems	.0420	o	o	-	o	o	+
Not identifiable	.2556	--	++	o	+	--	-

In the next paragraphs, we are going to report and qualify the classification of the 661 programmes identified by referring to the analysis conducted on the programme level, which is supplemented by our findings on the item level.

1. Programmes characterised by short preparation time and primary input orientation

These programmes tend to be produced by media that are specialised in observing news from the field of science, choosing those that seem especially useful to its audience, for example because they concern many people, and processing the selected topics quickly. Another characteristic of this type of programmes is that they are to a lesser extent specialised on the linkage of relevant non scientific news items with science. This is the case when, for example, a natural disaster happens, toxins are discovered or the stock exchange crashes. To gain attention in this case, programmes are forced to gather quickly scientific background information about an event or an event's context and to broadcast it. Accordingly, features within this programme type are very often prompted by current events from within the science system. Furthermore, recent events from within other social systems or the physical world (catastrophes, for instance) more often prompt media products in this programme type than in other categories. However, these programmes usually give an argument of why recipients should be interested in what is reported. The share of features which do not mention a specific prompt are below the average of all programmes.

A characteristic of this programme type is a comparably short preparation time. This determines how the selected topics are processed. Genres, which are highly standardised like news reports are commonly used by programmes belonging to this category. The same applies for genres, which do not need a long preparation time as interviews or colleague talks, which means a dialogue between the presenter and a reporter/journalist in the studio or outside the studio.

Constraints of short preparation time are also reflected in the average lengths of the items within this programme type. These programmes more often concentrate on shorter features, not beyond seven minutes. Short preparation time, specialisation in observation of current events from within the science system and a bigger number of features per episode compared to the mean of all programmes implies that these programmes covers a variety of themes per episode, and their focus on themes tends to be stronger than in other programme types on a scientific discipline. This coincides with the fact, that scientists are more often main actors of the features. The comparably strong focus on science is further illustrated by the fact that ordinary people seldom appear as main actors.

Because of its close relationship to current events and the lack of a specified need to be fulfilled by these programmes, we will call this type of specialisation "Information on Science". The programmes showing this specialisation we simply call "**Information Programmes**" (on Science). 12 per cent of all 661 radio and TV programmes identified in 13 European member states belong to this category.

2. Programmes characterised by long preparation time and primary input orientation

These programmes tend to be produced by media specialised in taking on stories, which, when seen in isolation, are not new in a chronological sense but belong in the wider context of scientific fields and condensing these stories into new messages. This is the case, for example, in reports about the birth of black holes, the origin of humankind, the history of the theory of relativity, in other words, more or less big themes in science. They attempt to offer deeper insights into fields of science that would otherwise be closed to wider publics. Accordingly these programmes are characterised by long preparation times and are forced to concentrate on a focal theme approach. This kind of programmes faces a completely different problem from that of Information Programmes.

The main problem lies not in the selection of relevant scientific news and a quick reconstruction, but in the development of communication techniques which seek to have the media user engage with a topic relatively intensely. Generally this type of programme has no convincing answer to the question of why a media user should engage with relativity theory, black holes, the Egyptians or human evolution today of all days. Accordingly, what prompts the selection of topics in this programme type is very often not identifiable or must be assessed as being the result of own investigation of producers or the selection can only be explained by its integration into a series (a series of six programmes about human evolution, for instance).

Additionally, this type of programme needs more airtime and demands more attention that is in short supply, than a concise report. The share of lengthy productions within this programme type category is much higher than in all other programme types. Two third of items within this programme category are longer than 20 minutes. The vast majority belongs to the genre “documentary”.

Especially on television, this form of relaying information can be seen as an effort to depict science as a fascinating journey to the frontiers of knowledge or as an adventure. This is sometimes even evident in the title of relevant formats. One of the most common means to spark and kindle fascination in the course of the reception is to create a reconstruction of the actual process of finding, to retell wrong turns that were taken, to depict scientists like the hero of a drama. The dramatic arc in this case is generated through asking questions that are supposedly unanswered. In the course of the programme the raised questions are addressed and answered, which creates the impression of witnessing the solving of a mystery. What creates the fascination here is either the sensational property of a question or the sensational way in which answers are found, or both. This produces an adventure-like character that is to a certain extent typical for these formats. Accordingly, this programme type has by far the highest share of items which include information about scientific methodology.

Even more than information programmes the thematic focus of the items within this category is on science, the content can clearly be linked to the formal production of scientific knowledge within disciplines and scientists act far more as main actors as in other programme types, which corresponds with what has been said about the important role scientists play in the narratives developed. Thematically, this programme type focuses more often than other programme types on humanities, i.e. predominantly history and archaeology, which has been classed to humanities. We will come back to this characteristic in detail later.

Because this type of programme is specialised in the neat relaying of scientific insights, we will call it “**Popularisation Programme**”. 29 per cent of 661 science programmes sampled belong to this programme type category.

3. Programmes characterised by long preparation time and primary output orientation (getting recipients educated and entertained)

Programmes can also specialise in using unheard-of scientific explanations to enrich people’s experience of things that are, in a broad sense, part of their realm. This type of programme often answers questions such as why the sun goes down, why one gets more quickly wet in the rain when running, what happens if one places a broom stick into a specially prepared blender or sticks one’s head into a bubble of helium. The selection of topics is unlike information and popularisation programmes not at all guided by happenings from within the science system.

These programmes face the task of delivering surprising connections between everyday phenomena and scientific explanations and presenting those explanations in a popular way. Accordingly, features of programmes belonging to this category are more often prompted by people’s realm of experience. The selection of topics, therefore, is hard to organise for media professionals. The selection cannot be guided by the observation of sciences or other social systems, instead selection processes are guided by a programme’s specified need, the need to get recipients educated or specified effects such as getting recipients entertained. This is the main reason why many of the programmes of this type involve recipients in getting the topics to be explained within the programme. The regular selection of topics would certainly often overburden the creative capacities of media institutions.

Programmes of this programme type are characterised by a relatively high share of items that show no link to science at all, i.e. scientific explanations are often only one part of the whole programme. Scientists act less often as main actors, and other people like singers, artists or sportsmen dominate the scene more often than in any other programme type.

Accordingly, selections of these programmes are frequently not processed in ways that can be grasped by referring to journalistic genres. We will call this type of programme “**Edutainment Programme**” because of its primary outcome orientation, which targets education or entertainment of recipients or both. 16 per cent of 661 sampled science programmes belong to this programme type.

4. Programmes characterised by short preparation time and primary output orientation (advising recipients on health and technology issues)

Programmes of this type specialise primarily on giving advice on how to live more healthily or – for instance - how to save energy in a household with the help of a new technology available on the market. Selection of topics and processing of the selections are primarily output oriented in these programmes, selection and reconstruction are guided by the necessity to provide recipients with clear and unambiguous tips. Topic selection is more often prompted by people’s realm of experience. But this programme type shows also some characteristics of input oriented programmes. The science system is observed to get topics that are considered useful for the needs and effects envisaged by these programmes. Observations do not primarily focus on happenings within the science system, but on those stemming from the healthcare system or the market for new technologies. This is reflected by the fact that a higher share of features is prompted by observation of happenings in systems other than science.

This programme type broadcasts a variety of short features, predominantly news reports and interviews. This underlines that these programmes are characterised by a short preparation time. Due to its primary orientation, ordinary people act more often than in all other programme categories as main actors, explaining health problems and/or asking for advice.

Due to its primary output orientation, we call these programmes “**Advice Programmes**”. The selection of these programmes was restricted to those specialised on health and technology/computers. 17 per cent of 661 sampled science programmes belong to this programme type category.

5. Programmes characterised by short preparation time and primary output orientation (protecting the environment)

The last programme type is characterised by a short preparation time, which determines similarities to information programmes and advice programmes regarding the number of features in an episode and their length and – to a certain extent – also the way, the selections are processed by these programmes. News reports are somewhat over-represented in these programmes.

Compared to information programmes and advice programmes these programmes focus less on happenings in the science system than on those in other social systems. According to the main social actors involved, happenings in politics in particular prompt features more often than in other programme types and these programmes are characterised by the highest share of politicians, members of interest groups and economists appearing in the programmes. Thematically, these programmes focus on environmental issues, which has classified as being science-related.

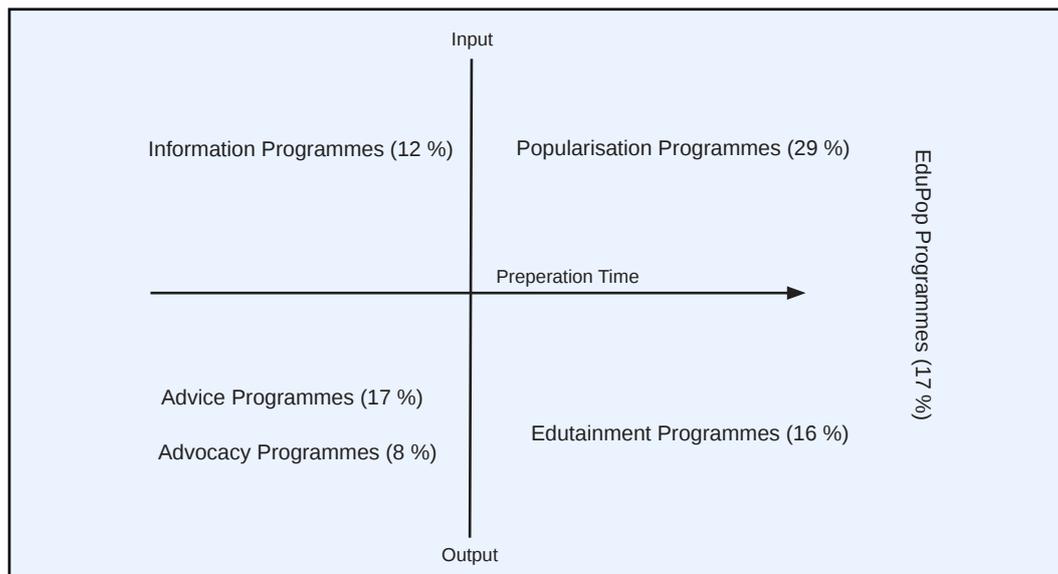
Similarly to advice programmes this programme type has characteristics of input oriented programmes, but is classified as primarily output oriented due to the centrality of fulfilling a specified need, which is the societal need of environment protection. We argue that selection and reconstruction of scientific information, although input oriented to a certain extent are clearly guided by this need. These programmes process their selections more often as comment than any other programme type. This genre is of no importance in all other programme type categories. Due to the centrality of environment protection, we call these programmes “**Advocacy Programmes**”. 8 per cent of 661 sampled science programmes were identified as belonging to this programme type.

6. Programmes characterised by long preparation time, which show both input orientation and output-orientation

17 per cent of all 661 science programmes were not classified to one of the mentioned categories. Programme descriptions and topic lists available in the internet were not sufficient to decide, to which of the categories these programmes belong. They are characterised by a long preparation time and a combination of popularisation and edutainment. They obviously represent a mix of output and input orientation, which is underlined by the outcome of the content analysis. In the following chapters we will call these hybrid programmes “**EduPop-Programmes**”.

The following graph summarises the categorisation and distribution of the 661 science programmes, broadcast in TV and Radio between 2007 and 2008 in 13 European MS. The distribution shows that input and output oriented programmes are equally distributed, 41 per cent of programmes are either input or output oriented. Programmes which are characterised by long preparation times represents the majority of programmes. Almost two thirds of all programmes, specialised on science in one or another way, do not reconstruct science as news.

Graph 1.1: Categorisation and distribution of science programmes in 13 European MS (N=661)



Before continuing the exploration of programme types, we need to clarify what these programme types actually represent in our approach. We argue that what is reported by science programmes can neither be understood as a reflection nor as a distortion of what is going on “out there”. Instead, what is seen on the screen or heard on the radio reflects the practices of workers in the organisations that produce this content (Fishman 1982: 220). These practices are organised in the sense that a media professional who acts as a member of an organisational unit like a newsroom, cannot act professionally in any way he or she sees fit. Professional action is generally embedded and it is led by decisions that enable the perception and reconstruction of the world by media professionals through the reduction of hyper-complexity (Rühl 2002: 318). The different programme types stand for key decisions, which determine what actually can be selected and which determine how the material selected can be processed by a programme. The decision for or against broadcasting a particular programme type is key, since it has far reaching consequences. If a TV channel decided not to broadcast any information programme on science, including regular reports of science news, the channel has no need to accumulate expertise in observing and processing scientific occurrences as news. The “typification” (Tuchman 1973:116ff) of an occurrence by media professionals working in such a channel would transform a science news event automatically into a non-event (Fishman 1982). If a whole country lacks information programmes in TV, scientific news of any kind has only a very small chance of becoming public via TV, however intensively professional PR workers within scientific institutions may work on it. And – more importantly - scientific news have no chance of being selected and processed by media professionals who are specialised in observing and processing new scientific findings. The channel in such a case simply lacks organisational structures, which enable the perception and timely reconstruction of what is going on in the science system. The channel has to be assessed as being blind with regard to what has been typified as scientific news. This means that programme types in our theoretical framework are understood as the outcomes of decision making processes of media professionals within channels, which determines media selectivity on the programme level. We will come back to this later, when discussing the current state of science programming in Europe.

Production and scheduling of programmes specialised on science

The programme types have been profiled as distinct categories in order to develop an understanding of which *science contents* programmes can select and how they process these selections. This raises the question as to which characteristics apart from content match the choice of a certain programme type. We believe that coincidences between production and scheduling and programme types again have to be interpreted as closely related with the choice of a programme type; the choice of a certain programme type demands a certain way of scheduling and producing science content.

The decision to produce an *Information programme* implies that a programme slot is available, where these programmes can be broadcast regularly, as information programmes cannot be broadcast as single one-off production. Accordingly, information programmes more often appear daily than for other programme type categories, but weekly programmes are the most common. The close relatedness to current affairs limits the possibility to broadcast programmes only every two weeks or even less frequently. Information programmes are more often repeated more than twice within a week, which is due to the high frequency, with which new episodes are produced and the strong link to scientific news, which become outdated fairly quickly and limits the possibility to repeat the programme later. The choice of producing information programmes implies further that the programme has to be produced by the channel itself. Information programmes as a whole cannot be traded, co-productions of information programmes are very rare, even though the observed deviation is not meaningful due to the lack of cases. Instead, information programmes are comparably often taken over by other channels belonging to the same network, which means that channel networks obviously tend to make heavy use out of information programmes. Once produced they are not only repeated on the same channel, but also often taken over by other channels of the same network.

Table 1.2: Comparison of characteristics of different programme types (programme level) specialised on science (N=661)

	Distribution (in %) (N=661)	Information (83)	Popularisation (191)	Edutainment (104)	EduPop (110)	Advice (111)	Advocay (53)
Regularity							
Regular programme	52	+++	---	o	-	+++	+
Part of a serial	30	---	+++	o	o	--	o
Single programme	18	---	+++	o	++	---	--
Frequency							
Daily	12	+++	---	o	o	+	o
Weekly	68	o	o	o	-	o	o
Monthly	5	--	o	-	o	+++	~
Seldom/irregular	14	---	+++	o	+++	---	--
Reruns within one week							
Not repeated	66	o	o	o	o	o	o
One time within a week	26	o	+	o	+	o	--
More than one time	8	++	--	--	o	+	+
Production							
Own production	72	++	--	--	o	++	++
Coproduction	3	~	++	~	~	~	~
Bought in production	20	---	+++	+	o	---	--
Takeover	6	++	-	+++	-	o	

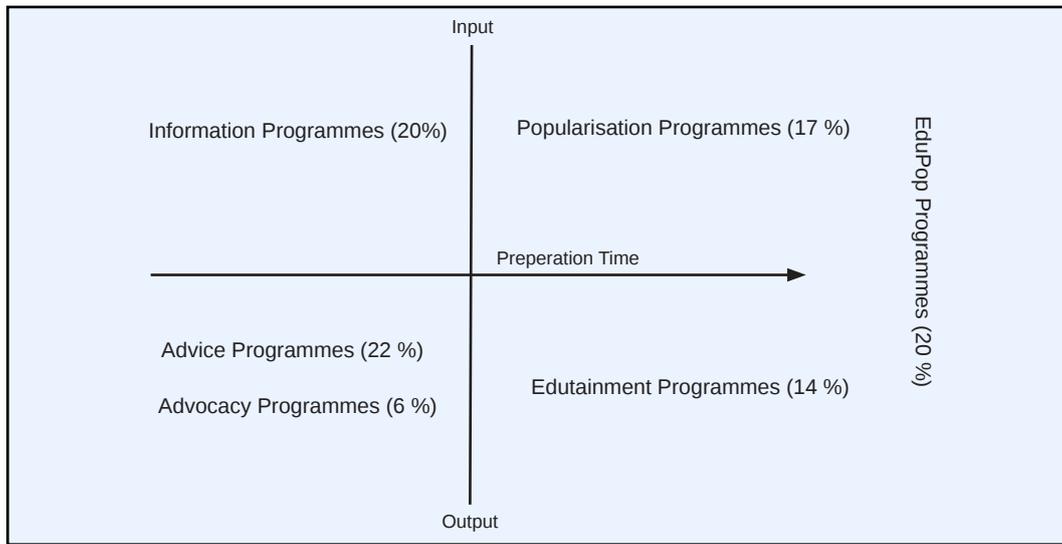
With some slight modifications, *Advice programmes* and *Advocacy programmes* show similar coincidences between regularity and production, even though daily productions are not that common compared to information programmes. All three types have to be seen as structurally similar regarding production and scheduling.

Popularisation programmes show together with *EduPop programmes* the highest share of one-off productions and both types are more often scheduled irregularly. The choice of this programme type obviously restricts the chances to broadcast programmes regularly. Popularisation programmes are particularly dominated by series, consisting of a limited number of episodes, broadcast generally weekly. Popularisation programmes are more often than others not integrated into a well profiled programme concept, which is relevant to guide audiences through media menus. A regularly scheduled programme in principle has a greater chance to be recognised and appreciated by media users than a one-off production. But integration into a profiled programme concept on the other hand would lead to a certain standardisation. It is not possible to profile a certain programme slot without restricting how the episodes are made. This means that integration into a profiled programme format, which appears regularly, would limit the potential ways of how to tell a scientific story and/or of what the scientific story is about, which in turn would limit the facility for trading these programmes internationally. Accordingly, popularisation programmes are the only programme type, where co-producing and trading plays a significant role. As far as TV productions (see below) are concerned, popularisation has to be seen as a relatively highly integrated market. Producers and programme managers tend to be internationally well connected, which is enabled by regular programme fairs for instance.

We have interpreted coincidences between both production and scheduling as practical constraints linked with the choice of a certain programme type. The most striking finding regarding *Edutainment programmes*, therefore is, that this programme type faces less constraints than other programme types in regard to scheduling. This type does not show any meaningful deviations from the mean of all programmes. Regarding production, this programme type consists slightly more often of bought-in productions and is more often taken over by other channels of the same network. But overall, the lack of meaningful deviations supports the view that edutainment programmes are fairly heterogeneous or – in positive terms – the concept of linking common everyday experiences with science provides programme makers with a lot of possibilities of producing very different programmes. Such connections can be made by a quiz show as well as a documentary, by a reality TV format such as the BBC production “Rough Science” does as well as by a public lecture.

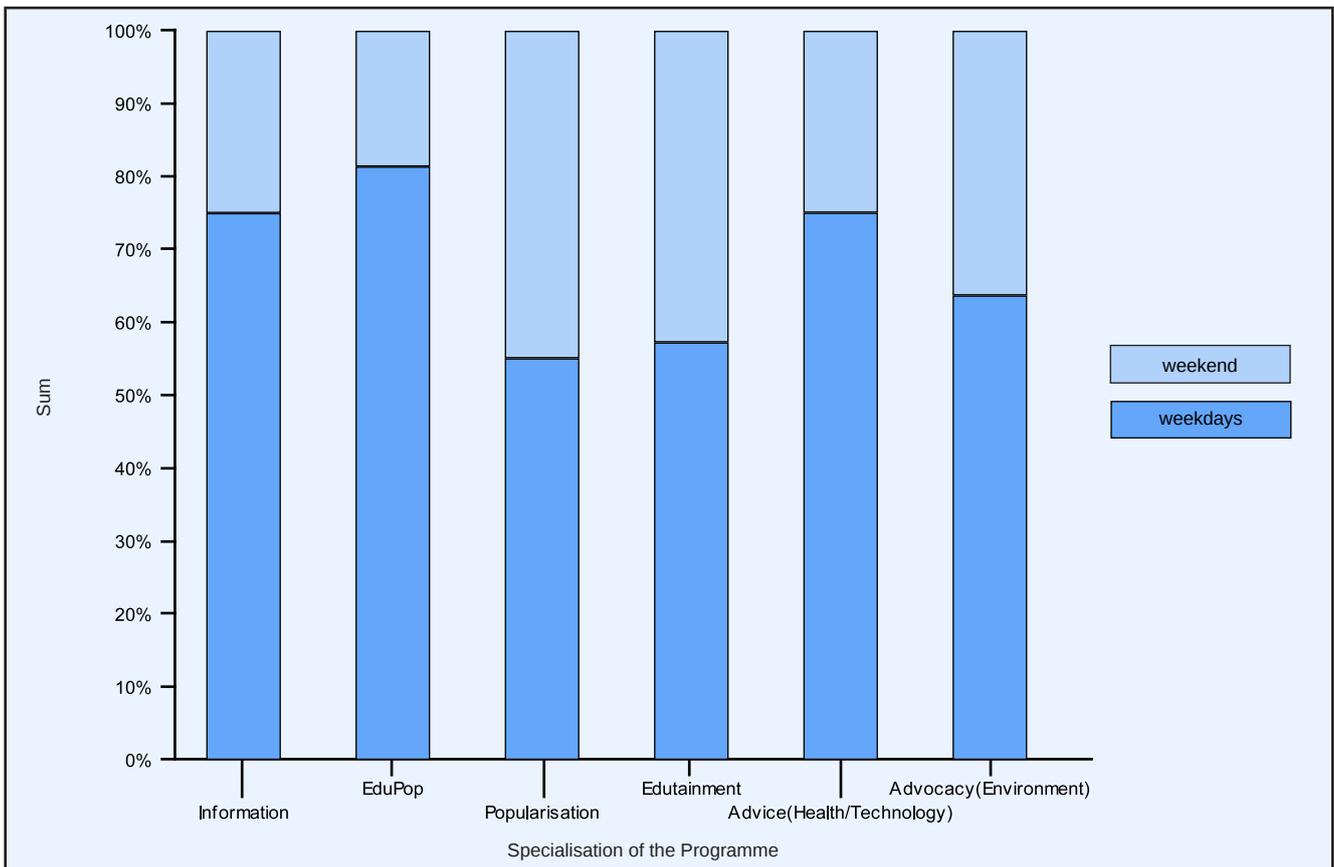
The differences regarding regularity and frequency leads to differences regarding the air time filled by each programme type. Number of programmes, regularity, frequency and lengths of programmes have been used to calculate the programme hours broadcast in an average week in 2007/2008. In sum, approximately 360 programme hours have been filled with science content in an average week in the 13 European MS studied. Re-runs have been excluded, though their inclusion would increase the number of hours substantially. Information programmes and advice programmes would fill considerably more programme hours, if re-runs were included. Although the programme types are fairly differently distributed when considering the bare number of single programmes, all programme types except edutainment programmes and particularly advocacy programmes (environment) fill a similar time span in an average week between April 2007 and May 2008. Advocacy programmes must be classified as being of marginal importance compared to other programme types. Such programmes on environmental issues have one third of the broadcasting hours within an average week than all others.

Graph 1.2: Distribution of programme hours by programme type category in an average week 2007/2008 in 13 European Countries (N=360 hours)

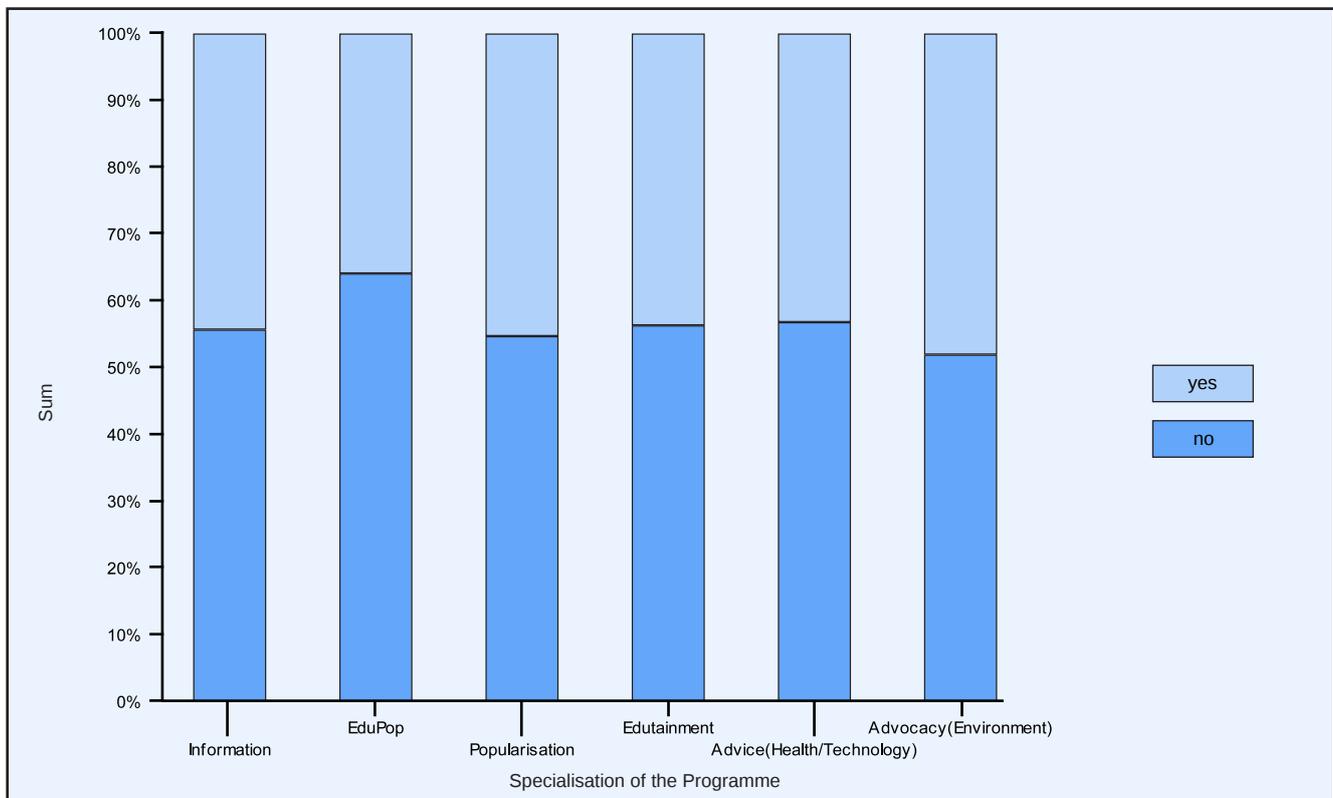


We will next explore briefly scheduling policies dependent upon the programme type category. Scheduling policies are considered to be crucial in reaching audiences. Independently of the actual content, for example, scheduling is decisive for the potential audience a programme can reach. We will compare the programme type categories by using two simple distinctions, the distinction between scheduling a programme on weekdays or weekends, and the distinction between scheduling in primetime and outside primetime.

Graph 1.3: Distribution of airtime through days in an average week 2007/2008 in 13 European MS



Graph 1.4: Distribution of airtime through time slots in an average week 2007/2008 in 13 European MS



Broadcast media tend to concentrate slightly programme hours of popularisation programmes and also edutainment programmes on weekends. These programmes have characteristics which make their scheduling on weekends more probable. We will come back to this when summarising the outcome of the analysis of 40 focus group discussions. After watching a clip from a TV science documentary, several participants pointed out that they would watch popularisation programmes in particular on weekends rather than on weekdays, since they need to be relaxed. Information programmes, EduPop programmes and to a lesser extent advice programmes tend to take air time on weekdays more than on weekends. Advocacy programmes do not show a preference.

The differences between programme types with regard to scheduling in primetime or not are fairly small. EduPop-programmes are least likely to be scheduled in primetime. Interestingly, the programme type does not appear to matter regarding the scheduling time.

We will also come back to these correlations after having conducted our next research step, which is the search for correlations between programme types and higher levels, i.e. the channel level; the medium level and the national or societal level. This research step takes into account that a decision for or against a certain programme type, i.e. the decision about how science is to be treated, is taken within a relevant media environment, which influences or determines the decision.

¹ For further descriptions, please download „Definition of Science Programmes“ from our website (<http://www.polsoz.fu-berlin.de/en/kommwiss/v/avs/Downloads/index.html>)

² Germany, Austria, Finland, Sweden, Greece, Cyprus, Bulgaria, Great Britain, Ireland, Estonia, Romania, France, Spain

³ For further information about channel selection please refer to „Codesheet Programme Analysis“ on our website (<http://www.polsoz.fu-berlin.de/en/kommwiss/v/avs/Downloads/index.html>)

⁴ How preparation time and input/output orientation have been operationalised for research is described in detail in the „Codesheet Programme Analysis“, which can be downloaded from our website (<http://www.polsoz.fu-berlin.de/en/kommwiss/v/avs/Downloads/index.html>)

⁵ Germany, Austria, Sweden, Finland, Great Britain, Ireland, Greece, Cyprus, Bulgaria

⁶ The codesheet of the content analysis can be downloaded from our website (<http://www.polsoz.fu-berlin.de/en/kommwiss/v/avs/Downloads/index.html>)

Chapter 2

Science in media and its respective media environment

Summary

In this chapter we seek to bring the diverse European landscape of science in audiovisual media into a certain order by using our insights into relevant factors that influence the volume and structure of science in audiovisual media across Europe. We propose three dimensions as being relevant to understanding science in audiovisual media properly and according to which comparisons of science broadcasting can usefully be conducted.

- A) The segmentation of media markets, with special emphasis on TV.
- B) The degree of market forces, with special emphasis on public service TV.
- C) Tradition of science reporting in audiovisual media with special emphasis on public service broadcasting.

We believe that each of these dimensions works properly in quantitative terms, that is, we can speak about a high or low level of segmentation, a high or low degree of market pressure within public service TV and a strong or weak tradition of science reporting in audiovisual media. But it is decisive to add, and our investigation will show this, that each dimension is fairly complex and needs further qualitative distinctions. In addition, depending upon the country, some additional factors are required to make sense of the distribution of science across both TV and Radio and across programme types. It is also decisive to add that we know too little in particular about the differences in the tradition of science reporting in audiovisual media across countries. Our investigation will show that strength or weakness of a tradition in science reporting in audiovisual media is often more a plausible assumption than a fact which has been proved historically.

However, by applying these dimensions, we identified countries whose media systems show characteristics that enhance the probability that a multicoloured picture of science in media appears - these are Sweden, Finland and Germany. These countries are characterised by relatively highly segmented markets, low market pressures on public service broadcasting and a strong tradition in science reporting. They must be distinguished from those, which show a less multicoloured picture of science and are restricted especially with regard to the volume of science content broadcast by audiovisual media - these are Great Britain and Ireland. We identified countries whose media systems show characteristics that decrease the probability of the appearance of a multicoloured picture of science in audiovisual media considerably- these are Spain, Greece, Bulgaria and Romania. Finally, we identified countries, which cannot be classed convincingly in any of the mentioned groups, because their characteristics cannot be transferred into a comprehensive framework, either for lack of data or because the volume of science in broadcast is too limited. To these countries belong France, Austria and Estonia. These countries have to be seen as somewhere in between the groups identified.

Introduction

Years of media research, starting in the nineteen seventies, have shown that the selectivity of mass media, i.e. decisions taken on different levels, is not primarily due to individual biases of reporters and editors, but due to a bundle of factors that have been classified in several different ways (e.g. Weischenberg 1992; Shoemaker and Reese 1996; Dimmick et al 1982). Dimmick et al. (1982) classed individual decisions by gatekeepers to the last level (number 9) of their taxonomy in mass media decision-making, which starts with supranational and national influences (level 1), goes down to intraorganisational influences (level 6) and ends up with level 9, the intraindividual or cognitive level of decision-making. Shoemaker and Reese (1996) offer five levels, starting with individual influences and ending with ideological influences on media selectivity.

It goes without saying that such taxonomies are quite general and should not be construed to mean that influence will operate both within and between levels in all media decision-making situations. The selection of a single issue within a science programme, scheduled regularly, is unlikely to be influenced by supranational influences, societal level influences or supra-organisational influences. However, "since influence on decision making may operate at several levels of analysis, it is important to have the capability of incorporating different levels into the design of research" (Dimmick et al 1982: 18).

We have integrated three levels into our design. This is the channel level, or, using the terminology of Dimmick et al. the organisational level, the medium level, i.e. the supraorganisational level and the societal or national level. We believe, that similarities and differences located on each of these levels will help to explain why science in audiovisual media appears as it does. Our exploration is led by the premise that not every programme type can be chosen by every channel, every medium and every country with the same probability. We search for characteristics that increase or decrease the probability of science programmes being broadcast and affect which specific programme type will be chosen.

We will start our exploration with a comparison located on the national level. This is by no means due to the fact that we expect societal differences to be key in explaining differences in the volume and structure of science coverage in the media. Our exploration is led by the hypothesis that it is not primarily cultural differences between European societies that accounts for differences in science in media, for instance the image of science widely shared by the population or the general interest in science as expressed for instance in Eurobarometer surveys or even different cultures within science on communicating with the public. We believe that these characters do not contribute substantially to an understanding of media selectivity in European countries. Instead, we believe that mass media all over Europe in principle operate within their respective media environments and that differences in the media environment primarily contributes to understanding why science is treated differently in different countries.

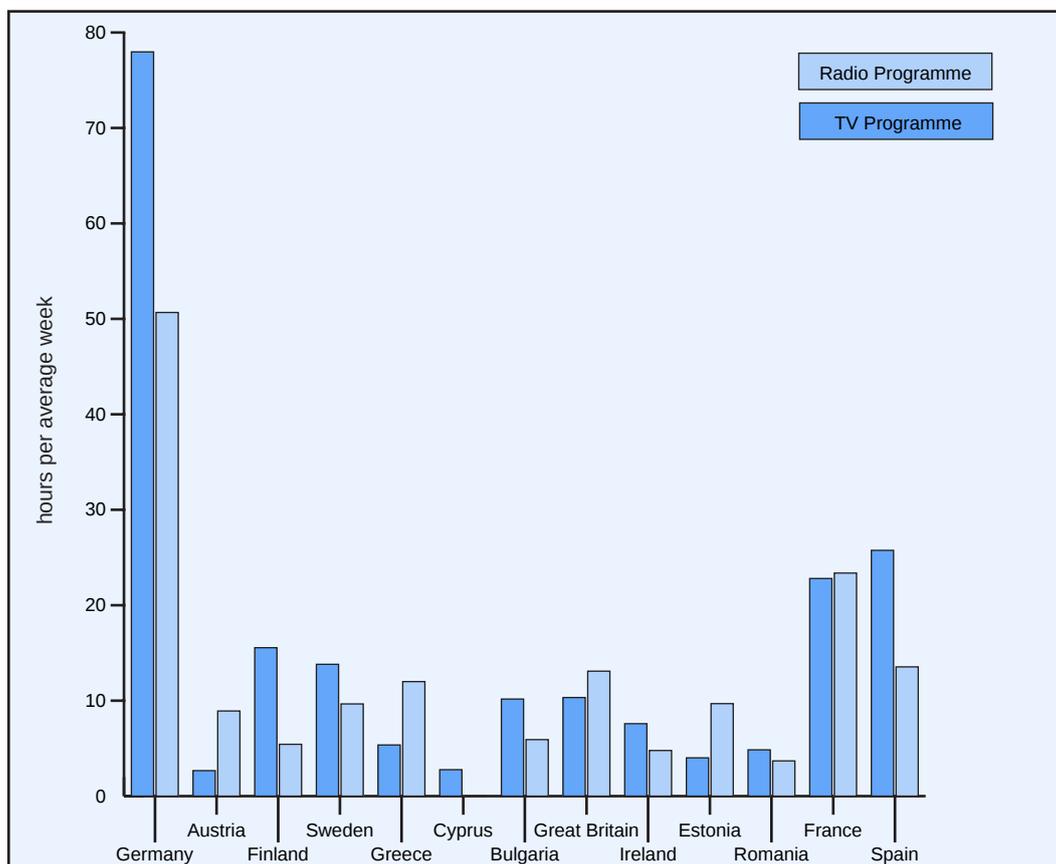
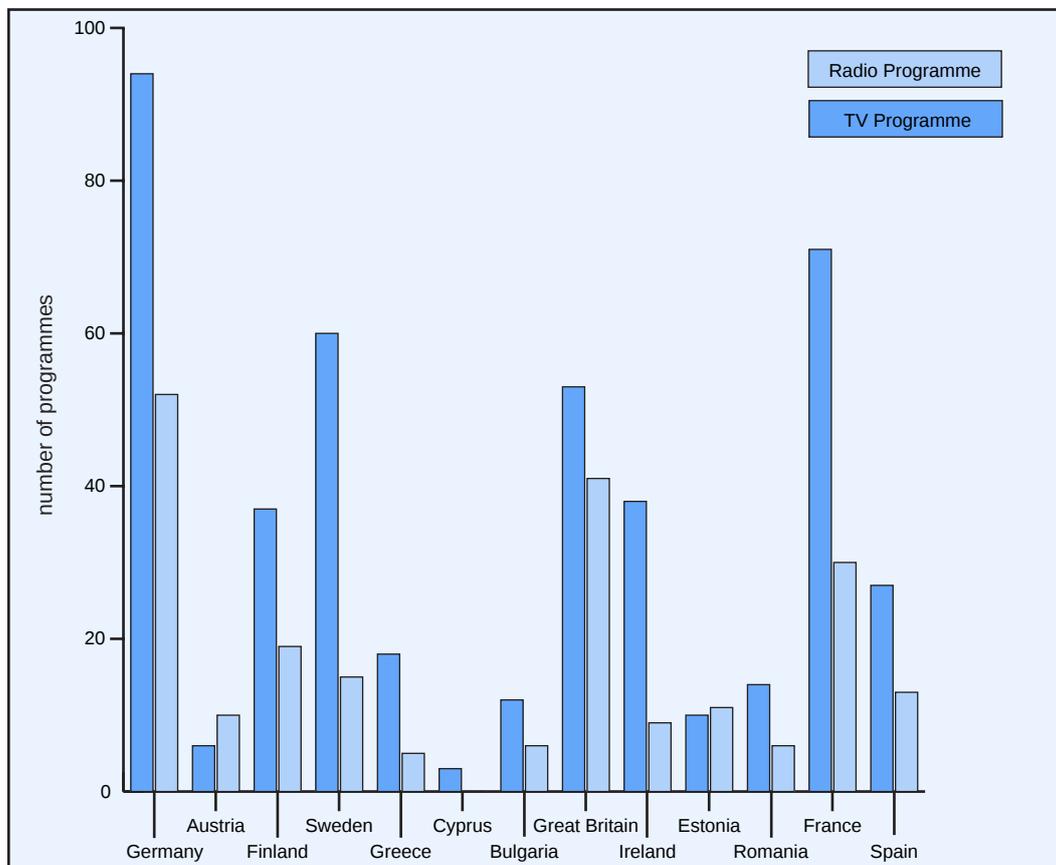
This means that we start our exploration by comparing differences on the national level, which we then try to explain by factors located on the medium and/or the channel level. If these factors are not sufficient to explain the differences on the national level, we have reasons to ask, whether or not societal differences might explain the patterns found on the national level.

Our exploration will show that borders between different levels of influence are sometimes difficult to draw, the pattern of science in media, which appears in each country, can only be explained sufficiently when taking into account all three levels together, which form a characteristic media environment, which differs from country to country. This is why we organise our investigation issue by issue rather than level by level. We will start with the explanation of differences in the extent to which science is processed by specialised units in audiovisual media.

Volume of science in audiovisual media in Europe

Science in media in Europe is not at all equally distributed across countries. We found fairly big differences between European societies. Of all 661 science programmes sampled, more than 20 per cent were transmitted by German channels, 10-15 percent each by French, English and Swedish channels, 5-10 percent each by Finnish, Irish and Spanish, and less than 5 percent each by channels in Austria, Greece, Cyprus, Bulgaria, Romania and Estonia. When comparing the broadcasting hours dedicated to science in an average week between 2007/2008, the dominance of German broadcasting is even higher. One third of all 360 programme hours is allotted to Radio and TV channels in Germany. This is due to the fact that unlike particularly in Sweden, Great Britain and particularly Ireland, regular programmes dominate the scene, i.e. programmes which are scheduled regularly (mostly weekly) across the whole year. This leads to more airtime in an average week in Germany particularly in TV.

Graphs 2.1 and 2.2: Distribution of volume and airtime of science programming across media and countries in 2007/2008 (N=661; N=360 hours)



The graphs report the distribution of science in media from the perspective of the broadcasters. This is not identical with the audience point of view, especially in TV and especially in countries which share the same language with bigger neighbour countries, i.e. Austria, Cyprus and Ireland. Due to the increasing penetration of satellite or cable broadcasters, a vast majority of households in these countries can receive German, English and Greek channels respectively. Foreign channels from Germany, England and Greece accounted 2008 for about 30 per cent market share in Austria, Ireland and Greece, in the case of Cyprus under the premise that the Cypriot sister channels of the main Greek commercial stations ANT1 and Mega are classed as being foreign channels (European Audiovisual Observatory 2009; Zehetner et al. 2007: 174).

Radio programmes on science in turn cannot necessarily be received by all national households. This is the case in Germany and is mainly due to the peculiar organisation of public broadcasting there: public service broadcasting is based on organisations that are licensed and regulated by the 15 federal states, not the national government and this has led to the establishment of seven different main public service networks, which each runs one TV channel and several (4-7) different radio stations. Although all TV channels can be received everywhere in the whole country due to the high penetration of cable, satellite or DTT, this is not the case regarding radio channels whose distribution is still restricted mainly to the federal states. A radio channel from Bavaria cannot be received by an ordinary analogue radio set in Hamburg (Kleinsteuber 2004).

As a consequence, from an audience point of view the number of programmes in TV and airtime dedicated to science is much higher in Austria, Ireland and also, to a lesser extent, in Cyprus. Similarly, radio airtime dedicated to science would be considerably lower in Germany if we had limited our focus to a national audience that can receive every science programme produced in Germany by an ordinary analogue radio set.

Table 2.1.:¹ Overview: Radio and TV terrestrial channels and public income per country

	Total	DE	FR	GB ²	ES	RO ²	GR	SE ²	AT ²	BG	FI	IE ²	EE	CY ²
Public TV Channels	45	11	4	2	6	2	3	4	2	1	4	3	1	2
Commercial TV Channels	52	7	2	3	4	12	5	2	4	6	3	1	2	3
Public TV Channels with no ads	20	9	2	2	0	0	0	4	0	0	4	1	0	0
Public TV < 5 % market share	24	9	2 ³	0	5	1	2	2 ⁴	0	0	2	1	0	0
Thematically specialised public channels (Culture/Arts/Science/Children)	7	2 ⁵	2 ⁶	0	0	0	0	1	0 ⁷	0	1	1	0	0
Comm. TV<5% market share	18	3	0	0	0	9	0	1	3	4	0	0	0	0
Comm TV 5-12 % market share	16	3	1	2	2	2	2	0	1	0	2	1	0	0
Comm. TV > 12 % market share	18	1	1	1	2	1	3	1	0	2	1	0	2	3
Public Radio Channel ¹	50	18	3	6	3	1	2	3	2	4	4	1	3	0
Public Talk Channel	30	13	3	3	1	1	1	1	1	1	3	1	1	0
Commercial Radio Channel	60	0	0	0	3	0	0	0	0	1	0	1	1	0
Commercial Talk Channel	5	0	0	0	2	0	0	0	0	1	0	1	1	0
Total Radio TV public income in Mio	17.678	7.265	2.388	4.185	1.278	512⁹	370	559	504	~	387	201	29	~

¹ Figures taken from European Audiovisual Observatory (2009).

² 85 % market share criteria not reached by TV channels in the sample.

³ France 5 and ARTE have been counted separately.

⁴ Barnkanalen and Kunskapskanalen have been counted separately.

⁵ ARTE and Phoenix are not part of the German sample, both channels reached in 2008 less than 1 % market share.

⁶ France 5 and ARTE have been counted separately.

⁷ 3sat has been classed to Germany, not to Austria.

⁸ Unlike TV, only Radio channels have been counted, where science programmes have been identified.

⁹ Figure taken from 2006.

Differences in the number of specialised programmes and the airtime dedicated to science programmes firstly reflect differences in the number of TV and radio channels, which together reach a market share of 85 per cent. The following table reports the number of channels and some important characteristics of these channels, which contribute to an understanding of the differences in the number and airtime. We report all TV channels, which were searched for science programmes, but, in order to keep our presentation as simple as possible, we count only those national and/or, in the case of Germany, “federal“ radio channels, where science programmes have been identified.

As far as TV is concerned, the differences in the number of channels mirror therefore differences in the extent to which national TV audiences have been dispersed over the last 20 years or so. Whereas in Great Britain an accumulated market share of approx. 85 percent is still reached by only four networks (BBC Group, ITV, Channel 4 and Channel 5), in Germany 85 per cent market share is spread through 18 different free to air TV channels, of which twelve reach less than five percent market share. From a producer’s point of view, it makes a huge difference whether a programme needs to reach a comparably small audience or has to address really big audiences. Hence, the different numbers of science programmes and the different airtime dedicated to science highlight characteristics of the pattern of channels, which either increase or decrease the probability of science programmes appearing in TV and Radio. In the next paragraphs we will describe differences between channel patterns across countries, which helps to understand the differences in number of programmes and airtime.

Generally, neither in TV nor particularly in Radio do *commercial channels* contribute substantially to the provision of science programmes in Europe. 14 per cent of all 443 TV science programmes were broadcast by commercial channels, in Radio only 7 per cent of 217 programmes. This is why the number of commercial channels available in a given country has usually only little effect on how many science programmes are produced. But the equation, commercial = no science at all, would be too simple.

The big exception from the general rule, Great Britain, sheds light on the fact that the relation between commercial TV broadcasters and science programming may be a bit more complex. In Great Britain, the majority of science programming both in terms of number of programmes and in terms of airtime is done by commercial broadcasters, namely Channel 4 and Channel 5. As far as Channel 4 is concerned, this coincides with its fairly unique remit, set by the Communications Act 2003, which obliges this channel to provide “high quality and diverse programming”, which includes “programmes of an educational nature and other programmes of educative value.” (Ward 2005: 1632).

Table 2.2: Science Programmes by main broadcasters in British TV between 2007 and 2008

	Frequency	Market Share 2008	Percent
Valid			
BBC1	8	22	15,1
BBC2	14	8	26,4
Channel 4	12	7	22,6
Five	18	5	34,0
ITV	1	18	1,9
Total	53	60	100,0

Whereas regulation may explain the contribution of Channel 4, it does not provide an explanation, why Channel 5, which faces, like ITV, no special remit comparable to that of Channel 4, contributes that much to the provision of science programmes in Great Britain. A particular regime therefore cannot be the only factor, which explains why especially Channel 4 and 5 do so much science programming.

We believe that an additional aspect is the market position of both commercial channels, which, according to their market shares, are placed well behind the main commercial network ITV, which does only little science reporting and which seems to be too big for broadcasting science programmes.

In Great Britain, science reporting generally is packed on all three smaller channels. This indicates that the contribution of commercial channels to science programming is not only due to regulation, but in addition mediated by their market position. Science reporting is obviously not lucrative for ITV, but it is for Channel 4 *and* Channel 5. With regard to science programming, the particular market position of Channel 4 and 5 obviously matters.

A similar pattern appears on the German market, which is apart from the market in Great Britain and in Bulgaria the only one, where commercial broadcasters contribute to an extent of more than 20 per cent airtime to what is provided. Also here, science programmes are packed on middle sized commercial channels (SAT 1; Pro 7, Vox), whose market shares are well behind the main broadcasters, especially well behind the big commercial channel RTL, which broadcasts no science programmes.

The dominance of middle sized commercial channels becomes evident when considering the distribution of all TV science programmes broadcast by commercial channels across Europe. Two third of all programmes have been scheduled by middle sized commercial channels, among which channels from Great Britain and Germany, both big European markets, dominate heavily. Spain broadcast a fairly small number of programmes, which makes it challenging to interpret their distribution through channels. But also in Spain, the only two TV programmes broadcast on commercial channels have been broadcast by LaSexta and Cuatro, both middle sized channels, which reached in 2008 an average market share between six and nine per cent (European Audiovisual Observatory 2009: 89).

Table 2.3: Market Shares of commercial channels, broadcasting science programmes in 2007/2008 in 13 European member states

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid				
1 to 5 percent	7	11,3	11,5	11,5
5 to 12	41	66,1	67,2	78,7
higher than 12	13	21,0	21,3	100,0
Total	61	98,4	100,0	
System	1	1,6		
Total	62	100,0		

This leads to the hypothesis that both specific regulations and a specific segmentation of TV markets influence the probability of science programmes being provided by commercial channels. Taking into account our theoretical framework, we are interpreting science programming as an outcome of a decision making process which is influenced by determinants located on several different levels. Hence, we conclude that media professionals within commercial channels are usually not in the position to broadcast science programmes. Only in markets with a sustainable and clear segmentation of commercial channels into big and middle sized channels is science programming becoming interesting, especially for the smaller ones. We believe that this requirement restricts science programming by commercial channels to an extent worth mentioning in big European markets, which also show a clear segmentation as is the case in Germany, Great Britain, Spain and also Italy. According to the size of the markets, also Poland, France and perhaps Romania are in a comparable position, but commercial TV markets in these countries lack a clear segmentation. We believe that this is why in France and Romania commercial channels contribute only very little to the provision of science programmes.

That a specific remit of commercial channels also matters can, apart from the British example, be exemplified by Bulgaria, where the commercial channel Nova TV accounts for more than 20 per cent of airtime dedicated to science in an average week in 2007-8, even though this channel is not a middle sized one, but a big one, and even though the Bulgarian market lacks clear segmentation. The comparably high share of Nova TV coincides with far reaching and precise obligations listed in

Nova TV's license, which includes the transmission of a) educational programmes and b) cultural, scientific and religious programmes to an extent of not less than 5 per cent of the weekly programme time (Kavrakova 2005: 403).

Table 2.4: Provision of TV science programmes by commercial broadcasters in Europe

	Share of programmes	N	Share of airtime	Sum
Country				
Germany	14,9 %	93	29 %	77,97
Austria ¹⁰	33,3 %	6	40 %	2,67
Finland	8,1 %	37	8 %	15,55
Sweden	6,7 %	60	4 %	13,81
Greece	0	9	0 %	5,36
Cyprus	0	1	0 %	2,77
Bulgaria	16,7 %	12	21 %	10,17
Great Britain	58,5 %	53	70 %	10,33
Ireland	0	39	0 %	7,77
Estonia	0	8	0 %	3,55
Romania	0	2	0 %	4,85
France	5,6 %	67	9 %	31,89
Spain	7,4 %	27	10 %	25,75
Total		414		212,43

¹⁰ Share of Austria is by sister channels of German channels and have just been taken over from there.

In conclusion, we can state that an influence of commercial channels on the volume of science in audiovisual media is mainly restricted to TV. Commercial radio only plays a certain role in Estonia and Spain, but due to the very small number of science programmes in radio there, this finding is hard to interpret. Regarding the TV market, influence of commercial channels on number of science programmes and airtime dedicated to science is mainly restricted to countries with segmented TV markets and/or a special regulation, which forces commercial channels to broadcast science programmes.

The weakness of commercial broadcasters in all countries except Great Britain sheds light on the strengths of *public service broadcasting* regarding the provision of science programmes in Europe. Accordingly, the differences in number of programmes and airtime dedicated to science reflects mostly the establishment of public service channels in a given country. Our findings suggest that the relationship between public broadcasters and the volume of science programming, is a bit less complex compared to the contribution of commercial channels. Overall, we can state that the number of public service channels generally directly coincides with the airtime dedicated to science and the pattern is remarkably consistent across Europe.

But for the explanation of differences in the airtime for science programmes as defined here, segmentation of public service TV markets also matters to a considerable extent. Decisive for the explanation of differences in airtime is the clear segmentation into one or two big public broadcasters, which reach more than 12 per cent market share, and one or more small channels, which reach generally considerably less than 5 per cent market share. Not that relevant is the middle sized segment.

In all countries with such a segmentation we observed the same pattern. The small channels account for the lion's share of airtime dedicated to science, whereas the airtime on big and middle

sized channels together generally do not exceed a limit of two and a half hours science programming per week. Spain is a unique case, since only one advice phone-in health programme (Saber vivir), scheduled in the morning, accounted for almost six hours airtime in an average week on TVE La Primera.

Only big and middle sized public broadcasters, which are not in a segmented market environment, dedicate considerably more than three hours weekly to science, namely in *Estonia and Ireland and particularly Bulgaria*. We have classed Ireland to countries, which lack a segmentation, since TG 4 is unique in our sample of small channels. TG 4 cannot be seen to operate as a sister channel of the bigger RTE channels, RTE1 and RTE2, since it broadcasts mainly in the Irish language and programmes therefore cannot be exchanged between RTE's two primary channels and TG 4.

Table 2.5¹¹: Average number of programmes and airtime for TV science programmes per public channel in hours per week

	No of public channels			>12 % market share		5-12 % market share		< 5 % market share	
	>12%	5-12%	< 5 %	airtime	programmes	airtime	programmes	airtime	programmes
Germany	2	0	9	2:40	8	-	-	5:36	7
Finland	2	0	2	2:30	12	-	-	4:42	12
Sweden	1	1	2	1:43	9	1:20	7	5:06	20
France ¹²	2	0	2	2:00	7	-	-	8:06	25
Austria ¹³	2	0	1	0:48	2	-	-	5:00	15
Great Britain	1	1	0	1:10	8	1:55	14	-	-
Spain ¹²	1	0	5	5:46	1	-	0	3:30	5
Greece	0	1	2	-	-	1:25	2	2:00	4
Ireland	1	1	1	3:50	22	3:25	15	0:30	2
Bulgaria	1	0	0	8:00	10	-	0	-	0
Estonia	1	0	0	3.36	9	-	-	-	-
Romania	0	0	1	-	-	~	6	~	3

¹¹ Reruns excluded, Cyprus is missing due to lack of data

¹² airtime estimated

¹³ 3sat has classed to Austria and Germany

Countries, which lack a segmentation of channels and dedicate therefore relatively high amount of airtime to science on major public channels, show a tendency to displace the segmentation on the channel level by another kind of segmentation. All three countries show a different pattern of scheduling science programmes on their big public channels, when compared with media markets, where channel segmentation exists. In Ireland, approx. 50 per cent of all programmes are scheduled at night or early in the morning, i.e. on very unattractive places. The other half is scheduled primarily on fairly attractive places during primetime. Bulgaria concentrates science programmes in the morning and in the afternoon and broadcasts no science programmes during primetime at all. Estonia also shows a concentration of these programmes in the afternoon before primetime starts.

Table 2.6: Scheduling of science programmes on middle sized and big public channels in the non-segmented markets Ireland, Estonia and Bulgaria and in the segmented markets Germany, Finland, Sweden, Austria and France.

		non segmented	segmented	Total
Scheduled Prime Time				
no	No. of programmes	41	44	85
	% within segment	70,7 %	52,4 %	59,9 %
yes	No. of programmes	17	40	57
	% within segment	29,3 %	47,6 %	40,1 %

This indicates that public channel markets, which lack a segmentation of channels, tend to broadcast more science on big public channels (small ones are missing), but schedule a bigger share of these programmes outside primetime than their relatives in segmented markets.

When we leave the exceptional single programme *Saber Vivir* aside, *Spain and Greece* show a different pattern when compared with the other countries in the sample. First of all, these countries lack a clear segmentation of public broadcasters into big and small ones. The programme hours dedicated to science on the small channels, do not exceed significantly the average airtime dedicated to science on the big channels in countries with segmented markets. In addition, these programmes are relatively frequently scheduled outside primetime like in countries with non segmented markets.

We believe that this unique pattern can be explained by their particular market position, which resembles that of the bigger public channels in segmented and non segmented markets. All Greek and Spanish channels, although small, compete intensively among one another and particularly with commercial broadcasters. We believe that this is why the volume of science programming broadcast by small channels in Greece and Spain does not exceed the extent on big public channels within segmented markets, which are also forced to compete for audiences with other channels. Like the big channels and unlike the small channels on segmented markets, public channels in Greece and Spain are heavily exposed to market forces, which evidently restrict the volume of science programmes broadcast.

The tendency to schedule these programmes predominantly outside primetime, as seen in Ireland and Bulgaria, and unlike the big channels in segmented markets coincides with the fact that all public channels in Greece and Spain depend heavily on advertising and get a smaller share of their income from license fees or from other public means. Taking into account their small market shares which limit the amount of income from advertising, and the relatively low level of public income, it becomes likely that Greek and Spanish public channels lack the money to produce science programmes with mass appeal during prime time.

This draws attention to two other factors, which are in most cases mutually linked and which probably matter when trying to explain the pattern in the volume of science programming and its structure regarding scheduling across countries, namely the dependence of public channels on advertising and the level of their total public income. The exceptional high airtime dedicated to one health programme in Spain in addition indicates that these factors may not apply to all programme types distinguished here in the same way. Relatively inexpensive advice programmes may in particular be an exception. We will come back to this later when discussing the distribution of programme types across channels and countries.

Austria broadcasts relatively few science programmes on their two big public channels ORF 1 and ORF 2, which had an accumulated daily market share of just over 40 per cent in 2008. Only about a half of the public broadcaster's budget is covered by public income, primarily income from the license fee (European Audiovisual Observatory 2009:16f.). We believe that in Austria the comparably small number of science programmes per channel is partly due to the fact that Austrian channels lack the money to produce science programmes of a quality capable to attract such a big share of the general audience. That Austria is in turn capable of running a specialised channel, which broadcasts five hours of weekly science programmes is due to the fact that this is a joined channel with Germany

and Switzerland, to which Austria contributed a small share of science programming (see box in this chapter).

This raises the question as to why Sweden and Finland can manage to broadcast a relatively large number of programmes and can dedicate more airtime to science than Austria, although they have a similar income from licence fees and why Sweden dedicates a relatively high share of airtime on the large and medium-sized public channel in primetime. We think this is partly due to differences in the market position of the large and medium sized public channels, which are not that much obliged to attract big audiences and particularly not that much obliged to reach economically attractive audiences like Austria with its heavy dependence on advertising. This leaves more space to fulfil the public mission of public broadcasting regarding science programming. And - more importantly - it indicates differences in programme policies in Finland and Sweden, which both import 50 per cent of the programmes, a level that comes behind only to Ireland. This in turn indicates that both Scandinavian countries are characterised by a fairly distinctive media culture regarding science programming.

Great Britain finally is in many respects an exceptional case. It is first of all difficult to classify the British market by using the indicator of segmentation. Great Britain is highly segmented on the one hand and highly diversified on a level below the one per cent audience share criteria, which was used as a threshold for the sample of channels. Apart from Ireland, Cyprus, Austria and Sweden, Great Britain is the country where the sample of channels does not reach an accumulated market share of 85 per cent. On the other hand, the market shows characteristics of not segmented countries, since a fairly high audience share of 60 per cent is allocated to only five channels.

Great Britain has a relatively large number of TV programmes, but relatively little airtime for these programmes due to the fact that practically all programmes are series with 6 to 12 episodes. This indicates firstly that the British market is highly dynamic in sharp contrast to the market in Germany, for instance, where regular programmes, scheduled predominantly weekly across the whole year, dominate. The BBC schedules science programmes preferably in primetime, this is apart from Sweden a fairly distinctive pattern and indicates that science programmes produced by the BBC have mass appeal. This in turn indicates that the BBC invests and can invest much more money than other broadcasters in the production of single science programme series, which is plausible due to the high public income the BBC receives and which explains partly why BBC science productions are exported successfully throughout Europe and across.

Summing up our findings, we found a direct correlation between the number of public channels and the total airtime dedicated to science in all European countries. In addition, the volume of science programming in European countries increased substantially where public broadcasters were clearly segmented and disposed of small channels, not exposed to heavy competition. It is astonishing that nowhere except in Ireland, Estonia and particularly Bulgaria does science programming on large and medium sized channels exceed approx. three hours per week, even though the income structure of these channels is likely not comparable. Even public broadcasters in Germany and particularly Great Britain, which both dispose of a relatively large public income, do not exceed this limit. Indeed, Great Britain dedicates less airtime to science on big channels than Finland in particular.

We will next explore a bit further the distribution of Radio programmes. As the graphs indicate, with few exceptions, we found generally less specialised programmes in Radio than in TV, which indicates that the medium matters even with regard to the bare number of programmes. The smaller number of science programmes in Radio is by no means an indicator that less science is broadcast by Radio. Instead, it reflects the general lack of a profiled programme structure in Radio, which has been interpreted historically as the result of the rise of TV as the primary mass medium. With the rise of TV after the second world war, Radio was more and more relegated to a secondary or background medium. Due to a bundle of factors it became a companion, which accompanies its audience during the day. Quite late and certainly catalysed by commercialisation in the 1980s and 1990s “radio largely abandoned its pattern of varied, separate constructed programmes and adopted instead “streamed” programming, output of one particular and predictable type organised into stripes or sequences, each lasting several hours” (Crisell 1994: 1183). This output has become known as format radio. Accordingly, as a response to changed user habits, in Radio the channel as a whole got profiled by media professionals, the unit “programme” as a meaningful content category gradually disappeared from modern radio production.

This explains why a programme structure which reflects the internal organisation within channels into certain beats (politics, economics, sport, science, entertainment) is largely missing in Radio.

Specialised science programmes can generally only be found in a fairly small segment of Radio, which still continue producing distinctive programmes. This segment is represented by talk radio channels, which are still organised into beats, which have responsibilities for a programme rather than for the channel as a whole. From 56 channels, where science programmes have been identified at all, 35 were assessed to be talk radio channels, of which especially BBC Radio 4 and BBC Radio 5 are known across national borders. Accordingly, the bare number of science programmes in Radio is directly influenced by the number of talk radio stations, which are available in a single country.

We again have to stress that this does not rule out the possibility that programmes named “Breakfast show”, “Good morning” or simply “The day” and the like, do not contain science contents. It rather indicates that science contents are less likely to be selected and processed by *specialised* media professionals, since the medium Radio, especially newly formed commercial networks, owns fewer or no specialised units, in which expertise can be accumulated reflecting the absence of a programme structure, which forces or enables specialisation (Donges et al 1997). As a consequence, from an audience point of view science contents via Radio may be seen as being received rather accidentally, since much of the science content is largely invisible and not predictable.

In conclusion this means that science has generally smaller chances to be selected and processed by specialised programmes in Radio than in TV due to influences which must be classed to the supraorganisational level. In addition, the extent to which Radio can process science within specialised programmes is moderated by factors, which must be located on the channel level. This in turn leads back to different patterns on the national level.

The proportion between TV and Radio science programmes on the national level reflects the proportion between the number of TV channels (especially the ones which get 100 percent of their income from subsidies and/or are thematically specialised like ARTE, France 5 (France); 3sat (Germany), Kunskapskanalen (Sweden) or Teema (Finland)). Differences in this proportion will result in different proportions of TV and Radio science programmes on the country level.

This explains why the proportion between science programmes in TV and Radio is different in Austria (when 3sat has been excluded), Great Britain and Estonia. Austria has no TV programmes, which do not depend heavily on advertisement, but has one strong talk radio channel, which get practically all of its income from subsidies. UK has three talk radio channels (Radio 4, Radio 5, BBC World Service), but no thematic specialised channel as part of the sample of TV channels from Great Britain. Estonia has more talk radio channels than TV channels. This means that in cases, where the proportion between talk radio channels and especially public TV channels is equal or even positive, it is likely that the proportion of science programmes in TV and Radio will mirror this.

Although the number of programmes which have been identified, is generally much smaller in Radio than in TV, the airtime dedicated to science does not reflect this accordingly. On an average a single radio programme fill about 15 minutes more airtime per programme within an average week than TV. Radio produces 160 hours, TV 200 hours per week, which is - given the bare number of programmes - only slightly more than radio.

Ireland and particularly Great Britain are exceptional cases. As in the TV sector, both countries schedule science programmes more usually as serial productions with a limited number of episodes. This indicates differences in media culture between these countries and most others in our sample, concerning how science programmes are produced, especially in Radio. In TV both countries share their preference for serial productions with Sweden and Finland.

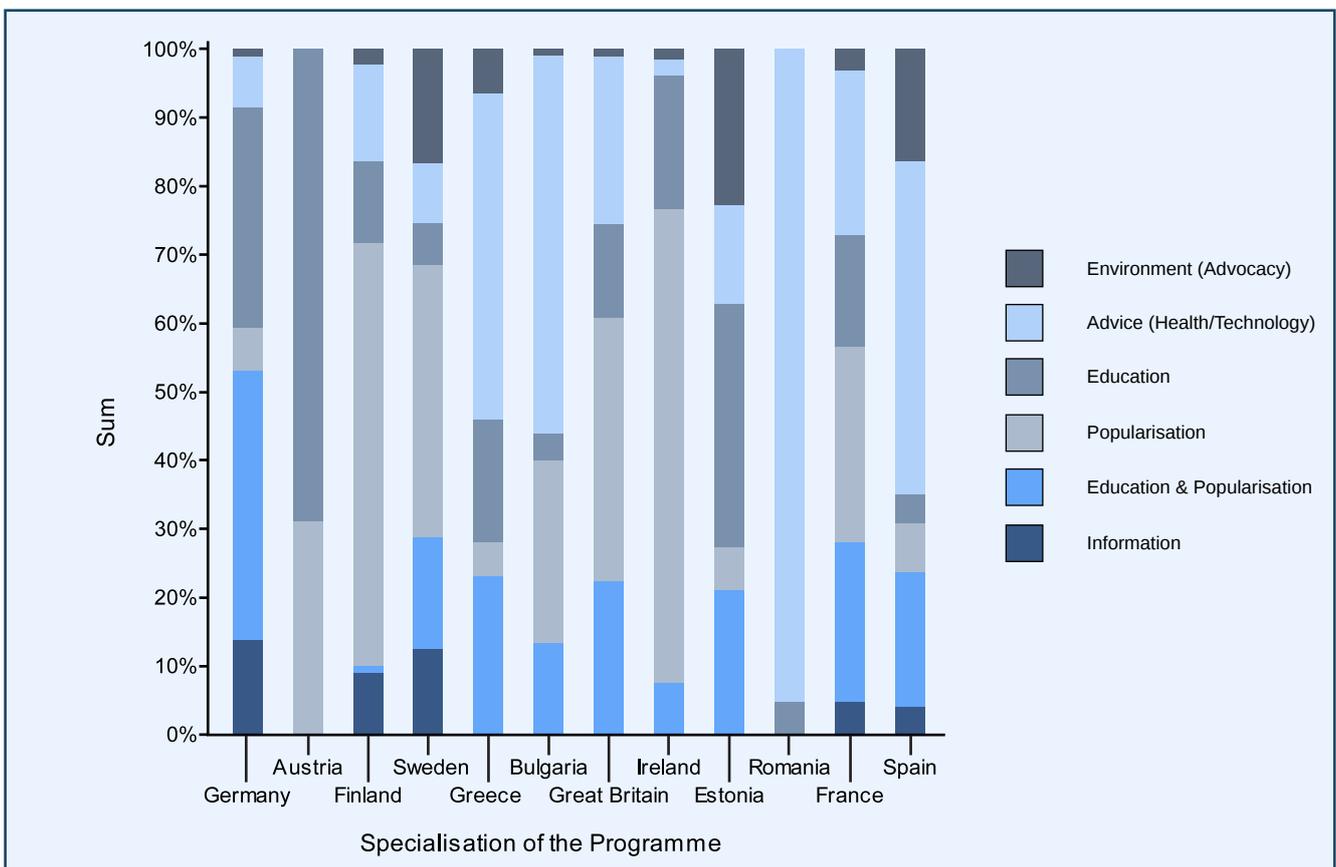
Although the volume of science programming in radio correlates particularly with the number of public talk radio channels available in a country, there are still differences which cannot traced back to this single characteristic of national media systems. Especially in Southern Europe relatively few science programmes are broadcast by radio channels. Whereas in all other countries including Bulgaria and Romania the number of programmes per radio channel accounts on average for 4-10 programmes, the number in Greece and Spain is smaller (1-2), and Cyprus completely has no specialised radio programmes. We believe that this is probably due to particular economic factors affecting public radio but we lack data which allows a comparison of radio markets. Certainly also differences in media culture, namely the weak tradition of science reporting, contribute to an understanding of the different pattern especially in Southern Europe, where – as in TV – not only is the volume of science programming in radio restricted but so also is the choice of programme types, which will discussed in detail in the following section.

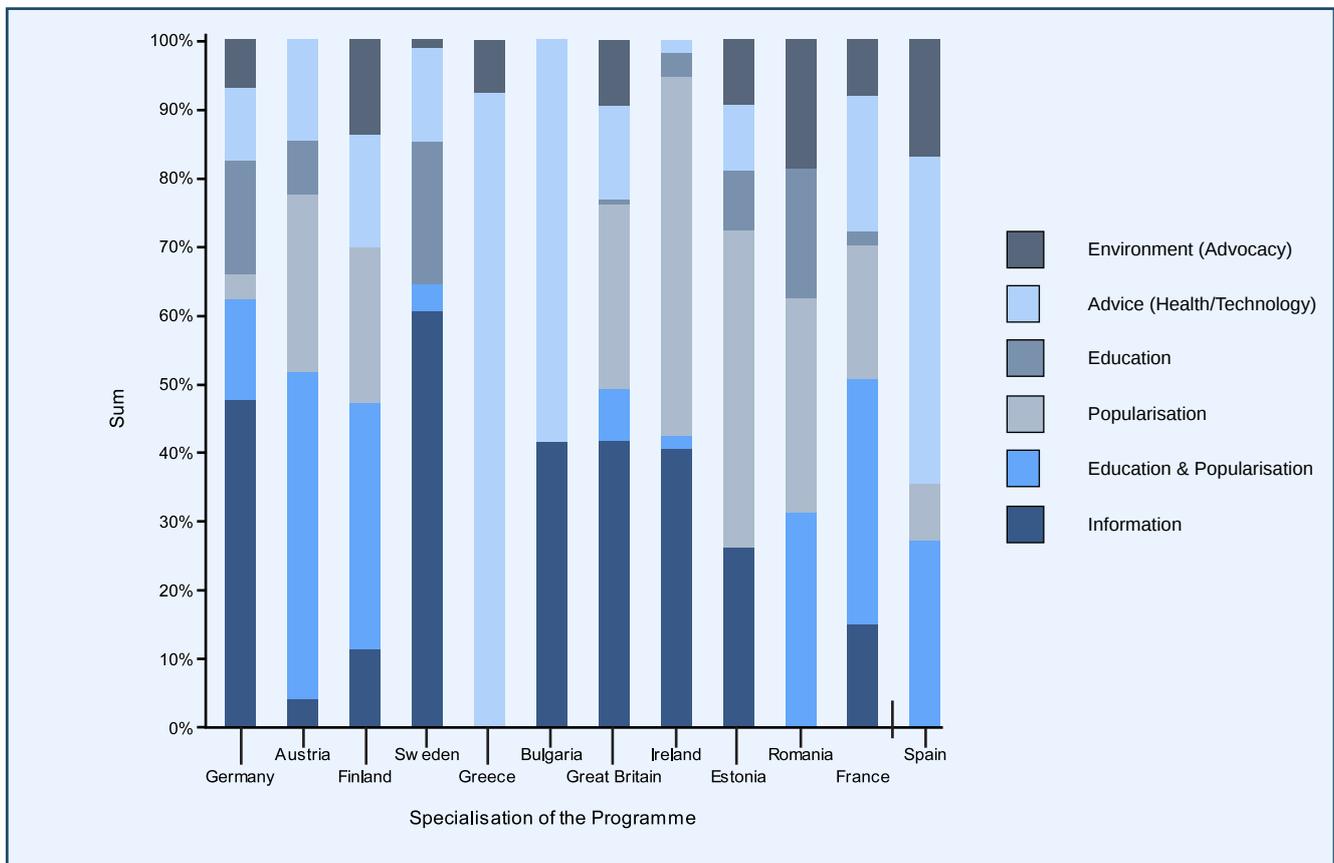
Types of science programmes across Europe

Having explored explanations for the differences in the volume of science programming across European countries, we will next explore the shares of science programme types, which also differ considerably across countries and across media. We will start our exploration as in the previous section by identifying patterns of the choice of programme types across countries, which we then try to trace back to similarities on the channel level or the medium level where applicable. After this we will discuss some national particularities regarding the probability, with which a certain programme type is chosen by countries.

As the graphs indicate, science programme broadcasting in Spain, Greece, Cyprus, Bulgaria and Romania is heavily dominated by advice programmes, while information programmes are almost completely missing. This is true for TV and also partly for Radio. This coincides with the weakness especially of public service broadcasters, who depend heavily on advertising, reach relatively small market shares and/or have a relatively small public income. The public TV market in the countries mentioned has to be seen as heavily exposed to market pressures.

Graphs 2.3: Shares of airtime dedicated to different programme types in TV



Graphs 2.4: Shares of airtime dedicated to different programme types in Radio

In addition, in all four markets programme imports do not play a significant role. This limits the extent to which popularisation programmes are scheduled. Although the share of popularisation in Bulgaria and the share of edutainment in Greece is not lower than in other countries, all of this programming, representing a relatively high share of airtime, is scheduled outside primetime. This means that popularisation programmes in Bulgaria and of edutainment programmes in Greece is not capable of attracting big audiences, unlike all other countries, where at least a small share of these programme types are scheduled in attractive time slots.

The shares of airtime for EduPop programmes are difficult to interpret. As we have outlined in chapter one, EduPop programmes share certain characteristics with edutainment programmes and others with popularisation programmes. In order to avoid misinterpretations, we will hence class the share of EduPop programmes variously to popularisation programmes and to edutainment programmes and will interpret its share accordingly. When we calculate first EduPop programmes and popularisation programmes, the share of these programme types is well below all other countries. In addition, these programmes are more likely to be scheduled in less attractive places. The same pattern appears when we collapse EduPop programmes and edutainment programmes.

Apart from the dominance of advice programmes and the weakness especially of popularisation programmes, all countries mentioned broadcast a small volume of science programmes, either in relative terms as in the case of Spain or in absolute terms as in the case of Bulgaria, which is assigned to these countries predominantly because of the poor diversification of programme types.

There are a bundle of similarities between these countries, which coincides with the weakness of science in audiovisual media. These similarities concern firstly the weakness of public service broadcasting both in terms of segmentation and in terms of public income. In Spain and Greece for instance (as in Portugal and particularly Italy), “public service broadcasting in the full sense of the word never really existed” (Hallin et al 2004: 125). Instead, both countries have been classed to markets characterised by a “savage deregulation” (Traquina 1995, 1997). For Romania and Bulgaria we lack deeper insights into the history of public service broadcasting, but especially Romania and partly also

Bulgaria shows characteristics of a “savage deregulation” especially of TV markets. We believe that this is key for understanding the weakness of science broadcasting in these countries and probably implies an absent or notably weak tradition in science reporting, which in Great Britain, Sweden and Germany at least dated back to the very early days of public service broadcasting in both media.

The next group of countries consists of Ireland and Great Britain. They are characterised by a certain concentration on Popularisation (in the case of Great Britain when jointly calculated with EduPop Programmes) and a comparably small amount of airtime dedicated to science. Both countries show in addition lesser shares dedicated to edutainment, both in TV and Radio. Advocacy programmes are fairly weak, particularly in TV, even though this is not a unique characteristic of these two countries only. Ireland in particular broadcasts relatively little science but focuses on popularisation programmes fairly heavily. Great Britain is less dominated by popularisation programmes than Ireland, but, if we jointly calculate popularisation and EduPop-programmes, Great Britain has the highest share of both programme type categories after Ireland. Both countries are dominated by series and do not broadcast science programmes on a regular basis, which coincides in TV with the absence of information programmes, a kind of specialisation which is closely linked to regular scheduling. Both markets have to be estimated as being highly dynamic regarding science programming especially in TV.

The preference for popularisation programmes in Great Britain and Ireland is not only indicated by the bare share of airtime, which, as far as Great Britain is concerned, is not even higher than in some other countries, namely in Finland. It is rather justified firstly by the fact that Great Britain and also Ireland dedicate so much airtime to popularisation, even though they lack thematically specialised public channels or simply small public channels with market shares between one and five percent. A segmentation of public TV markets not only increases the probability that more science is scheduled, it increases also the probability that a higher share of popularisation programmes can be broadcast. Our findings indicate that the share of popularisation programmes (in Germany (see below), the share of popularisation programmes and EduPop-programmes) would be lower if the media markets were not segmented. This applies particularly for France, which scheduled 92 per cent of the 25 popularisation programmes on France 5 and ARTE. When we calculate Sweden, Finland, Germany and France jointly, 76 per cent of all 85 popularisation programmes have been placed on the small channels available in these countries.

Table 2.7: Scheduling of popularisation programmes on public service channels in Germany, Finland, Sweden, France and Great Britain

		Market Share (grouped)			Total
		0 to 5 percent	5 to 12	higher than 12	
Country					
Germany	No. of programmes	14	-	3	17
	% within Country	82,4 %	-	17,6 %	100,0 %
Finland	No. of programmes	13	-	8	21
	% within Country	62 %	-	38,1 %	100,0 %
Sweden	No. of programmes	15	1	6	22
	% within Country	68,1 %	4,5 %	27,3 %	100,0 %
Great Britain	No. of programmes	-	22	3	25
	% within Country	-	88 %	12,0 %	100,0 %
France	No. of programmes	23	-	2	25
	% within Country	92 %	-	8,0 %	100,0 %
Total	No. of programmes	65	23	22	110
	% within Country	59,1 %	20,9 %	20,0 %	100,0 %

In addition, the high share of popularisation programmes in Great Britain is remarkable, since science programming is dominated by commercial channels. Generally, popular reconstruction of big scientific issues (popularisation) –as well as regular observation of the science system (information) are not part of what can be expected from commercial channels. As far as information programmes are concerned, this is particularly true for TV. There is a total lack of these programmes on commercial TV channels in Europe. The minimal presence of popularisation programmes on commercial channels is mainly due to commercial broadcasters in Great Britain. Of all 14 popularisation programmes on commercial channels, 12 were broadcast by Channel 5 (5) and by Channel 4 (7).

This raises the question, why *popularisation and information programmes* in particular are a domain of public broadcasters and why only in Great Britain commercial broadcasters choose popularisation programmes? Both programme types have to be seen as expensive, though for different reasons. Information programmes are expensive as they require an organisational unit, which is specialised on the day to day observation of scientific occurrences and their timely reconstruction into media products. They are also characterised by the need to schedule regularly and frequently, which limits the flexibility of channels. Popularisation programmes are expensive due to the production qualities required to target effectively a big share of the general audience. In addition, both programme types are primarily input oriented, which means that their selections and reconstructions are not guided primarily by fulfilling a specified need of their audience. This is extremely relevant regarding information programmes, not that much perhaps regarding popularisation programmes. Apart from the costs another characteristic accounts for the difficulties of commercial broadcasters especially in TV. Episodes of Popularisation programmes or whole series used to be focussed on just one topic, theme or issue, which shows no link to current affairs and requires a high level of audience attention. These factors will be discussed in detail in chapter four, when we report the outcome of the focus group discussions. Hence, a calculation of its market success is fairly difficult and can vary substantially depending on the topic and the way it is reconstructed. In addition, due to their heterogeneity popularisation programmes cannot be integrated in well profiled regular programmes easily, which certainly would increase their chances to get mass appeal.

The preference for popularisation programmes in Great Britain and in Ireland is difficult to explain, but is certainly not due to the same causes. In the case of Great Britain it coincides with a long lasting tradition in producing costly popularisation programmes, which dates back to the 1960s, when the famous programme “Horizon” was first broadcast (although at the very beginning as a magazine programme), which later became a model of costly science popularisation throughout Europe (Silverstone 1984). The early success of this programme may have established a tradition which continues until today. An additional factor, which may better explain why also commercial broadcasters are that active in the production of popularisation programmes is the fact that British productions in particular are easier to trade virtually globally. British commercial broadcasters do not only have to look for commercial advertising income on their home market, but can also count to a certain extent on trading income, unlike commercial broadcasters especially in Germany. In 2007 and 2008 Channel 4 earned €47 million from programme sales or four per cent of its total commercial income. The German commercial network ProSiebenSat1 did not declare income from programme sales in a separate category, but it seems unlikely that this network could have reached a comparable share of its total income from programme sales (European Audiovisual Observatory 2009: 124).

Ireland probably dedicates such a big share of airtime to popularisation, since this country depends heavily on programme imports, primarily from the US market. 79 per cent of all 38 TV science programmes broadcast in Ireland in 2007-8 were imported. Of all 386 TV science programmes broadcast in all other countries, only 25 per cent were imported. We believe that this is the main factor which explains why especially in Ireland the share of popularisation programmes is so high. The selection of programme types follows the offerings made by international programme traders. In addition it explains why Ireland can manage to broadcast a good bit more science in TV than Austria for instance, with which the Irish media system shares some important economic characteristics. An additional aspect certainly has to do with the fact that Irish TV must be estimated as being more influenced by the British market than all other European markets within our sample. “Horizon” is not only well known by British publics but certainly also by Irish publics as the outcome of our focus group discussions indicates (see chapter 4).

We classed Sweden and Finland together with Germany into a different group of countries, although both countries share with Ireland a fairly big dependence on programme imports. We believe that this explains in addition to the segmentation of markets the dominance of popularisation

programmes in Finland and – to a lesser extent – also in Sweden. The size of these national markets limits the development of their own science programme production on the one hand but the ability to broadcast programme imports successfully to a relatively large audience enhances the provision of science programmes significantly in these markets. The dependence on programme imports or – in positive terms – the ability to import programmes and broadcast them successfully distinguishes these markets sharply from the markets in Spain, Bulgaria and Romania.

Table 2.8: Characteristics of production of science programmes in Europe

		Characteristics of production				Total
		own production	coproduction	imported	Takeover	
Country						
Germany	Count	56	5	4	27	92
	% within Country	60,9 %	5,4 %	4,3 %	29,3 %	100,0 %
Austria	Count	2	1	2	1	6
	% within Country	33,3 %	16,7 %	33,3 %	16,7 %	100,0 %
Finland	Count	13	3	17	1	34
	% within Country	38,2 %	8,8 %	50,0 %	2,9 %	100,0 %
Sweden	Count	29	0	30	1	60
	% within Country	48,3 %	,0 %	50,0 %	1,7 %	100,0 %
Greece	Count	9	0	9	0	18
	% within Country	50,0 %	,0 %	50,0 %	,0 %	100,0 %
Cyprus	Count	3	0	0	0	3
	% within Country	100,0 %	,0 %	,0 %	0,0 %	100,0 %
Bulgaria	Count	8	0	3	0	11
	% within Country	72,7 %	,0 %	27,3 %	0,0 %	100,0 %
Great Britain	Count	46	0	7	0	53
	% within Country	86,8 %	,0 %	13,2 %	,0 %	100,0 %
Ireland	Count	8	0	30	0	38
	% within Country	21,1 %	,0 %	78,9 %	,0 %	100,0 %
Estonia	Count	7	0	3	0	10
	% within Country	70,0 %	,0 %	30,0 %	,0 %	100,0 %
Romania	Count	14	0	2	0	14
	% within Country	100,0 %	,0 %	8,0 %	,0 %	100,0 %
France	Count	39	8	23	0	69
	% within Country	55,1 %	11,6 %	33,3 %	,0 %	100,0 %
Spain	Count	26	0	0	0	26
	% within Country	100,0 %	,0 %	,0 %	,0 %	100,0 %
Total	Count	259	17	128	30	434
	% within Country	59,7 %	3,9 %	29,5 %	6,9 %	100,0 %

However, we believe that Finland and Sweden belong in a group together with Germany. Although Sweden and particularly Finland are dominated by popularisation programmes, both countries share some important characteristics with Germany, of which a relatively large volume of science programming is key. In addition, Finland and Sweden share with Germany the characteristic that information programmes play a more important role than in all other countries; this applies to TV and, with the exception of Finland, also to Radio. Especially due to this all three countries are comparably diversified in terms of the choice of programme types. All three contribute at least 10 per cent airtime in TV to information programmes. This is remarkable, since the share of airtime for information programmes in TV in general indicates that in European TV new scientific findings have very limited chances to be selected and processed by specialised media professionals. Given the share of airtime dedicated to information programmes, only Germany and, to a far lesser extent Sweden and Finland, contribute significantly to what is dedicated to information about science in Europe. 80 per cent of the whole airtime in TV is broadcast by public channels in Germany, Sweden and Finland.

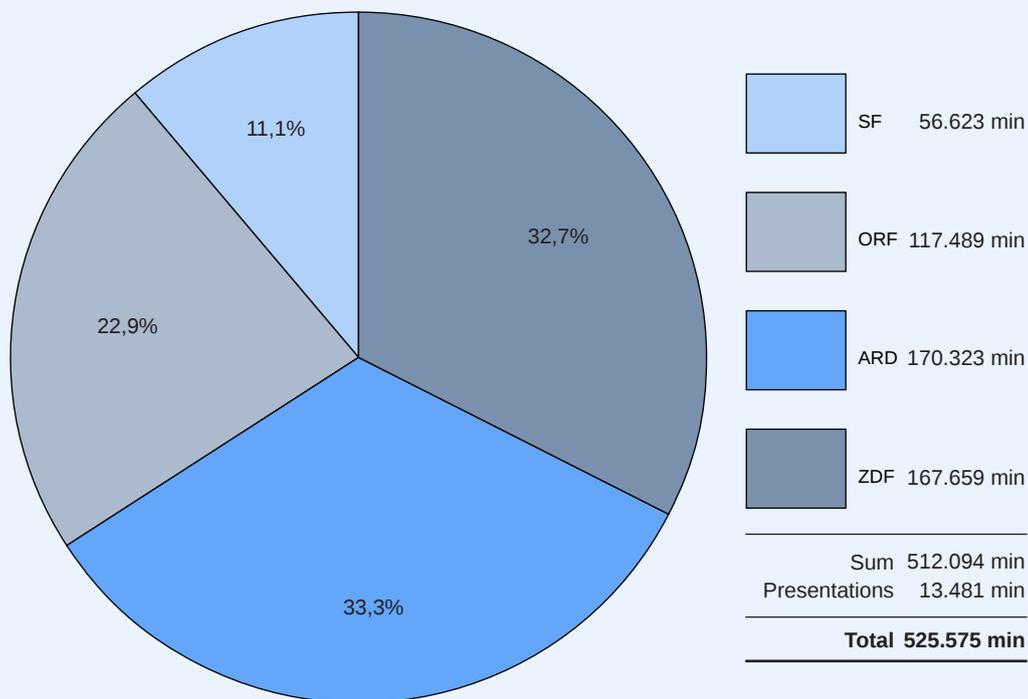
The weakness of information programmes in TV across countries and the big differences between TV and Radio almost everywhere except in South-East Europe, where even in Radio information on science does not play a significant role, suggest that TV is not able to shape a specialisation on information. Specialised information programmes on science obviously represent a barrier, which TV unlike Radio can cross only in exceptional cases.

Apart from the few weekly programmes, which broadcast at least a certain share of science news, there is only one daily programme available on the market, this is the German programme “nano”, which is unique in Europe. The share of airtime and particularly the total airtime in Germany dedicated to information programmes is higher than everywhere else especially due to this daily 30 minutes programme, broadcast by the thematically specialised channel 3sat, which has been additionally taken over by four other public service networks in Germany. Take-overs, unlike bare re-runs, have been incorporated into the sample of programmes, since they are broadcast by a *different* channel and, from an audience point of view, form, like programme imports from across, an original offer of the channel which broadcast the programme.

Since the programme is unique in Europe, we have explored this programme and the channel, where it is broadcast in detail (see box).

The German channel 3sat and its daily science programme nano

The channel 3sat is operated by the nine federal state broadcasting corporations of the ARD (SWR, WDR, NDR; MDR; BR; RBB; HR, RB, SR), by the ZDF, the Austrian public service corporation ORF and the Swiss SF, which has the nature of an international public service corporation. Their participation in the programme of 3sat is presented in Graph 2.5 below. In 2006, 3sat reached a potentiality of reception of 97%.¹⁴ The sphere of culture and science has the biggest share in the programming of 3sat, namely 38.1% (2006). Its average market share was at 1% and has been at the same share for the past few years, with the highest market share in the group of audience over 50 years (1.2%) (Zubayr/Gerhard 2007:191 seq.). 3sat does not broadcast any advertisements as does no channel of the public service corporations apart from the two big ones in Germany (Das Erste (ARD) and ZDF) and Austria (ORF 1 and ORF 2). Since 1995, 3sat broadcasts around the clock.



Graph 2.5: Participation of Programme Providers for 3sat in 2007 (Source: ZDF Jahrbuch 2007)

The ZDF Jahrbuch 2007 (ZDF Yearbook 2007) describes culture, knowledge, education and science to be the four pillars of 3sat's programming. Daniel Fiedler, coordinator at 3sat, argues how well a strong orientation towards science fits in with the label of 3sat as a "cultural channel" ("Kultursender") when he argues that "culture" in this case does not stand for a discipline but for a lifestyle or an attitude of mind for which the question: "How do we want to live tomorrow?" is symptomatic and thus a "cultural channel" can very well be a "science channel" at the same time (Fiedler 2007).

Actually, it has become symptomatic for any discussions on the quality or the decline in quality of television programming to make reference to 3sat and ARTE as the channels which raise the flag for quality (e.g. Deutschlandradio, discussion round on "culture on television"¹⁵ ("Kultur im Fernsehen"), or a commentary on the TV debate in the Süddeutsche Zeitung¹⁶).

The Programme: "nano" is subtitled "Die Welt von morgen" (roughly: "Tomorrow's World"). Soon after it started broadcasting in December 1999, the programme developed into one of 3sat's "musts sees" (press release of 3sat, dated 1 April 2004¹⁷). It is a daily science magazine of 30 minutes in length, broadcast every weekday at 6.30 pm with two reruns on 3sat,

one in the night and one in the following morning. The programme in 2007/2008 was taken over by ZDF, SWR, MDR, RBB and SF 1 from Switzerland. At times those single programmes are replaced by the monothematic popularisation programmes “nano spezial”. “nano extra”, irregularly broadcast on weekends.

3sat is a magazine. A magazine is defined as a periodical format that can combine various genres of journalism; its single features are typically held together through a presentation which ensures the continuity of the programme; typically, its audience is less heterogeneous than for general programmes; its format can include persuasive, informative, educational and entertaining elements (Hanel 1994:11).

It is remarkable that the format of “nano” has remained largely unchanged since its initial broadcast on 1 December 1999 as the first and only daily science magazine broadcast on a public service television channel. Its length and timeslot have remained the same throughout the years of its broadcasting with the only promoted changes in the programme being those of slight amendments in the accoutrement of its studio in spring 2008.

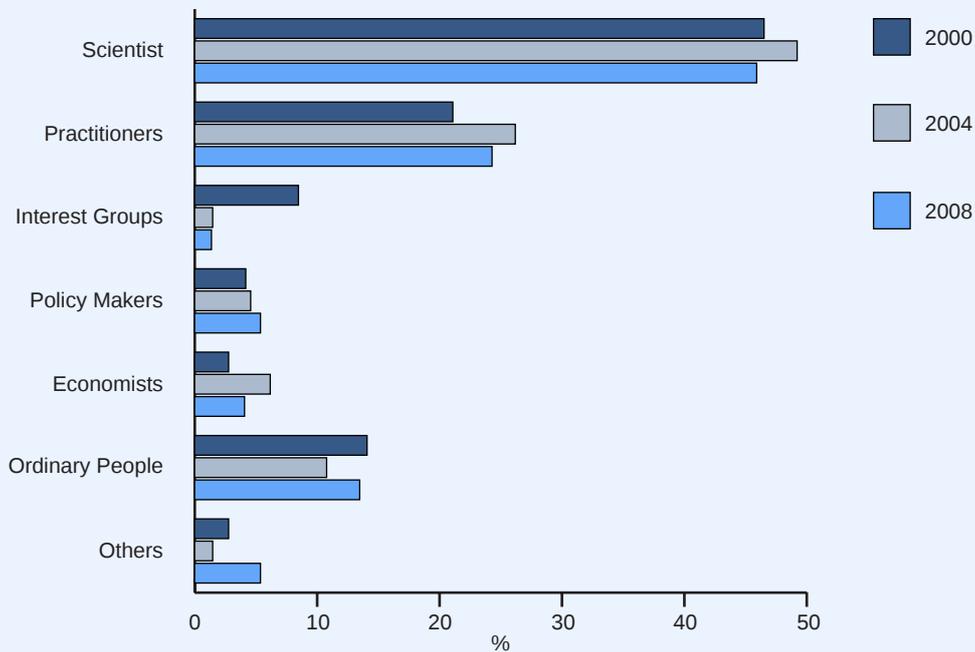
For the regular “nano” magazine the ZDF Jahrbuch 2007 lists 223 single broadcast programmes in the year 2007. The editors work for “nano” conjointly in Vienna (ORF), Zurich (SF), Baden-Baden (SWR), Berlin (rbb), Cologne (WDR), Leipzig (MDR) and Munich (BR), but the editors are based in Mainz.

“nano creates knowledge” (nano schafft Wissen) is one of the key phrases used to describe the programme on the 3sat homepage. In the programme’s self-description which is available on the 3sat Preetreff provided for journalists via the 3sat homepage, “nano” is described as a magazine with a thematic focus on “presenting findings from technology, research, natural science and humanities in a comprehensible, factual and competent way” (präsentiert Erkenntnisse aus Technik, Forschung, Natur- und Geisteswissenschaft verständlich, faktenreich und kompetent). Its features on science are described as being an “entertaining, exciting and informative mixture” (unterhaltsame, spannende und informative Mischung) with which it aims to “prepare its viewers for tomorrow’s world” (seine Zuschauer fit machen für die Welt von morgen). It aims at explaining and getting across “developments, which might fundamentally change our lives already tomorrow” (Entwicklungen, die unser Leben morgen schon grundlegend ändern können). On a regular basis, focal points are being set and “lit under a different aspect” (unter einem anderen Aspekt beleuchtet). As its target group it names all members of the general audience who are interested in science (Sendeprofil “nano”).

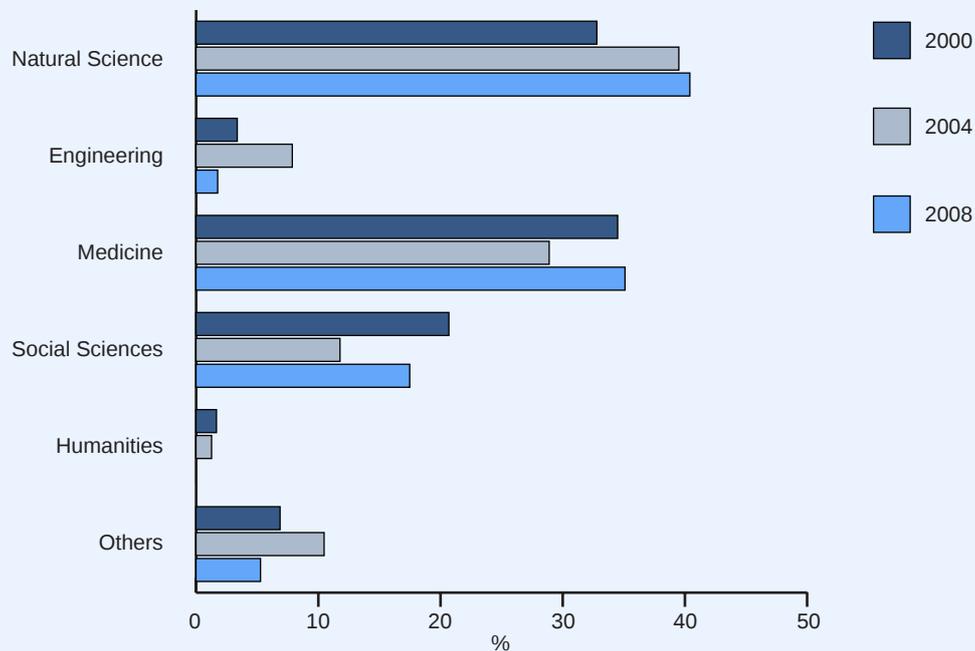
Magazines are the most popular genre for programmes carrying current information in German television. In 2007, the share of this genre in the range of information programmes of the channels lay at 20.4% (ARD) or 27.5% (ZDF) for the public broadcasting companies and at around 13.5% for the private broadcasting companies (Krüger/Zapf-Schramm 2008:174). According to information received from Max Kirchner, strategy co-ordinator for “nano”, “nano” started broadcasting with a market share of 0.7% in December 1999. After having fallen to 0.6% in 2000, its market share has remained at a constant 0.8% since then. This corresponds to a reach of approximately 180,000 viewers. When viewers of the reruns are included, the magazine reaches approximately 500,000 viewers per programme.

The concept of the programme “nano” has not changed over the years since it started. Our analysis of 156 single items broadcast in programmes from 2000, 2004 and 2008 shows a constantly high relatedness to new events, primarily based in the science system. Also the analysis of the main actors within the items shows a constantly high share of scientists, which is typical for information programmes on science.

Graph 2.6 and 2.7: The Main Actors in the Features, in %



Also the thematic focus of the programmes is fairly stable over the years. The selections are dominated by natural sciences, followed by medicine.



In the longitudinal aspect, the analysis did not show a clear trend in the contents and presentation of “nano” over the last nine years. For the time being, it can be established that “nano” has been and still is a science magazine that features an input orientation in its programming through its contents and presentation.

Although the small number of information programmes in TV makes it challenging to identify a certain pattern of countries and channels, which allows certain insights into the specific economy of TV information programmes, it is obvious that a significant level of production of information

programmes is restricted to segmented public TV markets, which include thematically specialised channels (3sat; Kunskapskanalen, Teema). 80 per cent of the TV airtime dedicated to information programmes on science is represented by channels with less than three per cent market share, 15 per cent by channels with an average market share of more than 12 per cent, all of which is scheduled outside primetime. The only country which schedules an information programme in TV on a bigger channel at primetime is Sweden. As a result, Sweden is the only country which broadcasts an information programme on science that reaches a big national audience (see chapter 3).

Germany shows some particularities in the choice of programme types which are worth mentioning and need to be interpreted. This concerns firstly the fairly high share of airtime for the less profiled programme type category EduPop in TV and the comparably low share for better profiled popularisation programmes. A similar pattern appears in Spain, Greece and Estonia. We believe that this pattern is a side effect of the preference for regular programmes, which characterises all mentioned countries except Estonia. Regularity of scheduling coincides with less-profiled programme types regarding the difference between edutainment and popularisation. In addition, the small share of popularisation in Germany is due to the one per cent market share criterion applied in the selection of channels. In Germany popularisation programmes are packed on smaller public channels like Phoenix and ARTE. How dominant popularisation is on ARTE is indicated by the data from France, where ARTE unlike in Germany is part of the sample of channels, as it reaches a higher market share than one per cent. Phoenix also broadcasts many popularisation programmes. The inclusion of both channels into the German sample increased the share of popularisation programmes at least slightly.

An additional particularity is the relatively big share for edutainment, not only in TV but also in Radio. As far as TV is concerned, this coincides with the activities of commercial broadcasters especially in Germany, which focus on Edutainment. This programme type generally has the greatest potential for commercial channels, even in the British market. We believe that this is due to the fact that edutainment offers a new option to re-evaluate established TV entertainment genres such as the family show, the quiz show and even reality TV in regard to concepts and contents. Furthermore, the combination of existing TV genres with explanations offers the possibility to plan the popular success of these developments more reliably than was possible with popularisation. Accordingly, edutainment programmes more likely are scheduled in prime time slots than other programme type categories. The mass appeal in turn requires investments, which are more difficult to cover by small commercial channels than by middle sized ones on big markets. This is why German commercial broadcasters play a relatively important role in this programme type segment. But this is certainly just one aspect.

Another aspect, although difficult to grasp, is the tradition of science reporting in audiovisual media in Germany, which was since its early days strongly connected with programme formats which today we would class as edutainment programmes (von Cube 1994). But as in other cases, we lack knowledge especially regarding the historical roots of science programming, which can be connected conceptually with preferences regarding how scientific information is selected and broadcast. It remains therefore rather difficult to assess whether or not differences in tradition of science in media contributes to a deeper understanding of the choice of programme types.

France is a country which is difficult to class, since it shares some important characteristics with segmented and relatively diversified countries, namely Sweden, Finland and particularly Germany. But it also shares some characteristics with non-segmented markets like Bulgaria, Spain or Greece. When compared with other countries, the most striking particularity of France is the tendency to place the lion's share of science in TV on the small public channels France 5 and ARTE. France shares this tendency with Austria, when we include 3sat into the sample of channels. In Austria science in TV is packed on the small channel 3sat.

With regard to scheduling, French media, like particularly those from South-Eastern Europe, pack science outside primetime; this is seen in the cases of French big public channels France 2 and France 3. Only about 10 per cent airtime on these channels is scheduled in primetime. This is the smallest share of all countries with segmented markets. All productions, which are placed on the bigger channels are French productions, this is a striking differences when compared with smaller markets and resembles the practice in Germany, Great Britain and Spain (on all channels). As far as the choice of programme types is concerned, the offers on big French channels are fairly diversified like in Germany, Sweden and to a lesser extent also in Finland and unlike particularly South-Eastern Europe. But when comparing the choice of programme types on big channels in France with the

Nordic countries and Germany, France is characterised by a lack of popularisation programmes on its big public channels and by a lack of this programme type category in Radio. After Spain and Greece, France dedicates the smallest share of airtime to popularisation programmes. After Germany, France dedicates the highest share to Edutainment.

On its small public channels ARTE and France 5 in contrast, the programme types are dominated by popularisation programmes (40 %), like in Sweden and particularly in Finland and advice programmes (30 %) like in Spain and Greece. Accordingly, one-off productions, of which a considerable proportion is imported (37 %), makes up a similar share as in Finland or Sweden, and a far bigger share than in Germany, where very many small public channels are dominated by takeovers, i.e. programmes exchanged between the public channels.

When we oversimplify our findings a good bit we can class France somewhere in between regarding the strengths of market forces, which weighed especially on public broadcasters, the segmentation of the TV market and a tradition in science broadcasting, which we assume is linked to the particular notion of public service broadcasting in any particular country. This coincides with findings which indicate that although France has always had a particular strong rhetoric about the importance of public service broadcasting as an institution of national culture, “it was never as pure a public service system as some. It was a mixed-revenue system, funded in part by advertising, and public funding was limited compared with much of the rest of Europe” (Hallin et al 2004: 126). As far as funding for public service broadcasting is concerned, France shows similarities with Austria and Ireland in particular, but also with Spain. But at least compared to Spain and Greece, France was much more successful “in developing an effective centralized state, and the *dirigiste* tradition of state intervention in the market to accomplish national ends can be seen (...), even if the focus of *dirigisme* in media policy has moved from promoting culture to a greater emphasis on building competitive national media industries” (Hallin et al 2004: 127).”

We will next explore a bit further the distribution of programme types in radio using the differences with TV as a starting point. This comparison clearly shows that supraorganisational influence must be seen as key in explaining the shares of airtime dedicated to specific programme types. This concerns particularly the choice of information programmes and of popularisation programmes. Everywhere except in Southern Europe, radio dedicates a far bigger share of airtime to information and less to popularisation and edutainment when compared with TV.

This means that a new scientific finding is more likely to be selected and reconstructed as news by specialised professionals in Radio than is the case in TV. TV instead prefers *popularisation and edutainment programmes*, which both are underrepresented in Radio. The medium obviously does not matter regarding the airtime dedicated to *advice and advocacy programmes*. This means that the medium influences the probability of a certain type of specialisation on science evolving. This influence is particularly strong regarding information programmes, popularisation programmes, edutainment programmes and also EduPop programmes.

The differences in the share of airtime dedicated to different programme types dependent upon the medium raises the question, which characteristics of the medium or the programme type explain the coincidences. We have already described that Radio has become a secondary medium, which accompanies its audience during the day. Radio is used as a medium which keeps recipients up to date, according to this gratification that recipients expect from radio, the relatedness to news matters especially for radio. In addition, due to technical restrictions neither newspapers nor television can match radio in terms of its immediacy as a purveyor of news (Chrisell 1994:343). The strength of radio that it can be used easily while doing other things can also be described as its main weakness as far as popularisation in particular is concerned. Radio must constantly fight for listener’s attention. Unlike Radio, TV is widely used as a medium for entertaining people. A good share of the popularising programmes consists of documentaries and the main characteristic of documentaries is that this programme genre reports on real life events, but uses narrative techniques adopted from TV drama or movies. The expression in Radio is the so called “Radio Feature” developed by the BBC at the end of the 1930s. Due to changed user expectations and habits, Radio is not the place for a mass audience to tune in to follow radio-features of at least 30 minutes lengths about a single issue. Programme types requiring attention for a longer period than only a few minutes are not that common in today’s radio landscape. This weakness of radio features may again change into a strength, when it comes to podcasts, which can be used at any time recipients want.

Explaining scientific subject matters to recipients finally may work better in TV, since TV unlike Radio can visualise even quite trivial scientific explanations of common every day things spectacularly. Another explanation for the overrepresentation of *edutainment programmes* in TV is the fact, that within this programme type category formats have been developed in the past 10 years or so, which have really no equivalent in Radio. Examples include the evening show format or the quiz show format like “Die große Show der Naturwunder”, “Clever” (both Germany), “El hormiguero” (Spain) or the French programme “C’est pas de socier”, which has a German expression called “Kopfball”. Also quite innovative programme formats like “Rough science”, which adopted the potentials of so called reality TV formats, belong to edutainment programmes and do not have any expression in Radio.

Finally, Radio lacks a characteristic, which must be taken into account when discussing differences in the airtime dedicated to specific programme types. Radio producers nowhere in Europe except partly in Switzerland have a clear idea who they attract with their programmes. Radio audience data are unlike those for TV which can be directly linked to every single episode of a programme right after it has been broadcast. Accordingly, Radio does not get daily feedback on the audience it actually reached with a single programme and specialised information programme producers do not know who actually listens to these programmes. This characteristic provides apart from the cheaper production of contents the possibility for very small public talk radios with national market shares of one per cent or less to broadcast very specialised programmes, for instance on social scientific findings exclusively.

¹⁴ All data given in this paragraph is taken from the ARD Jahrbuch 2007(ARD Yearbook 2007) if not denoted differently.

¹⁵ access on 14 November 2008, <http://www.dradio.de/dkultur/sendungen/fazit/619286/>

¹⁶ access on 14 November 2008, <http://www.sueddeutsche.de/kultur/880/314776/text/>

¹⁷ access on 23 October 2008, <http://pressetreff.3sat.de/viewbody.asp?bodyid=19818>

Chapter 3

Exposure to science programmes in Europe

Summary

In this chapter we are going to explore the audiences reached by TV science programmes across Europe. Our findings indicate that information programmes lack formats which reach really big audiences. We believe that the small range of audiences, which can be attracted by formats belonging to this programme type category is mainly due to the fact, that the variations within this group are quite small. It is dominated by magazines. Within this programme type, we cannot observe any innovative TV programme format, which is able to attract big audiences. That a Swedish programme reached comparably big audiences, in our view, is mainly due to less channel choices people have within primetime in Sweden and due to the fact that the programme is scheduled on one of the big public channels.

In sharp contrast, edutainment programmes cover a broad variety of different formats and even genres, by which everyday experiences are linked with scientific explanations. Quiz shows attract the biggest audience within this programme type. We believe that especially within this programme type the format of a programme matters. It is not by chance, that in this category we found formats which have been adopted in other countries, which means that they are not simply taken over, but the format is used to fill it at least partly with domestic contents.

Within the group of popularisation programmes, the topic area is what matters most with regard to audiences. Documentaries in which historical and/or archaeological findings are popularised, dominate the most attractive programmes within this category.

Advice programmes, like edutainment and edupop programmes, show a broad range of different-sized audiences. This is surprising due to the very limited variety of formats. Of course, the topic area matters to a certain extent, but apart from this, there is no convincing explanation for different levels of attractiveness, which can be linked to particular innovative programme concepts and the like. We believe that especially for this programme type, scheduling matters most. We found no other programme type which is as widely spread across different schedule slots.

Advocacy programmes obviously are like information programmes not able to attract really big audiences, with the exception of Spain. The range of audiences is quite small. But even in Spain, the programmes are not that popular, they are simply more popular than in other European countries. Within this programme type, outside Spain, we cannot observe efforts by programme makers aimed at attracting big audiences. Regarding the question, what is missing on the TV market we can summarise our findings as follow:

- A) We lack innovative programme formats, by which new scientific findings are broadcast and by which big audiences are attracted.
- B) We lack popular popularisation programmes in France, Bulgaria, Greece, Estonia and Spain. Whereas in France this is mainly due to scheduling, in the other countries mentioned we lack offers.
- C) We lack attractive edutainment programmes particularly in Bulgaria, Greece and Estonia.
- D) We lack attractive advocacy programmes nearly everywhere. Spain is an exception.

Introduction

In the first part of our investigation, we have outlined a structure of programmes, specialised on science in a specific way, which are broadcast in 13 European countries and which form a specific patch of offers by media institutions in each of the countries. The main intention of the structural analysis of what is actually offered was the exploration of potential determinants to explain the structures found comprehensively. We believe that the determinants identified so far are sufficient to explain differences and similarities of the programme pattern identified in each of the sampled countries, as far as the production sphere is concerned.

The explanation of the presence or absence of programmes, specialised in science in one way or another must also include differences regarding the popularity of these programmes in European societies. This is especially relevant for the TV market, which is characterised by very close relations between the production process and the audience rating of this programme. Unlike the radio market, TV channels are supplied relevant ratings every day, giving the audience exposure in detail. In the following paragraphs, we will explore the ratings of the programmes by referring to data gathered by specialised agencies.

The analysis will be done by addressing mainly four research questions:

1. Do European audiences in general prefer certain programme types?
2. Do age groups and/or groups with different educational backgrounds prefer certain programme types? Does gender matter?
3. Are there any programmes, which can be considered particularly popular?
4. How dispersed are science programmes on a societal level?

Data base

Our data base regarding the TV ratings is incomplete. We received data from 11 out of the 13 countries in our sample. We miss data from the UK and Romania. From the other countries, we received valid TV data, but not for every single programme selected. The omissions in data in each of the countries is quite different, in some cases it is not of greater concern, since the lack of data is not systematic in the sense that for instance commercial channels are mainly or exclusively missing. Additionally, the number of missing cases is very limited. This is the case in Germany, Austria, Finland, Bulgaria, Spain, Greece and Cyprus, from which we received audience data for more than 70 per cent of the programmes selected. In other countries we lack data from commercial channels - this is the case in Sweden, Ireland and France due to the ownership of the data. In addition, we do not have sufficient data for the Swedish public channel Kunskapskanalen, which, according to its market share, reaches small audiences but broadcast the majority of the programmes identified in Sweden.

Table 3.1.: Description of the sample of TV audience data

		Audience data		Total	
		No	Yes		
Country	Germany	Count	10	84	94
		% within Country	10,6 %	89,4 %	100,0 %
	Austria	Count	0	6	6
		% within Country	0 %	100,0 %	100,0 %
	Finland	Count	9	28	37
		% within Country	24,3 %	75,7 %	100,0 %
	Sweden	Count	42	18	60
		% within Country	70,0 %	30,0 %	100,0 %
	Greece	Count	2	16	30
		% within Country	11,1 %	88,9 %	100,0 %
	Bulgaria	Count	3	9	12
		% within Country	25,0 %	75,0 %	100,0 %
	Ireland	Count	18	21	39
		% within Country	46,2 %	53,8 %	100,0 %
	Estonia	Count	5	5	10
		% within Country	50,0 %	50,0 %	100,0 %
	France	Count	32	42	74
		% within Country	43,2 %	56,8 %	100,0 %
	Spain	Count	8	19	27
		% within Country	29,6 %	70,4 %	100,0 %
	Cyprus	Count	0	3	3
		% within Country	0 %	100 %	100,0 %
Total		Count	129	251	380
		% within Country	34 %	66 %	100,0 %

Sweden is therefore the country, from which we got less than 50 per cent of the user data. Although the lack of data in the other mentioned countries is systematic in the described sense, we received data for approx. 50 per cent of the programmes selected. Overall, this leads to a sample size of 66 per cent of all selected programmes, for which we received audience data. This is sufficient to conduct

an exploratory analysis of the structure of TV science programme audiences, although the lack of data will occasionally challenge our ability to interpret the findings.

The lack of reliability is a specific point of greater concern regarding the radio data. Here we are simply unable to follow the research strategy as intended. Radio science programmes are often scheduled on stations and at times which reach low or lowest audiences. Due to limitations in the size of samples, it is simply not possible to calculate audience exposure in the same way as for TV. Radio producers of science programmes do not know much about their audience, even the simple number of listeners, not to speak about the split of the audience into gender or age groups. These cannot be calculated reliably in many cases, since the reach of the channels is generally too low. This is why we must restrict our exploration to TV audiences.

Research strategy

The question whether or not there are different preferences within European societies regarding different programme types is more than a trivial question and it needs more than just a simple comparison of audience ratings. The exposure to media content is influenced by many more factors than just individual programme type preferences, tastes or gratifications sought (Webster et al 2006: 191). In order to justify our methodological approach, we have to discuss briefly structural factors, which affect the exposure and which therefore have to be taken into account by trying to assess, whether or not individual preferences may contribute to an explanation of the ratings. We are not going to discuss every single factor identified, but highlight those, which are of crucial importance for our approach.

The first factor is the *size of the potential audience* a programme can reach, which refers primarily to the population within a given country. It goes without saying that 100,000 viewers in Ireland with a potential audience of about 4 million are not easily comparable with 100,000 in Germany with its 80 million inhabitants.

The second factor, which influences exposure independent of individual preferences, is the *size of the available audience*, which refers to seasonal, weekly or hourly variations of the size of the potential audience. It goes without saying that 100,000 viewers in Scandinavia in summer are not easily comparable with 100,000 in winter. The same is true for comparing to the audience for programmes scheduled on weekend and those, scheduled on weekdays, or to hourly variations, which refer to the point in time, during which a programme is broadcast. 100,000 in the morning cannot easily be compared with 100,000 in primetime.

The third factor, which has to be taken into account, is the number of choices, which are provided by the media system. This refers to the repertoires of channels on offer and additionally to special service subscriptions like satellite pay TV offers. 100,000 viewers in Germany might not be comparable with 100,000 in Finland, but Germany does offer many more free to air channels than Finland. 100,000 in Finland are not easily comparable with 100,000 in Ireland, although the size of the potential audience is not that different. Ireland provides many more choices than Finland thanks to UK channels, which can be received by almost all of the Irish population. The same is true for Austria, where German free to air channels can be received by almost the whole population.

This three factors spotlight the complexity of trying to analyse exposure data from eleven European countries. The first problem is the actual unit of exposure to media content, which should be used: *Market shares*, rates or absolute figures.

Market shares express the size of an audience in per cent which tuned in at a certain point of time. This means that market shares control for differences regarding the available audience. 10 per cent market share in the morning perhaps means 100,000 viewers, 10 per cent in primetime may mean 3 million. The use of market shares would lead to the misleading assumption that the programme in the morning is considered to be as popular as the one in the evening. On the other hand: 10 per cent market share in Ireland in primetime can perhaps be compared with 10 per cent in France. The use of market shares would distort the findings on the national level while making exposure easier comparable when comparing different countries.

Rates control for differences regarding the potential audience. A rating of one per cent expresses the share of the potential audience, independent of the number of people, who actually tuned in. This means that a rate of one per cent expresses the share of the potential audience reached by a media outlet. The use of rates would lead to the misleading assumption, that one per cent reach in Finland

can be compared with one per cent in Germany, where the number of choices is much higher than in Finland. This means that the use of ratings would lead to distortions towards small media markets with a small number of choices. This is, by the way, also the case, when market shares are used.

Absolute figures neither control for potential audiences nor for available audiences, so the use of this figures would lead to heavy distortions towards big European markets. On the other hand, absolute figures are less abstract than market shares or rates and therefore easier to interpret, since 100,000 viewers in Estonia is the same as 100,000 in Germany, although, of course, the figure has to be interpreted differently.

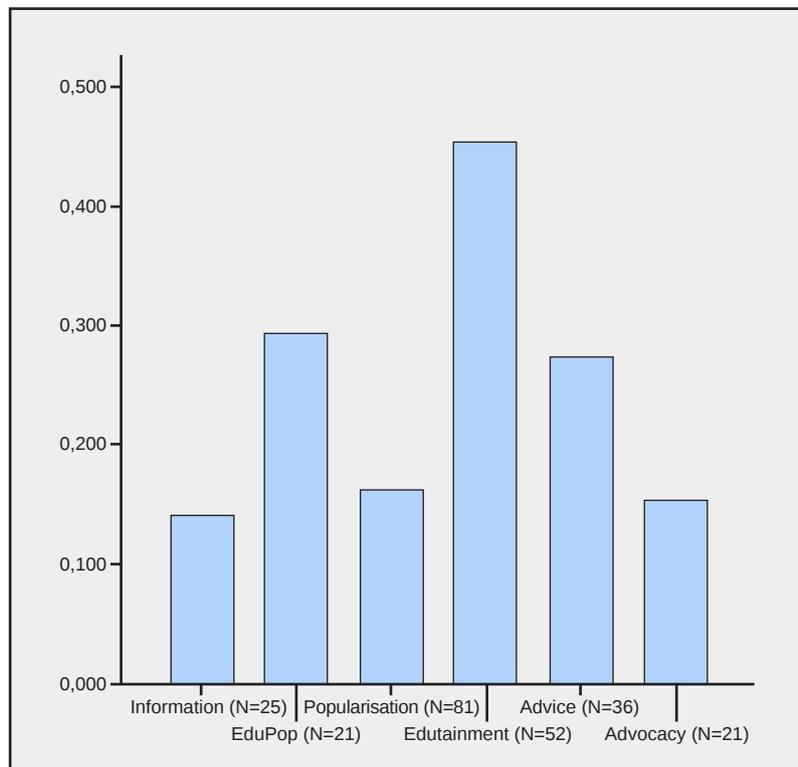
We believe that an exploration of exposure data should start with the exploration of absolute figures. We argue that the weakness of absolute figures, which do not control for potential audiences nor available audiences, is their main strengths in this context, since possible distortions becomes easier to detect. Additionally, absolute figures are easier to interpret than market shares or rates. Another argument for the use of absolute figures is the fact, that the absolute size of an audience sets the economic frame of TV productions. In terms of popularity it goes without saying that 200,000 viewers in Ireland do not have the same meaning as 200,000 in France. Whereas in Ireland the programme must be assessed to be popular, this is by no means the case in France. From an economic point of view, 200,000 viewers do have the same meaning. For the assessment of the economic frame, in which TV productions are embedded, the absolute size of the audience is relevant, not the societal impact a given programme might have. In other words, given a TV programme concept is sufficient to reach 0.5 per cent of a national population, such a concept can under certain circumstances only be realised in a big country like Spain, where the absolute number of viewers would be 200,000. In Ireland the same concept would attract only 20,000 viewers, in Estonia even less. In such a case it is not likely that the programme can be produced since the audience is too low to justify the costs of the production, which cannot be dropped under a certain limit.

The decision to use absolute figures leads us to the need to specify our methodological approach with regard to our research questions. We need to explore whether or not the audience or certain parts of the audience prefer certain types of science programmes and – at the same time – we need to identify particular popular programmes. In order to make our approach as comprehensible as possible, we will start with some calculations, which may illustrate the problem.

Every single programme in our sample has been watched by 251,640 thousand viewers on average. The size of the audience differs from type to type. Edutainment programmes, by which everyday experiences are linked with scientific explanations, drew an average of 453,520 viewers, meaning this programme type on average reached the biggest audience of all programme types classified by our analysis in the first part of our investigation. Information programmes on science reached a considerably lower number of viewers. With 140,420 watchers this programme type reached the lowest average audience of all programme types identified.

Environmental programmes reached only slightly more people, with an average of 153,740 tuning in to these programmes. The programmes on health or technology, which focus on practical advice, reached a similar audience as the programmes which popularise scientific findings or concepts and explain issues, which can be linked to the everyday experience of their target audiences. With 160,800 viewers these popularisation programmes have a surprisingly low average reach.

Graph 3.1: Average number of all viewers (10 to 14+)¹ of each programme, specialised on science in million (N=241)²



¹ Sweden provided data, which are not fully comparable due to differences in grouping the age classes. The Swedish audience rating starts from 10plus, whereas all others starts from 14plus.

² The number of programmes in the sample may change from analysis to analysis due to missing values in one of the categories required.

The differences in the average reach are by no means sufficient as an indicator for differences regarding the attractiveness of the programmes within European societies dependent upon the type of programme. As outlined above, this is due to differences in the size of potential and available audiences. We believe that differences of the average size of an audience imply differences in preferences only *if the programme sample is equally distributed through at least the main relevant categories, which influence the size of the audience independent of individual preferences*, i.e. the size of the potential audience and the size of the available audience by distinguishing roughly the primetime from other points in time during the day. Additionally the sample must be equally distributed throughout different seasons of a year.

Whereas our sample does fulfil this requirement regarding the channels and the scheduling, it is distorted regarding the probably most relevant category of the potential audience that can be reached, mainly due to the heavy overrepresentation of German programmes within the sample. Moreover, the programmes from Germany with the biggest potential audience in Europe are not equally distributed through the types. Edutainment programmes are strongly overrepresented, popularisation is underrepresented, as are environmental programmes. In Germany there are several programmes of each type that reach an audience, which is extraordinary big. The edutainment programme “Die große Show der Naturwunder” for instance, which is scheduled at prime time on one of the leading public service channels ARD, reaches on average 4.6 million people per episode, making it is by far the most watched science programme in Europe. From the 24 programmes in the sample, which reach exceptionally large audiences, 21 are broadcast in Germany, two science documentaries (popularisation programmes) are broadcast in Sweden and one health programme in Spain. Therefore, an arithmetic mean cannot tell much about the differences of attractiveness depending on the programme type, since means react sensitively to exceptional big values.

This leads to a dilemma. We’ve argued that an estimation of preferences regarding science programmes is only possible if the sample is equally distributed through crucial items, which influence the size of an audience strongly apart from individual preferences. The sample must be equally distributed throughout the size of potential audiences and the size of available audiences, expressed by an equal distribution throughout seasons within a year and points in time during the day, when the programmes have been

broadcast. However, our programme sample does not fulfil all of the mentioned criteria. It is first of all distorted regarding the size of potential audiences.

Table 3.2: Distribution of numbers of programmes per country (grouped), split into specialisation and scheduling

Prime Time			Country				Total
			Germany	France, Spain	Greece, Sweden, Austria, Bulgaria	Finland, Ireland, Estonia, Cyprus	
no							
	Specialisation of the Programme	Information	8	4	3	3	18
		EduPop	6	2	3	4	15
		Popularisation	6	17	5	16	44
		Edutainment	16	2	7	5	30
		Advice	8	8	6	0	22
		Environment	1	6	4	2	13
	Total		45	39	28	30	142
yes							
	Specialisation of the Programme	Information	3	0	3	1	7
		EduPop	3	2	2	1	8
		Popularisation	8	9	8	12	37
		Edutainment	14	2	4	3	23
		Advice	6	1	2	5	14
		Environment	1	3	1	3	8
	Total		35	17	20	25	97

Germany is heavily overrepresented: this one country with an extraordinary potential audience represents one third of the sample. We therefore decided to conduct the very first exploration by using two samples. The first consists of the German programmes, the second sample consists of all other programmes.

The programmes in the second sample are quite well distributed first of all through the size of potential audiences, 58 programmes have a potential big audience (France; Spain), 49 programmes have a medium sized potential audience between 7 million and 11 million (Bulgaria, Austria, Sweden, Greece), 55 programmes have a comparably small potential audience, from 5 million in Finland to 1.2 million in Estonia.

The equal distribution through potential audiences must additionally correspond with the equal distribution through one factor which influences the size of available audiences. Here we have to report some distortions, which will probably influence the exploration of the distribution of audience exposure. While the distribution through primetime and other times is well distributed through small and medium sized markets, this is not the case in the big markets. Primetime programmes are underrepresented.

The distribution of programme types is also not perfectly equal. Outside primetime popularisation programmes are overrepresented in small markets and underrepresented in medium sized markets. Edutainment programmes are overrepresented in countries with a medium sized potential audience, whereas they are underrepresented in those with big potential audiences. Advice programmes are overrepresented in big markets, in small countries they are completely missing outside primetime. During primetime they are slightly overrepresented. In primetime we miss information programmes in

big markets, whereas in medium sized markets this programme type is overrepresented.

The German programmes are very well distributed through the types and through time variables, which differentiate roughly different sized available audiences.

The distributions of programme types and particularly the distortions within the second sample have to be taken into account, when we next start to explore the actual exposure to these programmes.

Exposure to science programmes by European Audiences

The following boxplot shows the distribution of the average size of the audience in absolute figures. The bold black line represents the median of the distribution, which is particular relevant to address our first research question: Does the European public prefer one of the programme types identified? The graphic informs additionally about the range of the audiences and the distribution of the figures through the second and third quartile.

Moreover, extraordinarily large average audiences of single programmes dependent upon each programme type are marked as single points. Two programmes with exceptional big audiences are not plotted, since their audience is outside the maximum of 650,000 viewers on an average per episode.

We believe that within our sample the comparison of medians is most meaningful with regard to our first research question. Due to the differences in the size of potential and available audiences, we have to allow for exceptionally large or small audiences within each programme type. This is why a comparison of arithmetic means in this case cannot contribute much to the explanation of different preferences. The median can, since the figure reports where exactly the middle of a given distribution is. We argue that, if the audience in general prefers a certain type of programme, this must be quantified by higher audience figure levels within all programmes of a certain type, not just by some single programmes, which reach a considerably bigger audience than the others.

The differences between the medians are rather small. Half of the programme types distinguished reach less than 50-60,000 viewers on average per episode, half reach more. The 21 Advice Programmes are an exception. The median is 91,000 viewers, which means that 10 programmes are watched by less than this number on an average per episode, 10 are watched by more. One programme has to be considered an exception, it is not plotted since it is outside the maximum. It is a Swedish programme, called “Fråga doktorn”, and is watched by 850,000 viewers per episode. In the following paragraph, we will briefly discuss whether or not this implies a preference towards advice programmes. We believe it does not.

Graph 3.2: Average total audience (10 to 14+) in nine European Countries, split into programme types (N=158) in thousand

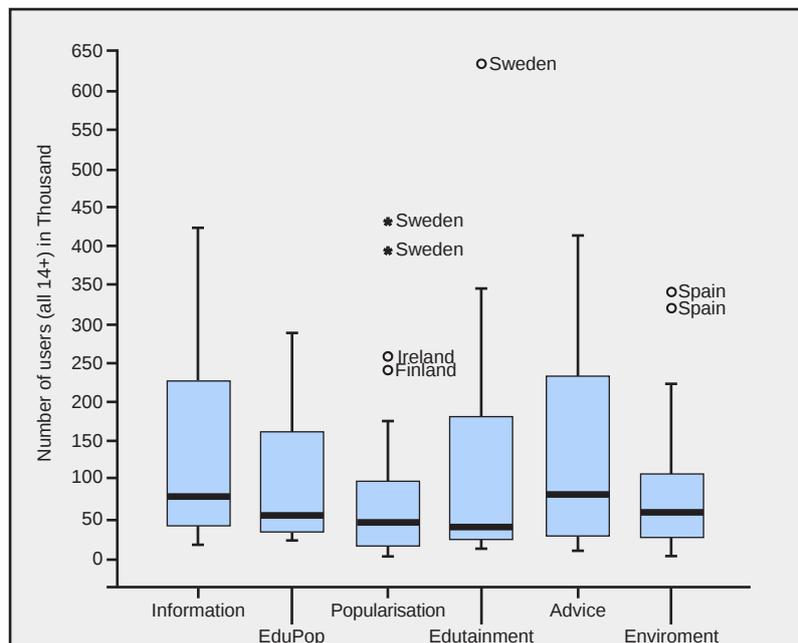


Table 3.3: Arithmetic mean and median of average total audience (10 to 14+) in nine European Countries, split into programme types in million

	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,14091	12	,146297	,08200
EduPop	,09936	14	,092742	,05600
Popularisation	,07266	67	,084488	,04600
Education	,16153	24	,304451	,04200
Advice	,15915	22	,194143	,09100
Environment	,09187	19	,101231	,06000
Total	,10806	158	,162685	0,05

Advice programmes scheduled outside primetime are completely missing in small markets. Within primetime they are slightly overrepresented. We think that especially this distortion within the sample more convincingly explain the higher median than the assumption of preferences towards this single programme type within European societies.

Unlike what probably could have been expected, the big countries do not exclusively broadcast programmes which reach exceptional big audiences. Instead, Swedish programmes dominate. French programmes are completely missing in the list of programmes, which could be assessed as extraordinary popular measured by the reach of other programmes of the same type broadcast in the sampled countries. Even two programmes from small markets appear in the list of programmes, which reach exceptional big audiences. One education programme from Spain is not plotted since it is outside the maximum of 650,000 viewers per episode. The programme is called “El hormiguero” and is scheduled on the commercial channel Cuatro in primetime. It reached about 1.6 million people per episode. The programme is one of the “in-between-science-programmes”, it only partly uses science to attract audiences. Within this show-format a crazy looking scientist, called Flippy, conducts spectacular experiments, which illustrate some basic principles.

We next consider the case of Germany, where we found comparably many science programmes, which are distributed sufficiently equally through the relevant categories, in order to conduct a separate analysis. Unlike the other sample, in Germany we do not have to control for differences in the potential audience, exceptionally large exposure is either due to different preferences or due to different sized available audiences or both. Therefore, also the arithmetic mean is meaningful under certain circumstances. The main problem of trying to interpret the exposure data consists in the small number of cases depending upon the programme type.

Graph 3.3: Distribution of average total audience (14+) in Germany, split up into programme types (N=80) in thousand

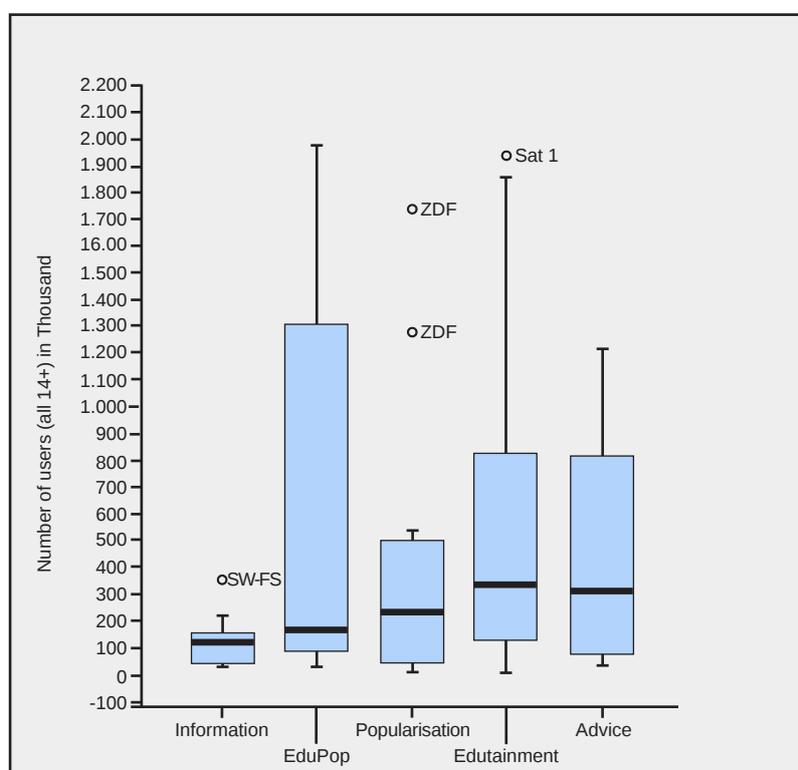


Table 3.4: Arithmetic mean and median of average total audience (14+) in Germany, split up into programme types in million

	Mean	N	Std. Dev.	Median	% of Total N
Specialisation of the Programme					
Information	,16000	11	,156684	,12000	13,8 %
EduPop	,59444	9	,752784	,15000	11,3 %
Popularisation	,58264	14	,820692	,26250	17,5 %
Education	,65863	30	,908035	,33500	37,5 %
Advice	,45071	14	,423805	,31250	17,5 %
Environment	,74000	2	,212132	,74000	2,5 %
Total	,53520	80	,729823	,23000	100,0 %

We only have two environmental programmes in the sample, not enough to conduct an exploration, which aims at identifying programme type preferences. Also small is the number of programmes which are not specialised on either popularisation or education, here we have only nine programmes in the sample. The graph reports the distribution of the total average audience per episode of each programme type, the table reports the arithmetic mean of each programme type. Environmental programmes are excluded from the graph due to their small number.

It sheds light on the complexity of the audience figures, that we even cannot assume different preferences as the reason for the clear differences of the audience exposure to information programmes. We believe that the low figures can partly be explained by some German particularities, which influence the size of audiences heavily. 90 per cent of the German population have access to at

least 35 free to air channels upon which the vast majority is originated in Germany. This means that the number of choices is particularly big. This seems to lead to a concentration by the average TV user on a cluster of 10 channels, which accounted for 90 per cent of individual TV consuming within a period of three months independent of the actual number of channels which can be received, and independent of programme genre preferences individuals have expressed in polls (Beisch, Engel 2006: 375). In order to assess the chances for big audiences to be attracted, it becomes therefore relevant, whether or not a channel belongs to the list of the ten favourites, which are ranked top according to common user-habits within the German population. Unlike other programme types, information programmes have exclusively been scheduled on channels which do not belong to the top ten of channels, with only one exception: two programmes have been scheduled on ZDF, which belongs to the top ten. But the programmes were scheduled during the night, where the available audience is very small.

While we think that scheduling is one point, different preferences do also account for a sufficient explanation of the small audiences. Six out of eleven information programmes can be assessed as very unattractive, since they have just been taken over by one public service channel from another. We did not define this as re-run, since the programme is scheduled on a different channel at a different time. But we believe that take-over-programmes are, like re-runs, less attractive than others, since they are usually used just to fill certain programme slots in less attractive places during the day. We believe that both characteristics together explain at least to a certain extent comparably small audience figures within this programme type segment.

We will list the programmes which reached particular big audiences in one or another market environment. We believe that these programmes can be particularly interesting, since they represent examples, which fulfil an essential requirement of all TV productions, they attracted big audiences.

Table 3.5: Science programmes that reach exceptional big audiences

	Country	Channel	Title
Information	Sweden	SVT24	Vetenskapsmagasinet
Popularisation	Germany	ZDF	Terra X
	Germany	ZDF	Abenteuer Forschung
	Sweden	SVT 2	Europa – en naturhistoria
	Sweden	SVT 2	Vetenskapens värld
	Ireland	RTE One	Hidden History
	Finland	TV 2	Dokumentiprojekt
Edutainment	Germany	ARD	Die große Show der Naturwunder
	Germany	SAT 1	Clever
	Spain	Quatro	El hormiguero
Advice	Sweden	SVT 2	Fråga Doctorn
Advocacy	Spain	La 2	El escarabajo verde
	Spain	TV 3	El medi ambient

This does not mean that these programmes necessarily reached the biggest audiences of all programmes identified in each programme type category, instead, these programmes are particularly successful either compared to other programmes of the same type in the same market environment (Germany) or compared to other programmes of the same type, broadcast in ten European countries.

Exposure to science programmes by different sections of European Audiences (Age groups)

We next report the distribution of audiences, split into gender, age-groups and educational levels. For the sake of this exploration, we will use the relative audience of each programme type by gender, age groups and educational levels in per cent, in order to avoid a splitting of our sample due to the reported distortions of the size of potential and available audiences. We will start with different age groups.

Graph 3.4: Distribution of young audience (10/14 to 29) exposure to science programme types in per cent. (N= 238)

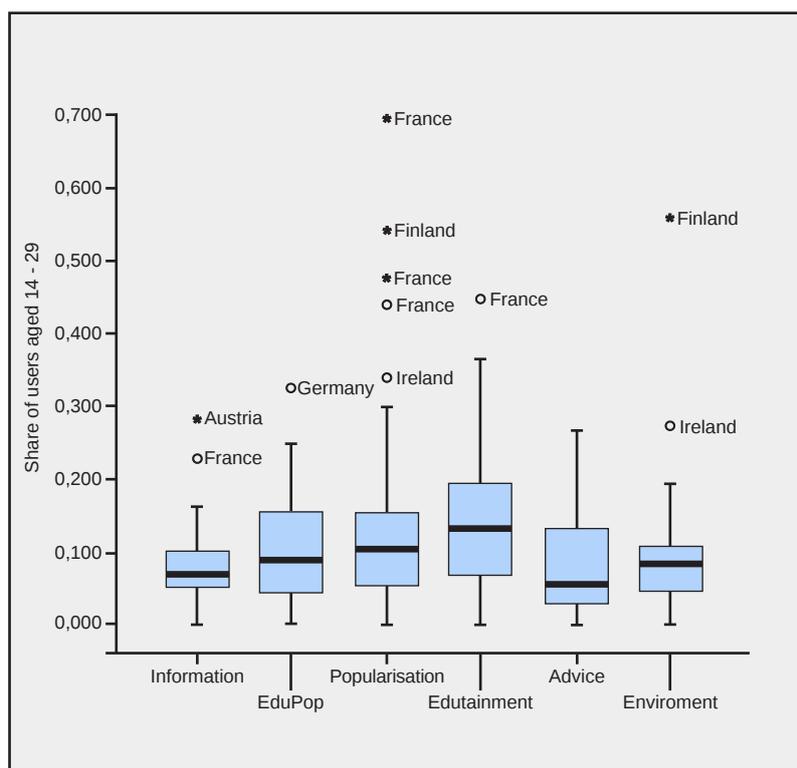


Table 3.6: Arithmetic means and medians of young audience (10/14 to 29) exposure to science programme types in per cent

	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,09024	21	,068665	,06808
EduPop	,10975	23	,087077	,08929
Popularisation	,12594	78	,121435	,10332
Edutainment	,14404	52	,107450	,12852
Advice	,08297	36	,074390	,05556
Environment	,10859	21	,122282	,08336
Total	,11688	231	,105950	,09651

The share of young audiences exposed to the different programme types is generally quite low. On average 12 per cent of the total audience is younger than 30 years. Half of the programmes within our sample have an audience which consists of less than 10 per cent young viewers. The comparison of the medians implies that advice programmes are slightly less preferred by especially this age group throughout the countries in our sample, and the same is true for Information Programmes. Edutainment programmes in contrast are watched by 14 per cent on an average, the median is only a bit lower, since the distribution of the shares is almost equal. This is no great surprise since especially within the sample of edutainment programmes, a good quarter targets explicitly children, teenagers or families. Therefore, it is even surprising that the differences in the share of youngsters are not higher within this programme type. We believe that all other programme types do not show differences, which can be interpreted convincingly with regard to different programme type preferences of this age group.

Part of our research strategy is the identification of programmes, which reach exceptionally large or small audiences dependent upon the category considered. It is evident, that French programmes are overrepresented, also overrepresented are Finland and Ireland, which have a comparably small potential audience. We believe that we can distinguish the programmes which reach exceptional high shares of young audiences roughly into three groups. The first group consists of programmes, for which the high share is most probably due to their scheduling that distorts the composition of available audiences towards youngsters. Programmes which popularise science are more often scheduled in France in the early afternoon between 2pm and 4pm than in any other country within the sample. We believe that this characteristic explains convincingly why especially French programmes dominate the exceptions within this programme type category.

The second group consists of programmes which can attribute their high share probably to a mixture of scheduling and concept, which means that these programmes obviously target young audiences and are scheduled at times during the day, where youngsters are supposed to be overrepresented within the available audience. This is for instance true for a programme called “Olipa kerran eläma” in Finland.

We believe that the third group is particularly interesting, since these programmes reached exceptionally large shares of youngsters, although not scheduled accordingly nor following a concept, which targets youngsters especially. This is true for an Austrian programme called Newton, a French programme called Rayons X, the German programme Galileo and one Irish programme, called “Two Wild”, a series of 12 costly high quality imported science documentaries. The first mentioned information programmes have a rather small total audience, the last mentioned reached big audiences. Certainly due to its success in terms of total audiences and its very high share of very young audiences the magazine concept of Galileo has been sold successfully throughout Europe and abroad. The magazine concept is broadcast in Belgium, Poland, Czech Republic, Italy, Russia, Thailand and even China (ProSiebenSat1 Media 2007).

We next report the relative exposure depending upon the type of the age group from 30 to 49 years. On average 28 per cent of the total audience of all science programme types selected belonged to this age group. The comparison of the medians as well as the arithmetic means implies preferences towards edutainment programmes and a certain antipathy towards advice programmes. Whereas the median spread closely around 25 per cent regarding all distinguished programmes types, advice programmes reach less than 20 per cent on an average, edutainment programmes more than 35 per cent.

Graph 3.5: Distribution of audience (30 to 49) exposure to science programme types in per cent. (N=238)

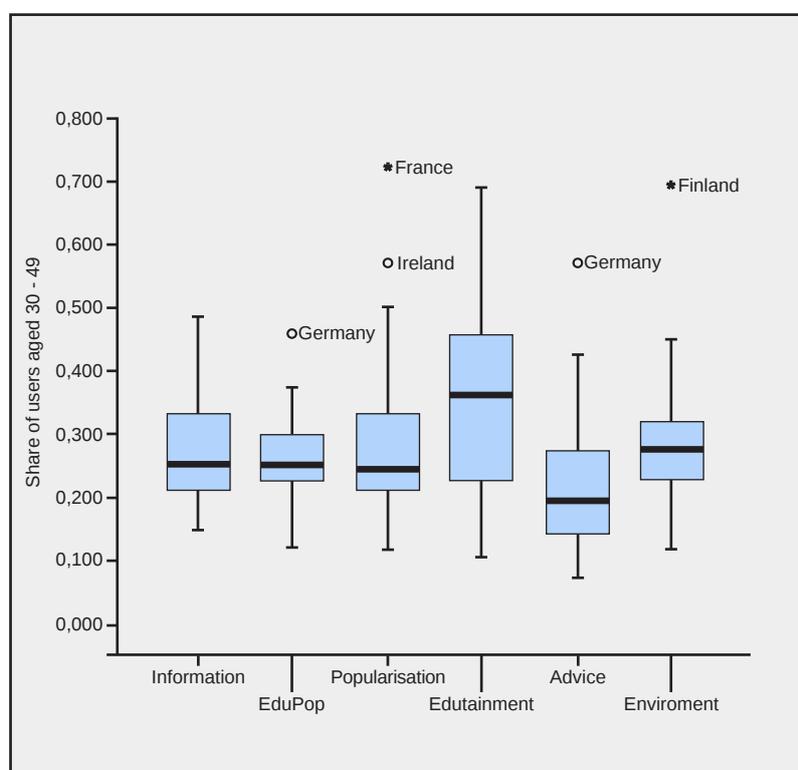


Table 3.7: Arithmetic means and medians of audience (30 to 49) exposure to science programme types in per cent

	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,27663	21	,088101	,25420
EduPop	,26685	23	,076254	,25362
Popularisation	,27715	78	,104326	,24689
Edutainment	,34450	52	,139337	,35965
Advice	,22002	36	,103186	,19698
Environment	,28798	21	,121896	,27805
Total	,28332	231	,116669	,25420

We believe that the big share of viewers, who belong to this age group has to do with the fact, that parents share TV viewing with their children, at least to a certain extent. Particularly high is the share of viewers (40 per cent) aged between 30 and 49 within the subgroup of edutainment programmes, which target explicitly children. In this perspective, the would-be preference of parents in fact mirrors the preference of the children or – in turn – the would-be preference of the children in fact mirrors what parents want their children to watch. But even after the exclusion of these programmes, audiences belonging to this age group are still clearly overrepresented. This is why we believe that this programme type is slightly preferred by this age group.

Advice programmes seem to be particularly unpopular in this age group. The distance of the share of this age group to the next following programme type constitutes six basis points, a bigger distance than in the young audience group.

Programmes with a particular high share of audiences, aged between 30 and 49, are rare. Two have been scheduled early in the morning on weekend and have been watched by a very small audience in total. One is a single programme scheduled on ARTE in France primetime. Therefore it is not possible to interpret this exception, single programmes from time to time may attract an exceptionally large share of audiences of a certain type thanks to many reasons, which cannot be explored by referring to just one single example.

Galileo, again, attracted an exceptionally large share of people in this age group. This means the programme is not only exceptionally successful in attracting young audiences, but also commercially attractive audiences aged between 30 and 49. We believe that this programme is the only one on the list of exceptions, which has conceptual characteristics that may help explain why this daily magazine in particular reaches that share of commercially attractive audiences.

The distribution of older audiences throughout the programme types corresponds with what has been outlined before. While the figures referring to information programmes, popularisation programmes, environmental programmes and programmes, which do both, popularising and “edutaining” do not indicate any preference, advice programmes and edutainment programmes do. The programmes which reach a particularly small share of older audiences have already been discussed with one exception. The Spanish science programme, “Redes”, did reach a very low share of older people. We believe that this is mainly due to the fact, that this programme is scheduled late at night, between 1am and 2am. Although it is scheduled that late, the programme reaches almost one million people.

Graph 3.6: Distribution of audience (50+) exposure to science programme types in per cent. (N=238)

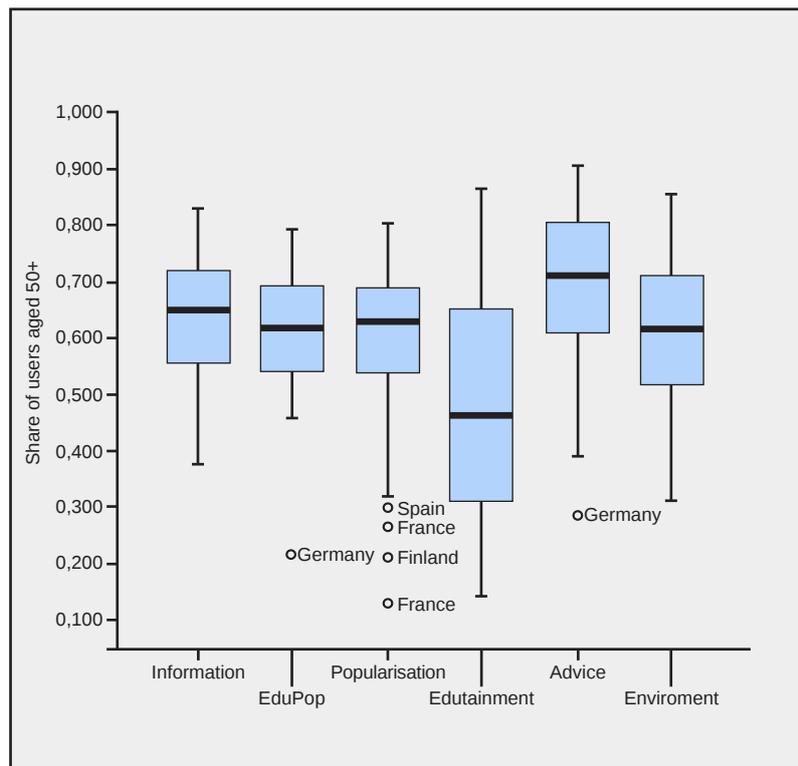


Table 3.8: Arithmetic means and medians of audience (50+) exposure to science programme types in per cent

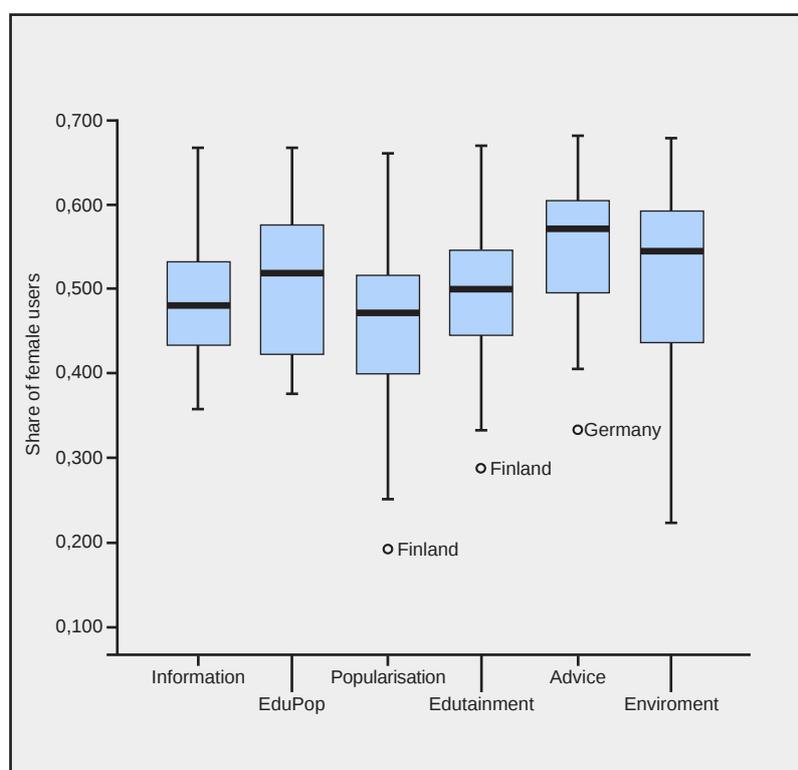
	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,63557	21	,114099	,65000
EduPop	,61206	23	,130598	,61842
Popularisation	,59313	78	,146011	,62945
Education	,47595	52	,203652	,45712
Advice	,70047	36	,142885	,71010
Environment	,62406	21	,163913	,62441
Total	,59204	231	,172437	,62500

Exposure to science programmes by different sections of European Audiences (Gender)

We are now going to explore whether or not gender matters with regard to science programme types, identified so far. Our data suggest: Yes, it does.

The comparison of arithmetic mean and median implies that female audiences slightly prefer advice programmes, which consist mostly of health magazines, but also of six computer and technology magazines, topics in which females are usually less interested. This is supported also by our findings. After the exclusion of advice programmes, which broadcast news, tips and tricks regarding technology, the median increases to nearly 60 per cent, the mean increases also and constitutes 58 per cent female share. This means that women prefer not particularly advice programmes in general, but health advice programmes in particular. Accordingly, males obviously do not like health programmes that much.

We believe that our data further supports the view, that popularisation programmes are less preferred to other programme types. Also within this programme type, the topic area which is covered matters. In particular, documentaries on history and archaeology are less preferred by females than by males. These programmes reach a female share of only 42 per cent on an average, while all other popularisation programmes have a female share of nearly 50 per cent.

Graph 3.7: Distribution of female audience exposure to science programme types in per cent. (N=238)**Table 3.9: Arithmetic means and medians of female audience exposure to science programme types in per cent**

	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,48145	17	,079665	,48122
EduPop	,51291	19	,096756	,51949
Popularisation	,45793	51	,099343	,47227
Edutainment	,50024	47	,081694	,50000
Advice	,54878	27	,085185	,57143
Environment	,50618	12	,128026	,52588
Total	,49530	173	,096438	,50000

We identified three programmes which reached exceptionally small shares of female audiences. One is a Finnish documentary on World War One, scheduled outside primetime by the specialised channel Teema, which usually reaches small total audiences. We believe that this exception simply underlines the general finding that females obviously are less attracted by history documentaries in general. The same is true for the technology programme, scheduled in Germany called “C’t Magazin”. The third example was scheduled primetime on the Finnish public service channel FST5, broadcasting in Swedish language, which usually reaches very small audiences. It is a buy-in production from the BBC, called “Rough Science”, which can be considered to be one of the innovative programme formats developed in the recent past within this programme segment. It makes use of Reality TV concepts with scientists as protagonists. The 11 episodes, which were broadcast within our reference period of 2007-08, reaches an exceptionally small share of females. Since the format

is quite unique, it is not possible to interpret this finding meaningfully.

Overall, we have no reason to believe that science programmes as defined in this context, in general are preferred by one gender. Instead, when we consider the whole programme selection, the audience is almost perfectly equally distributed throughout both gender categories.

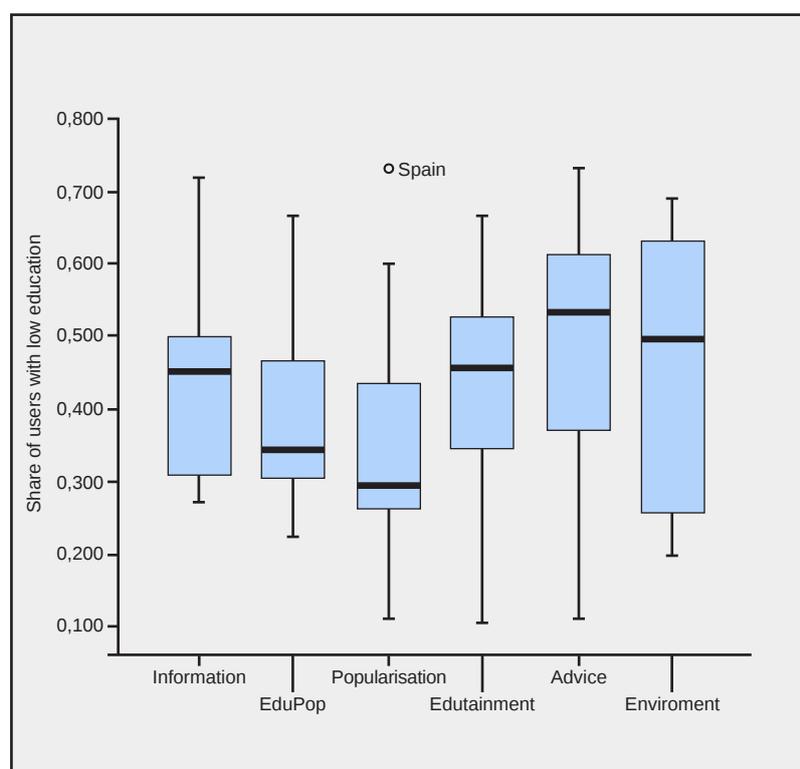
Exposure to science programmes by different sections of European Audiences (Education)

Finally, we will explore the audience shares of different education levels, which are reached by science programmes in our sample of European countries. Here again we are confronted with the distorted distribution of the science programme types throughout the countries. This will challenge our ability to conduct the following exploration due to the quite different education levels, which are attained in different European countries. Moreover, we lack data from France and Ireland, from which we did not receive user data that report the education level attained by the audiences of science programmes. We will come back to this, when we discuss the findings in detail.

In the following paragraphs, we will compare the shares of the audience having completed different education levels. Among audiences, which completed primary education only, advice programmes are the most popular. We believe that this corresponds with our finding, that older sections of the audiences seem to prefer this programme type slightly. Especially in older sections of European societies, primary education levels are more common than in younger sections.

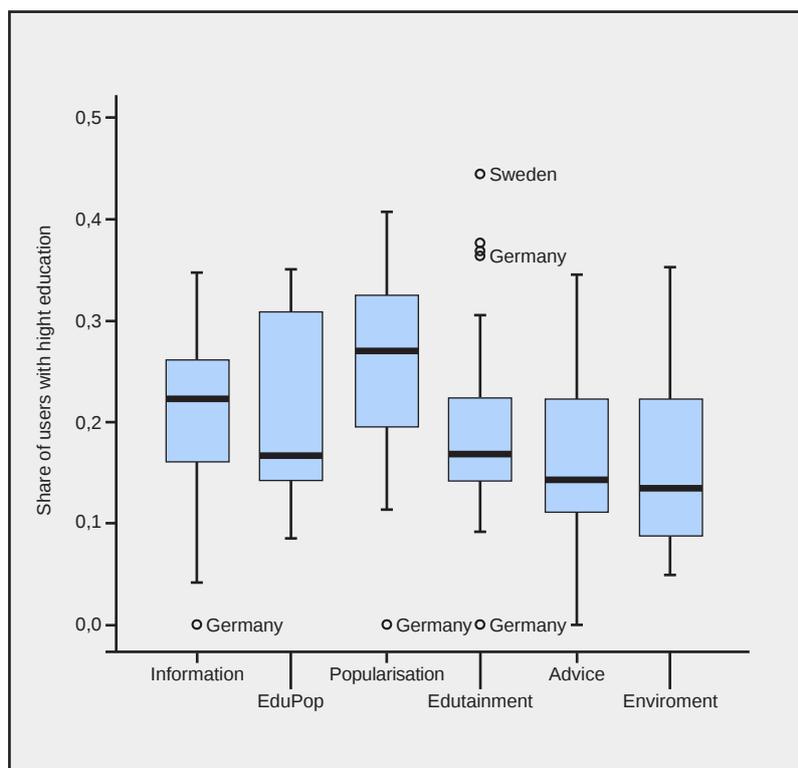
The audiences reached by popularisation programmes imply that less educated audiences seem to prefer programmes less, by which established scientific findings or big issues in science are broadcast. This interpretation is questioned by the fact that popularisation programmes are more often broadcast in Scandinavia, where the share of people, who completed only primary level, is considerably smaller than in Spain, Greece and Austria, where significantly less programmes of this type have been scheduled (Rodríguez-Pose et al 2007:11). We believe that this explains why the median in this programme type category is relatively low. Taken into account the distortion of the sample, we can at best assume a slightly lower preference for this programme type.

We believe that in all other programme type categories the differences are not high enough to be interpreted with regard to preferences.

Graph 3.8: Shares of audiences, who completed primary education levels in per cent. (N=238)**Table 3.10: Arithmetic means and medians of audience shares, who completed primary education levels in per cent**

	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,42780	19	,127933	,45161
EduPop	,38532	19	,123215	,34314
Popularisation	,34269	44	,127270	,29400
Education	,43214	45	,136800	,45638
Advice	,50213	29	,155573	,53333
Environment	,45762	16	,191124	,49596
Total	,41778	172	,149549	,42805

As far as popularisation programmes are concerned, the share of audiences, who completed tertiary education levels, corresponds with the share of lower educated audiences. But, due to the distortions regarding this programme type within the sample, the interpretation of the higher shares becomes as difficult as the interpretation of lower shares. We cannot rule out that the shares more reflects the distortions in the sample than programme type preferences of well educated audiences.

Graph 3.9: Shares of audiences, who completed tertiary education levels in per cent. (N=234)**Table 3.11: Arithmetic means and medians of audience shares, who completed primary education levels in per cent**

	Mean	N	Std. Dev.	Median
Specialisation of the Programme				
Information	,20550	19	,099472	,22222
EduPop	,20611	19	,086527	,16667
Popularisation	,25296	44	,084659	,26870
Education	,18698	44	,088494	,16840
Advice	,16318	29	,091423	,14286
Environment	,16298	16	,096999	,13371
Total	,20186	171	,094737	,18750

We believe that the range of audience shares, the median and the arithmetic mean do not support assumptions about the preferences of people with this education level.

Finally, we will briefly explore the programmes, which reached exceptionally large audience shares in this category. We believe that only one programme has the conceptual characteristics to attract particular better educated audiences: in the German programme, “Das philosophische Quartett”, a group of philosophers discuss recent societal trends. This programme was formerly scheduled on one of the big public service channels in Germany, but shifted to the specialised small channel 3sat. Accordingly, the programme reached only a small audience in total. The Swedish examples are difficult to interpret, since they represent single documentaries, scheduled primetime on Sunday evening.

Overall, education is not a category, which matters at the rather abstract level at which the programme types have been classified. The average shares reached by science programmes in general, coincides with the distribution of education levels within the European Union. 50 per cent of the European population completed primary education levels, 30 per cent secondary levels and 20 per cent tertiary levels (Rodríguez-Pose et al 2007:11). This distribution corresponds with the audience shares reached by science programmes, although the share of audiences with low education levels is a bit smaller. We believe that this is due to the fact that Scandinavia accounts for a good share of all programmes investigated, where less than 30 per cent completed only primary education levels. We cannot find any evidence that this programme type in general is more attractive to one or another audience group, which differs by education levels completed.

The societal dispersion of science programmes in Europe

The average exposure to single science programmes is helpful to explore differences in the popularity of single programmes or single programme types. It also helps identify particular successful programme formats from a European perspective. This does not tell us much about the societal dispersion of these programmes depending upon the country observed. With “societal dispersion” we mean an assessment of the extent, to which science programmes are spread within a given national context. Where aggregated data are used, this has to be distinguished sharply from measurements of the share of the population, which is actually reached by a single programme.

The assessment of the societal dispersion is fairly challenging regarding Sweden, since Sweden delivered only few data to assess the reach of science programmes scheduled on the small, thematically specialised channel Kunskapskanalen. In order to integrate Sweden into this research step, we have estimated the reach of single programmes scheduled on Kunskapskanalen by taking into account the average reach of programmes scheduled on this channel in different time slots. This means that we have replaced missing data for single programmes with estimated data.

In the following paragraphs we will conduct a comparative analysis of the estimated societal dispersion of science programmes in 10 countries³ by using three different units, which must briefly be discussed beforehand.

- a) The “episode dispersion” of science programmes is calculated by dividing the average total audience per episode with the population in a given country taken from Eurostat (Lanzieri 2008: 4). Example: A regular weekly programme with an average absolute audience of one million per episode reaches an average dispersion of 1 percent in a country with 10 million inhabitants. Due to the fact that not every episode of a weekly programme is watched by the same audience, this unit underestimates considerably the actual reach of the programme measured by the number of people who watched this programme within a period of one year. According to research conducted in Germany, a serial programme can only count on a 30 percent share of people, who watch two consecutive episodes (ARD-Forschungsdienst 1998).
- b) The programme dispersion therefore estimates the share of the population who have watched at least one episode of a given programme within one year. This unit multiplies in principle the episode dispersion with the number of episodes of a given programme. Example: A programme reached an average societal dispersion of 1 percent per episode and was broadcast 20 times within our reference period, thus the accumulated average episode dispersion in this example would be 20 percent. Hence, this unit would overestimate the actual reach of a programme considerably since not every episode of a programme is watched by different people. This is why we weighted the reach by a factor, which takes into account the linear relation between the frequency, with which a programme is scheduled and the disparity of its audience. The more often a programme is scheduled, the less different its audience is from episode to episode. For getting the weighting factors we used data of 42 German programmes, which report the actual reach of each programme within our reference period. But it is decisive to stress, that the calculation of the accumulated reach of all episodes of a programme remains an estimate and can only be used on an aggregated level. We cannot break down these figures to a single programme.

c) This is also true for the last unit. To estimate the share of the population, who have tuned into one of the offers provided in an average week in 2007/2008 we have calculated a weighted sum-index, which reports the probable share of the population, which has watched one of the programmes provided within one week. The weighting factors take into account that the average episode dispersion of a series with 10 episodes within one year for instance cannot be calculated in the same way as a regular weekly programme with 52 episodes within one year. Example: In a given country two science programmes have been provided between 2007 and 2008. The first broadcast 10 episodes of one hour and reached an average episode dispersion of 10 per cent. In our calculation of airtime, this programme goes in with about 11 minutes airtime in an average week 2007/2008) ($10 * 60 \text{ Minutes} / 52 \text{ weeks} = 11$). The second programme has broadcast 52 episodes of one hour length, it has also reached 10 per cent per episode, but goes in with 60 minutes airtime in an average week. If we simply summarised both programmes, we would state that in sum on an average 20 per cent of the population have tuned into the programmes provided. Instead, we have weighted the sum index by the differences in airtime, dividing the average episode dispersion by the airtime of a programme within an average week. We argue that this index allows a better estimation of the share of the population, who tuned into TV science programme offers within an average week. Notwithstanding, the index probably overestimates the societal dispersion of all science programme offers, since it is not realistic that every programme provided in one week has been watched by different people.

We believe that all three units together contribute to an understanding of how well spread science programmes are depending upon the country. The distribution of the different units leads to a distinctive pattern between the figures, which illustrates differences between the countries regarding the number of programmes, the number of episodes produced and their scheduling, which together leads to different levels of societal dispersion.

In Germany a single episode of one of the ninety programmes broadcast between 2007 and 2008 reached on an average 6 out of 1000 Germans. Due to the fact that not every episode of a programme has been watched by the same audience, the estimated average reach of each science programme within our reference period between 2007/2008 is about 10 per cent of all Germans. This means, an estimated share of 10 per cent of the German population has watched at least one episode of each of the programmes provided within one year. Due to the high quantity of offers, in Germany the highest share of the population was reached in an average week by science programmes. For the interpretation of the data it is important to stress, that the concrete figure is just an estimate, which is rather uncertain. Regarding the programme dispersion it is fairly uncertain whether or not 43 per cent of all Germans have watched one of the programmes offered in an average week between 2007/2008. If this concrete figure is not reliable, its relation to the other figures is. We estimate therefore that the programme dispersion in an average week in Germany is much higher than in all other sampled countries, including Sweden and Finland, which also must be estimated as countries, where the programme dispersion is comparably high.

Table 3.12: Societal dispersion of science programmes in 10 European Countries

	Episode dispersion	Programme dispersion* Ø	Programme dispersion Median	Episode dispersion Sum	N
Country					
Germany	,06	,097	,040	,43	90
Finland	,17	,175	,047	,28	36
Sweden	,20	,122	,064	,24	51
Ireland	,10	,050	,022	,04	27
Estonia	,33	,538	,341	,12	9
Bulgaria	,09	,146	,130	,09	12
Spain	,04	,096	,056	,11	25
Cyprus	,20	,337	,393	,03	3
Austria	,05	,127	,121	,02	6
Greece	,04	,078	,048	,04	18
Total	,09	,104	,040	,14	277

* Estimated

The differences in the average episode dispersion, the average programme dispersion and the share of the population reached by all offers within an average week leads us to a classification of national societies, in which science programmes are fairly widespread and those, where we cannot count on a high societal dispersion of science programmes. In the first group of countries we find Germany, Finland and Sweden, all three equipped with fairly strong public broadcasters, segmented markets and a comparably rich tradition of science programming in TV.

In Austria and Ireland the societal dispersion of science programmes offered predominantly by the public broadcasters ORF and RTE have to be assessed as comparatively low, but in these countries we have to take into account the considerably wider range of science programmes provided by channels of larger neighbouring countries.

The societal dispersion in Greece and Cyprus is comparatively low, although Cyprus reached like Estonia a very high programme dispersion predominantly due to the small size of the population and the preference for regular programmes. Spain, Bulgaria and Estonia finally have to be assessed as countries in between regarding the societal dispersion of science programmes. In Bulgaria and Spain dispersion of advice programmes is highest and these programmes also dominates the offers by media professionals.

The pattern of the assessed societal dispersion of programmes mirrors predominantly the size of the population and the structure of offers. This is why Germany, Finland and Sweden show a similar pattern. All three countries dedicate a comparatively large amount of airtime to science programmes, but broadcast the lion's share on small channels. This is why the average programme dispersion is not higher than in other countries, but the share of the population, who have tuned into a science programme in an average week, is. Within this group of countries, Germany has a smaller average episode dispersion due to the size of the population and the higher number of channels. The programme dispersion is also smaller than in Finland and Sweden, but would be even smaller if Germany was not characterised by a big share of regular programmes, which have been scheduled through the whole year. The societal dispersion of all programmes scheduled in an average week is higher than in Finland and Sweden, since Germany dedicates much more airtime to science in an average week than Finland or Sweden.

Greece, Bulgaria and Austria, when we exclude the influence of German channels, show a different pattern. All three reach a similar episode dispersion and a similar programme dispersion to Germany thanks to the dominance of regular programmes, which have been scheduled many times within one year. But these countries offer only few programmes, this is why the societal dispersion of all

programmes scheduled in an average week is much lower than in Germany, Finland or Sweden. Cyprus and Estonia show a similar pattern when compared with Greece. The exceptionally high programme dispersion is due to the preference of regular programmes and the small size of the population.

Ireland finally can attribute its low average programme dispersion to the dominance of serial or one-off productions. That the dispersion of all programmes within an average week is not even lower is due to the fact that Ireland broadcast a comparatively large number of single serial or single one-off productions within one year.

Concluding remarks

We have conducted the very first exploration of audience exposure to science programmes, which have been broadcast in 11 European countries, in order to analyse whether or not different preferences of the European public may contribute to an explanation of the structure of science programme offers by public service broadcasters and their commercial competitors. We have not found convincing evidence that audiences have different preferences depending upon the type of science programme distinguished. This means that on the level of programme type the size of an audience is more determined by scheduling than by different preferences of the European public. We believe that this finding does not necessarily support the view that the audiences just watch what producers want them to watch, or that audiences must be considered to be passive consumers of what is scheduled on their preferred channels. First of all our findings support the view that the programme type classification, which primarily refers to organisational needs of producers, is only slightly helpful for the explanation of audience exposure. We cannot ignore that the range of exposure to programmes, belonging to the same type, is generally quite wide. We identified edutainment programmes for instance, which reached both very small and very large audiences. The same is true for advice programmes and programmes, which are not specialised in popularisation or edutainment. Therefore, the exploration must be supplemented by an in-depth analysis of factors, which distinguished programmes within one and the same programme type. This is especially relevant for edutainment programmes. This is why we consider this exploration as very first step in understanding audience behaviour towards science programming in Europe.

³ The data from France are not sufficient to integrate them into this research step.

Chapter 4

Motives, expectations and judgements of European audiences towards science on TV

Summary

In this chapter we report selected outcomes of 40 focus group discussions, which took place in five European member states (MS): Germany, Finland, Greece, Bulgaria and Ireland. The aim of the discussions was to gather audience views about science television programmes. The responses of focus group participants in the discussions contributes to an understanding of:

- a) their motives to engage with science
- b) their expectations regarding science on TV
- c) their judgements of TV as a medium compared to other media and
- d) their judgements of selected TV science programmes belonging to three categories: information, popularisation and edutainment.

Motives to engage with science directly, from an audience point of view, are often indistinguishable from motives to engage with science through media use, especially through the use of TV. Respondents in focus group discussions do not usually have direct access to the world of science, this is why direct engagement with science is often confused with engagement through media use. The dominant motivation for engagement for all groups across the five countries is that science provides new insights into what is completely unknown. These insights into what is unknown appeared to be strongly connected with affective motives, e.g. feeling fascinated, inspired, surprised and feeling that one is not wasting leisure time.

This indicates on the whole that participants were motivated to engage with science by a desire for entertainment rather than a desire for information. This seems to be particularly true for television science, since the use of TV, more than other media, in general appears to be motivated by a wish to be entertained.

Accordingly, focus group participants were positive about the entertainment qualities of television, but responded negatively to the information content of TV in the sense that someone, who really wants to know, would not rely on TV. Likewise, concerning motivations and expectations regarding science in TV, respondents do not usually include information on science as part of what they expect from TV. This, in part, explains why TV lacks information programmes on science and why many respondents did not recognise a news report on a scientific finding as something that is broadcast by science programmes.

Instead, respondents expect popularisation and edutainment programmes from TV, they become fascinated, becoming inspired to go deeper into a certain subject area. TV programmes provide insights into unknown worlds and enrichment of known worlds by new scientific explanations.

All in all, we did not observe meaningful differences with regard to motives for engagement with science, expectations towards science on TV and judgements of the TV medium itself across countries. Hence, we found no evidence that allowed us to link differences in science programmes offered with different expectations of respondents across countries, which in turn could be linked to cultural differences or the like. Our findings suggest that respondents, who claimed to be interested in science and claimed to use science in media frequently share very similar views across European borders.

Introduction

In the previous chapters we have explored production and popularity of science programmes being broadcast in 13 European MS between 2007 and 2008. We have classified science programmes into five different types and proposed three dimensions, which are relevant to understanding properly the provision of science by audiovisual media and according to which a comparison of science broadcasting can usefully be conducted with regard to the production sphere. The three dimensions are:

1. The segmentation of media markets, with special emphasis on TV
2. The degree of market forces, with special emphasis on public service TV
3. The tradition of science reporting in audiovisual media with special emphasis on public service broadcasting.

We believe that the determinants identified so far are sufficient to explain differences and similarities of programmes offered by audiovisual media in each of the sampled countries comprehensively, even though each dimension needed further specifications.

The explanation for the presence or absence of programmes, specialised in science in one way or another must also include differences regarding the popularity of these programmes in European societies. This is especially relevant for the TV market, which is characterised by very close relations between the production process and audience ratings, which, unlike radio, provide TV channels with relevant data every day. In our second research step, we have therefore explored the ratings of the TV programmes selected by referring to data gathered by specialised agencies. Not surprisingly, the ratings mirror differences in programme policies, and heterogeneity of programme formats in each programme type category distinguished rather the differences in popularity dependent upon the type of programme. But it would be misleading to conclude that European audiences just watch what media professionals want them to watch. Instead, we believe that the engagement with science through audiovisual media is at least to a certain extent an active, rational behaviour of audiences, which we have divided into two basic parts, which must be distinguished analytically: *selection of science content* in audiovisual media and *reception of science content* in audiovisual media.

The AVSA research team conducted 40 focus group discussions each with 8 -12 participants in five European MS: Germany, Finland, Greece, Bulgaria and Ireland. The composition of the groups was varied regarding

- a) the direct access to science b) age c) education

Table 4.1.: Composition of the focus groups

Group 1	Group 3
Participants of mixed gender (preferably balanced) recruited from schools (vocational college), under 20 years old.	Participants of mixed gender (preferably balanced) recruited from schools (upper secondary school), 15 to 17 years old
Group 2	Group 4
Participants of mixed gender (preferably balanced) recruited from lists of science teachers, amateurs scientists, science museum visitors, café scientifique participants, etc.	Participants of mixed gender (preferably balanced) recruited from lists of science teachers, amateurs scientists, science museum visitors, café scientifique participants etc.
Group 5	Group 7
Participants of mixed gender (preferably balanced) who are well educated (university degree), between 30 and 49 years of age.	Participants of mixed gender (preferably balanced) who come from mixed educational backgrounds and are between 30 and 49 years of age.
Group 6	Group 8
Participants of mixed gender (preferably balanced) who are 50 + years of age, well educated (university degree).	Participants of mixed gender (preferably balanced) who are 50+ years of age and come from mixed educational backgrounds

These discussions aimed to explain why participants regularly selected science in media, i.e. why they show a characteristic pattern of media use. In addition, these discussions aimed to explain why participants stay tuned into specific TV science offerings, provided at a certain point in time, or why they switch off.

The focus group discussions have illustrated relevant aspects which contribute to an understanding of why participants engage with science through regular selection of science contents in mass media. They do it because of:

- a) the perceived personal functionality of science (in media)
- b) perceived own personality traits (curiosity)
- c) perceived characteristics of the medium that transmits science content.

In addition, the focus group discussions brought up a set of

- d) judgements relevant for understanding the reception process of science content dependent upon the programme type.

We will explain each of these aspects in detail in the following sections (with the exception of the personality trait curiosity, which is self-explanatory and represents an important motive for engagement with science).

Perceived personal functionality of science/ Motives for engagement with science (through media use)

In the following sections we summarise our findings regarding the question of . Due to the fact that motives for a certain behaviour – in this context engagement with science – usually cannot be provoked by a simple “why-question” (Krueger 1994: 54ff), we provoked relevant statements by asking two open questions:

- A) What prompts your interest in science?
- B) Which attributes of science do you find most attractive?¹

These two prompts in all countries brought up several statements, which are interpreted as individual motives for the engagement with science, even though we cannot clearly distinguish between motives, needs and rewards expected or obtained from engagement with science. A „need for education“ for instance, can be interpreted as being a motive for engagement with science, as a reward expected from engagement with science and also as reward obtained, since the identification of a need has to be assessed as being influenced by engagement with science in the past. This is why we – as many researchers before - cannot distinguish between motives, motivation, needs, rewards and uses clearly (Schweiger 2007: 73). All mentioned constructs may be distinguished for analytical reasons, but they appear mixed up in practise. The structure of the statements does not allow to us to draw a clear line between the constructs mentioned. However, in the context of the discussions all statements can be interpreted as explanations as to why participants are motivated to engage with science.

As the way the questions were asked indicates, the intention was to distinguish first between motives for engagement with science independent of a specific medium. Motives can refer to science *as a content category independent from a specific medium* or to *science as content category in TV* for instance (Schweiger 2007: 73). But participants often did not draw a clear line between motives for their engagement with science and motives for engagement with science through watching TV science programmes. Hence, motives to engage with science as such cannot clearly be distinguished from motives to engage with science through watching TV science programmes. Mixing up content and media was most clearly observed in Finland and Germany, both countries with an estimated comparatively high number of TV science programmes. When they were asked the open questions especially, participants with lower education levels started talking about their motives for watching science TV programmes. In sharp contrast, predominantly the active groups, with participants

equipped with direct access to “real” science, usually distinguished clearly between engagement with science as such (through doing science for instance) and engagement with science through watching TV programmes. This is why we conclude that a clear line between science content and the medium which transmits the content cannot usually be drawn. As a consequence, we cannot distinguish clearly between motives for engagement with science through various means from motives for selecting science in TV.

To order the various motives and to unfold their multidimensionality, we have adopted a typology of motives developed by Katz and Gurevitch (1976: 220), which consists of three dimensions:

- The first dimension refers to needs and distinguishes between cognitive, affective, integrative and social needs.
- The second dimension concerns the referent, to which the need refers to, this can be self, peers, relatives, the world... .
- The third dimension refers to the mode of the needs, distinguishing between acquiring, weakening or strengthening (Schweiger 2007: 83).

Table 4.1. shows the categories into which the motives of engaging with science (through media use) have been classed.

Table 4.2.: Classification of motives for engagement with science (through media use)

Referent	Self	Peers	Society	Tradition, Culture	World
Resource & Mode					
Cognition (acquiring, increasing knowledge, understanding)	x			x	x
Affect (increasing/acquiring emotional experiences)	x				
Integration (rising social status, trust, stability)	x		x	x	
Interaction		x			

Before starting to exemplify our findings by selected statements derived from the focus group discussions, we will firstly list the motives mentioned.

Box: List of motives for engagement with science (through media)

Cognitive motives:

- Expanding the limits of individual worlds by getting insights in completely unknown worlds
- Enrichment of known worlds by unknown scientific explanations
- Increasing understanding the world around
- Increasing understanding of self

Affective motives referring to self

- Becoming fascinated
- Becoming surprised
- Becoming inspired to search for further information
- Avoiding the feeling of wasting time
- Increasing ability to unwind from daily routine (self)

Integration

- Becoming orientated to the world in the future (world)
- Becoming orientated to behave rationally (self)
- Formation/confirmation of own identity (self)
- Rising social status (peers)
- Gaining expertise which will be requested by others (peers)

Interaction

- Gaining interesting things to talk about (peers)

In the discussion, the motives did not appear clearly distinguishable from each other. Instead, the statements indicate that the motives are strongly connected with each other. The perception that science provides information never heard of before is crucial for understanding the motivation for engagement with science by participants in all focus group discussions. The motive of increasing knowledge about the unknown is generally connected with other motives.

Selected motives for engagement with science as expressed in focus group discussions

Cognitive motives connected with cognitive arousal and integration

German participants expressed views that science (or science programmes) provides insights into completely or largely unknown phenomena, this is why participants liked science and/or science programmes. Statements were sometimes accompanied by remarks like “getting fascinated”, “getting impressed”; “getting inspired to go deeper into a subject“ e.g. Karin (68): “I learn a lot of new things I didn’t know before that have always interested me though. As an example, I’m interested in the abyssal sea – there is a wide range of programmes on that (topic) – and it happened before that I would stand in front of the TV in disbelief learning (amazing) things about it. Dinosaurs are another topic that has been broadcast a lot lately (...) I can hardly envision they were really that big. All the programmes shown at night are really fascinating as well (...) on mathematics for instance. And I realise: how can a human being actually be capable of doing such calculations? That’s just totally vague to me – all these numbers and what do you know – endless formulas (...) I don’t have a clue (about these things) but I’m fascinated by it and think ,Gee! Are you stupid or something for not having understood any of this...“.

Some German participants found that science provides explanations for well known phenomena, this is why participants like science programmes especially. Statements supporting this theme were sometimes accompanied by remarks like “aha”, which is an expression of “getting surprised”. Peter, 58, responding to the question of what prompts his interest in science said: “Explanations to the things I don’t know about or that I have not had cognisance of so far, simply like that – ,Wissen macht ah!‘, that’s a great a show (...) wonderful show which contains so many different topics that really make me say ,aha!‘ - that’s really interesting”.

Learning about the unknown is not only connected with some affective rewards, like being fascinated. Learning about the unknown is also connected with adjustment and/or development of individual world views by new scientific findings. Specifically, in group no. 8, Klaus (65) when asked what prompted his interest in science: “I’m 65, will turn 66: at that stage the question comes up about where we come from and where we will be going – I’m really taking a great interest in that at the moment. Natural sciences on the other hand – I worked professionally with that and I can get information on that anytime – are a bit boring for me.” Also, in group no. 6, more than one participant combined his interest in science with the adjustment of own ideas. Dieter: “We’re conceiving the future world, we’re making plans, we’re getting new ideas and often enough science and research come up with entirely different results: (...) that’s what fascinates me.” Also, in group no. 7: Science provides findings that question individual world views or pre-judgements. It provides unknown findings or explanations, which question well known beliefs. Florian, 39, when asked what prompts his interest in science responded by saying: “The acquisition of understanding, of insight – for me, personally. In the best case to also create a new conception of the world, in the sense of acquiring new insights which would help me to substitute my old conception of the world and to head it off. Therefore it’s science of history that interests me the most.”

Some German participants liked science because science provides orientation in different areas of everyday life and new scientific findings influence every day routines or habits. For example, it provides knowledge to rethink personal routines like diet. For example, Winfried: “Yeah, science also affects your everyday life, right? All these things you get confronted with by hearsay, like – I don’t know – you’re not supposed to eat that much cholesterol – new scientific findings, it’s all bullshit: if you drink too much coffee you dehydrate (...) that’s all nonsense. All these pragmatic issues and then – but my opinion is: you learn a lot of things by yourself (from your own experience) – whenever I drink coffee – I’m far more thirsty than before! ME! Personally! (...) Anyway - I don’t know if he’s right or wrong (with what he’s saying) about that coffee but I’m still thirsty afterwards!” Science helps people

to navigate through life by providing useful (scientific) background information, as Jutta, 48 said: “I believe it to be really important to acquire background knowledge on, for instance, certain diseases (...) so that you don’t get as infected by the general panic concerning the bird or the swine flu.”

According to *Finnish participants* new knowledge helped them understand how things work and new ideas helped them to understand themselves and other human beings as well as past and present societies. In group no. 3 (students of upper secondary school) practically everyone replied to the question by saying how science could help them personally in orientation in life or in becoming a better person. “When you learn more you can understand bigger entities and how things are linked with each other.” (Iiris K., group no. 3).

Bulgarian participants talked about education and knowledge the most and described their interest and engagement with science as an internal need they felt. The reasons they gave were, among others, „an opportunity to gain knowledge of the world“, „need for knowledge“, „need for information“, „teaches you something new“, „to know who we are and where we came from“. „We can learn from these shows what can be expected in the future in various areas of science and technology, what will happen in the future“, „to get facts and information on different topics“ e.g. „Only in shows like these you can see the progress that mankind has made, what is the newest thing in different spheres of science. More or less we must be informed“.

In *Greece* older participants added the dimension of education or information. This was exclusively done by the 50+ group no. 8. Participants liked science because of the fact that „you learn something“ [group no. 8, Rosa, 54] and „get informed about problems“ or „learn about the unknown you would like to understand better“ [group no. 8, Aristidis, 61].

Cognitive motives connected with other affective motives

This combination did appear less often compared to other combinations, it was explicitly mentioned in discussions in Germany, Bulgaria and Ireland.

Germany: Martin, 32: “It’s also a pastime activity, to be quite trivial. When I switch on the TV there’s quite some bullshit on and these programmes (science programmes) stand out against the other ones by letting time fly by rapidly. They’re also quite interesting even if you don’t derive any personal utility from them and just watch them to relax and to learn something about a topic you’d never heard of.”

Bulgarian participants mentioned entertainment and recreation as contributing to their interest in science and science programmes. Specifically, they mentioned that: „helps you unwind from the daily grind“, „pleasurable intellectual effort“, these programmes, according to participants, are more interesting than most of the entertainment programmes and talk-shows shown on TV (“We prefer them to the Turkish soap operas, which have flooded television”).

Watching science programmes, particularly blue chip documentaries rather than more entertainment-based formats was perceived by Irish participants as being a worthwhile activity. „FG7MP1: I think watching science as well you don’t feel like you’re wasting time if you sit watching *The Simpsons* you feel like you’ve wasted half an hour.“ Participants said that they enjoyed watching high quality programmes, one 16-year-old male student said he liked to watch such programmes because: “It gives you a break away from all the reality TV. It gives you interesting stuff that is real“. This was echoed by a participant in another focus group who said: “There’s nothing more interesting than real-life experience”.

Cognitive motives connected with integration and interaction

Bulgarian participants reported that being informed made them feel better about themselves in their social group e.g. „confidence and being up-to-date, which is valued in one’s reference group“ e.g. „I am happy that I am informed and colleagues and friends come to me with questions that they know that I can answer“ or „We get information that we are not familiar with. I become very irritated if my friends are familiar with this information and I am not, and when I go back home I try to find out more about it and thus I learn what it was like in the past, about the people and the wars, about technology, and about absolutely everything“ or „An opportunity to participate in different conversations, to argue with friends. This is what intrigues people“, „An opportunity to participate in internet discussions using the acquired knowledge“.

This dimension was also mentioned in the German focus group discussions in group nos. 1, 3, 5 and 6. HD (group no. 6): “It’s really important to be able to take part - (...) in your circle of friends or wherever and that means you have to study further by yourself a little bit.” Katrin, 40, (group no. 5): “I’d like to join in talks about current topics, would like to have a good general education, that’s it basically.” Andrea (group no. 3): “You simply have a topic of conversation – then you can talk about it with your friend – communication...”. In group no. 1 this attribute of science was mentioned several times, science provides things to talk about. Nicolas, 19 (group no. 1): “What I like is when it deals with common day-to-day things: when you watch science programmes you often get explanations about how things work and when people ask you about things they don’t know about you have the knowledge and you can brag a little bit. That’s what I like about it [science]: to understand the world so to say.”

Expectations towards science on TV

In the previous sections we have tried to unfold relevant dimensions, which have been interpreted with regard to motives underlying the engagement with science independent from a specific medium. After having explored the motives, we asked participants in all groups what came to their minds when they thought of TV science programmes. This question brought up various statements, which can partly be interpreted as expressions for what participants expect from science programmes on TV. Due to the fact that many participants presumably mixed up motives for engagement with science as such with motives for engagement with science through watching TV science programmes, their expectations are closely linked to their motives. The expectations can be linked to four referents: the content of science programmes, the set up of the programmes, the scheduling of the programmes and the actors, who are expected to play major roles in these programmes. The following box provides an overview of the expectations of the respondents.

Box: List of expectations toward science in TV programmes

<p><u>Content</u></p> <ul style="list-style-type: none"> • Content is new, unknown • Content provides background information • Content belongs to the body of common knowledge • Content can be linked to prior interests <p><u>Set Up</u></p> <ul style="list-style-type: none"> • The set up is simple and comprehensible • The set up is entertaining • The set up is inspiring • The set up is accurate <p><u>Scheduling</u></p> <ul style="list-style-type: none"> • Must be scheduled to convenient times <p><u>Actors</u></p> <ul style="list-style-type: none"> • Scientists appear as main actors
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In the following sections, we will report selected outcomes of the discussions, which have been interpreted with regard to relevant expectations towards science on TV as expressed in the focus groups.

Selected expectations towards science programmes as expressed in focus group discussions

Greek participants had very clear ideas about what they expected from a science programme. First, they expected something deeper than just plain information e.g. „They [programmes] are broadcasted under a different label compared to what they actually are. There are certain topics, can’t really think of an example, which end up simply reporting rather than offering something deeper, a deeper

explanation“ [group no. 2, Markos, 33]. Second, they expected to become informed but also to relax. This was brought up by group no. 5 - participants aged between 30 and 49 with a high education - when asked why they liked to watch science programmes, participants responded that they liked to be informed and also to relax. Third, they expected these programmes to provoke peoples' interest in a topic. This was mentioned by group no. 8 - participants from a mixed educational background aged 50+ - who thought programmes were meant to inform or give the opportunity to think about a topic and if they are interested to go away and search for more information. Fourth, participants expected programmes to include science experts who are able to explain the information in layman's terms. For example, a discussion panel of scientists, which is a common format adopted by health/medicine programmes, should trigger viewers' interest but also break down difficult information in order to help the viewer comprehend the issues better. Fifth, participants expected programmes to be educational. This was brought up by group no. 7. Participants said that TV science programmes should be „educational“ [group no. 7, Vicky, 34] or „informative“ [group no. 7, Nikos, 43]. Finally, participants expected programmes to offer information about something new e.g. „see or hear about something different“ [group no. 7, Nadia, 34]. Participants also thought that it was the duty of the state channels to broadcast science programmes. They also added that there should be a diversity of programmes as well i.e. different fields. One participant commented that „people think of TV as an entertainment medium rather than an education medium and don't really want to pay attention to what's on TV, they want to relax“ [group no. 6, Kiparissia, 51] and offered this as an explanation for low audiences for science programmes.

Participants thought that for a programme to be labelled scientific it needs to have some scientific content. For example „I personally believe that a documentary has to have if not all at least some scientific content which explains some things, not necessarily something innovative but to be scientific in its findings“ [group no. 2, Eygenia, 26]. Group no. 1 participants thought that science programmes could be described as an explanation of science to beginners. The whole group agreed that the essential element was the presentation of scientific explanations in a simple manner. Group no. 6 - participants with a higher education aged between 30 and 49 - provided comments based on the science programmes they were all familiar with i.e. *'Health for everyone'*, it was evident that they all thought it was reliable, not only because of the experts, but also because the programme kept to the same structure and furthermore because of the presentation of data, numbers and statistics.

Others thought that science programmes needed to be scientific but explain everything in layman's terms so that both the general public and scientists can understand it. „Obviously they (programmes) need to have some scientific characteristics i.e. data, method of analysis, if we are discussing certain issues. But the first thing that came to my mind is conversion. It is television product which will last 30 to 45 minutes, maybe broadcasted in series so it (scientific content) needs to be converted“ [Aggelos, 39, group no. 2]. Participants expressed the opinion that the elements which could disappoint, annoy or make people tired, in a programme, could be science itself, so science should be presented in concise, small amounts of information [group no. 2].

Bulgarian participants also expressed expectations about scientific shows broadcast on TV. Specifically: “Some kind of sequence of events that follows one after another“, “New information, something I do not know“, “Argumentation“, “Discoveries (findings)“, “It is important that scientists also participate in the show, not only journalists and engineers“, “Analysis of something big“, “Presenting the science behind the scenes (e.g. the Einstein-Bohr Debate). These passionate disputes must be shown. There needs to be some sort of intriguing element, in order for the shows to attract the viewers' attention.”

They expected to see innovations or scientific facts or other information from the field of science in an entertaining way. Specifically, the criteria they use are as follows:

- a) scientific shows need to provoke people's interest in certain scientific fields (e.g. „To provoke young people to learn and seek out information“)
- b) scientific shows need to present science in layman's terms directed to a wider audience, or present science on a more accessible level to a wider range of people (e.g. “To descend to the level of society”) or should be directed to a mass audience rather than to specialists in a given area (e.g. „The specialists have libraries, the Internet, databases and are less interested in popular science shows“, „The purpose of television is to attract a larger audience, so I do not see the purpose of showing highly specialised scientific programmes on TV“) or popularise science among the general public and cover many different

- scientific fields (e.g. „The point is, if a person wants he should be able to understand it, no matter what sphere of science it is in“)
- c) scientific shows must inform and / or educate on a particular issue in a given area or improve people’s general knowledge (e.g. „Shows, from which one can learn something“, „Shows that make you think rather than just being a spectator“, „To be educational in nature“, „They provide information about ‘something’: about a certain person, what was hundreds of years ago, what they discovered“) d) explanation of an innovation, a problem, past event or the present (e.g. „shows that explain the world, facts and phenomena in the past or the present“, „They give information in a specific area“, „They give information about facts and events“, „Something new in the sphere of science presented in an appropriate way“, „Something that is outside the main sphere that one works in“, „To explain certain problems“)

German participants, in common with Finnish and Irish participants, referred to what they expect or – to a higher extent than in Bulgaria and Greece – to what they got by watching the programmes: the wish to learn something is dominant, but not that dominant. Participants also wanted to be entertained, inspired and fascinated. the need for orientation is interesting, this led one participant in group no. 5 in Germany to classify an investigative programme format as belonging to the canon of science programmes.

Second, they referred to the science topic area, which is fulfilled differently. They – of course - expect science content in these programmes. But it was obvious that German participants did not use strict definitions of science, in order to distinguish science programmes from others. Participants with higher education generally used a narrower definition of what belongs to science while participants with lower education used a broader definition. Sometimes they even include as scientific topics such as para-sciences and mysteries. Unlike Bulgaria and especially Greece, participants do not view programmes about health, technology and the environment as being science programmes. Like the other five countries, they do include history programmes in their definition of science programmes.

Third, they referred to particular attributes of science, i.e. impartiality and trustworthiness of facts, scientifically proven. One active group did this categorisation. According to this group, a programme which is not impartial cannot be a science programme; also a programme which includes mistakes, or better still, inaccuracies, cannot be a science programme.

German participants in both active groups as well as group nos. 5 and 7 thought accuracy an important criterion. They expected accurate information. It is the main difference especially in comparison with both the groups of young participants and the groups with lower education, where accuracy or distortions in science programmes are not criteria at all. Participants qualify accuracy in two different ways: by referring to the correctness of facts and by referring to the common re-enactment strategy in documentaries which implies a knowledge which programme makers do not have. Group no. 4: Angela: “I have seen very many science programmes and everybody should actually know by now that wrong things are being told there. The best example was one of these science programmes on Kabel 1 (where they tested) why a ball gets into a bottle faster than a penny. And that was obviously due to the heavier weight of the ball. It’s sad when they show these programmes on TV because there are many people who poorly appreciate physics and who believe all of that just because it is presented on TV.” Group no. 5: Prompted by one participant (Mike, 30, historian), the group discussed how history programmes were distorted (the German Producer is Guido Knopp). The historian Mike (30): “I blame TV for not covering the scientific discourse. Once I saw it in “Nachtstudio”, where they in fact tried to criticise a little bit, but immediately this uncle came, this crony of Guido Knopp and straddled in saying: “We must explain how it was!” – this is the idea behind Guido Knopp: “We, by the way, know how it was. We have the materials!” Do they really? (...) They know how Hitler looked like when he was a child. Therefore they re-enact how his mother is washing him and so forth. And you, as the watcher, don’t ask how they can know this.” Mike was quite dominant, reacting to Andreas (36), who praised a history programme for providing him with background information about Romans.

The most educated *Finnish participants* seemed to be more at ease with “entertainment” than many other respondents. Participants in group no. 2 especially - science teachers and amateur scientists - expected to see “entertainment” when they watched science programmes. Johanna, who was preparing a doctoral dissertation, didn’t want to see too much discussion of methods, research

setting or other backgrounds of research in the programmes: “I want to see popularised information and not in a manner it is presented in scientific journals.” Timo (science teacher, group no. 2) agreed. He said that the competition for the attention of viewers is hard and if a science programme is not entertaining, it does not get viewers. He saw this as a reality of science programme production and in a way looked at the issue from the production makers’ point of view. But he said that he himself expects the programmes to be entertaining: “If the programme intends to get large audiences, it absolutely has to be entertaining... I have an education in natural sciences. In order to make me to watch some programme of archaeology there has to be something generally attractive.” Eki (group no. 2) said that television is by nature [sic] an entertaining medium. “If you really, I mean really want to *know* something, then you have to go to the internet or find some literature of the topic. In the end the science programmes in television are interesting entertainment to me.” Jarmo’s (group no. 2) views draws attention to the idea that the concept of “entertainment” is far from being clear and unambiguous. Entertainment certainly means different things for different people. Jarmo likes traditional (“educational”) science programmes - as well as (German) crime series. But he often finds (traditional) science programmes more entertaining and relaxing than crime series. He likes to watch them especially before he goes to sleep: “After them (crime series) you can be too exited or too bored, but science programmes entertain me and I feel comfortable and homey with them. I definitely want to see and learn new things.” (Jarmo) It was obvious that for Jarmo science programmes served at least partly the same function as “entertainment” programmes (police series, sitcoms, soaps etc.) for some other people.

Judgements of different media with regard to science contents

After having explored motives for engagement with science and expectations regarding science on TV, we will next report judgements of participants, which refer to science content in different media. The aim is to unfold relevant criteria, which are applied to express specific strengths and weaknesses of different media regarding the transmission of science content. Every judgement consists of

- a) an object, to which it refers (in this context TV, radio, press and the internet with regard to science content)
- b) a criteria, against which it is judged and
- c) a result of the judgement, we have distinguished negative judgements from positive judgements. (Schweiger 2007: 449)

In the next section, we will report how TV, radio, press and the internet are judged comparatively by respondents, and which criteria have been applied.

TV

TV was judged by participants of all countries both positively and negatively.

Positive judgements

Criteria: Simplicity, entertainment, accessibility, visual, undivided attention, usefulness in social relations.

Simplicity was one of the characteristics of TV that participants judged positively. Irish participants thought that science programmes broadcast on TV used simple language and did not include jargon. This was also true for Bulgarian participants who thought that science was presented on TV in an accessible manner (simple linguistically) which made comprehension easier. Greek participants judged TV as much easier to follow. Finnish participants thought of TV as a medium whose contents are easy to understand because issues are presented in a concrete manner and things are explained clearly. Simplicity and clarity were considered as an advantage especially in topic areas that were not familiar to the viewer.

Entertainment was another characteristic of TV which was judged positively by participants. Irish, Greek and Bulgarian participants thought of it as a relaxing and enjoyable activity. This view was also shared by German participants who thought that TV is the medium that entertains best and in a relaxing way as it needs less focus than all other media. Finnish participants differed in the sense that the groups with higher education thought of TV as an entertainment medium whereas the groups with lower education thought of TV science programmes more as a source of information.

Accessibility was another positive attribute of TV according to the participants. This was emphasised by all participants. Specifically, Greek participants felt that TV has the advantage of being able to reach a wider audience as well as those individuals who can't read. Finnish participants thought TV programmes are easy to find as they are prescheduled. Also that TV is always available unlike, for example, science magazines or books which one has to buy or find or the internet where one has to search for things of interest. Bulgarian participants shared this view stating that television gives quick and easy access at low cost. German participants also brought up the issue of the low cost of TV compared to other media i.e. press.

Another characteristic of TV which was judged as a positive one was the fact that *it is visual*. German participants thought that TV as a medium makes it easier to understand and easier to memorise. Greek participants agreed with this view. They thought that TV which uses images and sound could be far more successful in communicating a message about science and could play a decisive role in this if done in the right way. Finnish participants considered TV to be the most visual and illustrative media which offers something for many senses, especially compared to print media and radio. They went on to say that visuals help them to remember the topics and information they have seen. Bulgarian participants thought the most important advantage of television is the presence of sound and image, which considerably facilitates perception and thus according to participants has greater influence.

The fact that TV almost always requires *undivided attention* was seen as a positive attribute by some participants. Bulgarian participants thought that it does not require a lot of involvement on behalf of the viewer – it does not require searching, reading etc. while German participants mentioned that it less time consuming than reading for example. However, this view that TV requires undivided attention was not shared by all participants. Specifically, only older German participants thought this but no evidence was found in other groups. Also, some Bulgarian participants mentioned that TV can be used as a background medium whereby people can watch it a non-engaged way.

Usefulness in social relations was only brought up by German and Irish participants. Specifically Irish participants mentioned that they talked about TV programmes with their family and friends and would let someone know if there was an interesting programme on TV. German participants of a younger age mentioned that they would start a conversation about a TV programme at school.

Negative judgements

Criteria: Content, superficiality, topic selection, language precision, sensationalism, rigidity

Interestingly, there were no positive judgements regarding TV *content*. Certainly, a positive aspect is the widely shared opinion that TV provides interesting content, which can be further explored by audiences, for instance with the help of books or the internet. Greek participants thought that TV could have been the best medium to communicate science, however, there are no quality science programmes on TV and this works against the popularity or the status of the medium in general. When asked to compare science on TV with science on other media participants responded by saying that there is much more quality scientific information in other media. Irish participants also believed that the quality of television programmes had deteriorated over the years and that today's programmes were appealing the lowest common denominator.

German participants saw TV as a *superficial medium*, which did not go deep into subjects. This view came up in all groups, particularly when comparing TV with printed media, which were ranked at the top. However, superficiality, although judged negatively, was in line with participants' expectations of TV. Finnish participants agreed with this view in that they considered the simplicity of TV often corresponded with superficiality. This was the weak point of television most often mentioned in the discussions. Finnish participants from groups nos. 2, 3, 4 and 5 voiced the opinion that sometimes programmes are overly simplified and excessively superficial. They claimed that the information value of the programmes is often too poor or self-evident. Finnish participants

with a higher education claimed that if they want to find information on a topic, they use other media, usually the Internet or books. This was also mentioned by Irish participants although this was perceived as a positive thing. Most participants acknowledged that watching a science programme on TV could lead them to further follow up a science topic. Bulgarian participants also mentioned that TV science programmes can provoke peoples' interest.

Topic selection was another weakness mentioned by participants in Germany. Specifically, the importance of what is screened was assessed to be lower compared with printed magazines on science.

Language precision was another weakness mentioned by some participants in Germany. It was claimed that radio and print must be more precise when using language than TV has to be. Furthermore, radio operates much more intensely with words whereas TV can 'cheat' with pretty images that often don't even go along with what is actually being said.

The idea that *TV content can be too sensational* came up with Irish participants as another negative judgement about TV. Participants criticised television for sometimes being too sensational, and for exaggerating and glamorising science.

Rigidity was another weakness mentioned by some participants in most countries. Finnish participants mentioned lack of flexibility as one of the weaknesses of television. In contrast, the use of the Internet or magazines was more flexible in terms of time and space. German participants also saw as a disadvantage of science in TV that contents cannot be stored, that recipients are forced to stick to the time when programmes are scheduled. For some Bulgarian participants (mainly from the younger groups), one disadvantage of television is that it is only accessible at home and cannot be watched while a person is on the go. Irish participants had some criticisms of terrestrial television channels. They complained that they didn't repeat television shows enough, unlike satellite channels where you could watch the same programme several times over the course of twenty-four hours. Some participants also complained that science programmes were badly scheduled.

Reliability of television compared to other media

Comments from Finnish participants about the reliability of television's science programmes compared to the science content of other media were contradictory. It was commonly argued that television was more reliable than the Internet. Specifically, it was widely believed that the production and editing processes of television include the checking of facts while the contents of the Internet don't necessarily meet similar standards. The main argument against the reliability of television had not so much to do with the trustworthiness of individual facts but with the overall picture presented in the programmes. According to some participants programmes may be distorted or insufficient because of simplification and dramatisation. Participants especially in group no. 4 claimed that documentaries are not necessarily very reliable because they tend to emphasise the most interesting or most sensational aspect of a particular topic, not necessarily the most relevant from the content point of view. According to some of the Bulgarian participants, television can better guarantee reliability (as editors have to ensure reliability) while others had some reservations regarding the content of the information on television. According to them, television can provide incorrect information or distorted information.

Radio

The majority of participants in most countries concurred that radio is not an appropriate medium for science. This was partly due to the characteristics participants attributed to the medium itself and partly due to the science radio programmes availability and scheduling.

Specifically, listening to the radio was described as a time oriented activity not a programme oriented activity. Furthermore, participants switched on the radio to listen to music and/or relax. By definition people usually listen to the radio while performing other activities, for example when driving the car or cooking. Finnish participants described that in general they did not search for specific programmes on the radio, that it is difficult to know when radio science programmes are broadcast (time slots change frequently) and also that there are no science programmes on Finnish radio during rush hour when most of the participants would switch on the radio. Bulgarian

participants also mentioned that they did not think of radio as a source of scientific information and listed the lack of visual stimuli as a major disadvantage specifically for the communication of scientific information. German participants also reported in terms of acquiring information and knowledge radio has a disadvantage as it is much more difficult to understand and remember information without the accompanying images. German participants also saw radio as a background medium and were not aware of science programmes on the radio.

Ireland was an exception to this as participants from most groups young and older stated they enjoyed listening to science stories on the radio and „quirky science facts“. They were also able to identify programmes such as BBC Radio 4's *Material World*.

Press

Greek participants voiced the opinion that there is more scientific content in the press and also agree that press offers quality of scientific information. Some participants mentioned that the information one accesses through the press „sort of stays with you while information on TV and radio sort of go over your head sometimes“. Participants mentioned that there are science sections in newspapers – mostly Sunday ones but also daily ones have science columns. There are also specialised science magazines, even women's magazines which include health issues etc. They judged those positively stressing that they popularise science but said that the magazines (*Vita, Prevention*) were too expensive and that they preferred to read the science sections of the newspapers. Some negative judgements voiced regarding the press were that in contrast to the internet, the information found in the press was judged as difficult to comprehend both in terms of language and in terms of content. Participants felt that the press needs more attention by the reader and that they thought that the „press is impersonal“.

Bulgarian participants judged the advantages of newspapers to be that one can think over the information and analyse it. They found however, an important disadvantage of newspapers and magazines to be that there are few scientific articles in them and they are of low quality. The confidence of the public in the material is quite low, mostly due to the low quality and poor training of the journalists in the field in which they write (usually they have education in journalism, but not in the field of science they are writing about). Another disadvantage mentioned by Bulgarian participants is that the information in them is somewhat old. Furthermore, that the newspapers seek too much sensation and that the newspapers' approach is to provide short news stories, which is not enough to convey scientific information. Thus, newspapers and magazines are not a preferred source of scientific information for the participants mainly because of what has been offered so far. According to participants the Bulgarian newspapers and magazines do not publish enough scientific material, and if they do, it is not done on a regular basis. Therefore, people are not used to reading popular science articles in newspapers and magazines. The participants expressed the opinion that the Bulgarian print media need to publish more scientific material because at the moment they do not do it very often.

In Ireland only two participants in all of the focus groups mentioned specialist science magazines.

Internet

Greek participants felt that the internet, TV, and the press have more potential in communicating scientific content to the public as opposed to the radio. In fact, participants agreed that the internet is the medium which is associated primarily nowadays to science and technology. Participants thought that the internet and TV have the advantage of presenting images and diagrams and not just text, which makes information easier to understand.

According to Bulgarian participants advantages of the Internet include: the very wide range of topics and information that one can easily find there, the speed with which information can be found and that the information is available to them at all times. Furthermore, the internet gives access to lots of diverse literature (often even illegally), but for the participants this is the only way to gain access to these journals due to their high price.

Irish participants thought that the greatest advantage of using the internet was the amount of control

it afforded the user while one of the disadvantages of the Internet, according to Irish participants is that it is an engaging medium - one has to be actively involved – to search, read and it cannot serve just as a background like the television or radio.

A disadvantage mentioned by Bulgarian participants of the Internet is that its reliability is not guaranteed. However, the Internet allows for comparison of information from different sources and different opinions can be read in the forums. All this helps the user to find his/her way. However the internet remained the most problematic source because one cannot filter out the information in areas in which one is not knowledgeable, and be certain of the authenticity of the information. According to participants, the internet is the most accessible media, but requires a certain level of intelligence – the reader must purposefully look for something and know what he/she is looking for. A major disadvantage of the Internet is the lack of guarantees of the authenticity of material posted there, there are many errors, the information is not accurate, and one can stumble upon misleading information. Irish participants also thought that the reliability of internet sites is sometimes questionable. An opinion was voiced that the internet sometimes was not enjoyable as it just seems “endless”. On the other hand, Finnish participants defended the reliability of the Internet because one is not dependent on one source only.

Judgements of single stimuli

In the previous sections we have outlined a framework of motives for the engagement with science, expectations towards science TV programmes and judgements of selected media with regard to science, which – in our view – are relevant to understand the reactions of respondents when confronted with selected stimuli, belonging to information about science, popularisation and edutainment. We have ordered the reactions by naming the criteria, which are used to judge the stimuli negatively or positively.

Stimuli description

Finland

The first clip was recorded from the national news broadcast in August 2009. It handled the development of the vaccination for the H1N1 (“swine flu”) by a French company and how it is tested with small children in Finland (adults were tested in France). H1N1 was very current issue by the time the clip was presented for the focus groups in October and November because the epidemic was arriving to Finland at the time.

The second clip was a documentary about black holes and presented a theory according to which our universe is going to be sucked by a black hole after three billion years. It consisted of interviews and animations. The documentary was presented in Swedish language public channel FST5 in the summer of 2009.

The third clip was the last section of a weekly science magazine program. It is a light and funny ending of an otherwise “serious” program. In the end of the programme questions sent by audience are answered. The clip included a chemical but humorous answer to a question “why champagne bubbles?” The clip also clarified the difference between real champagne and sparkling wine and included practical advice on how to make the bubbles last longer when having a party. The presenter was wearing a cook’s outfit.

Greece

First clip

The clip chosen as representative of this type is part of a news programme. It lasts for 2.5 minutes and it discusses a medical advance which promises a cure for individuals suffering from Type I diabetes. The innovative method of treating diabetic individuals was introduced by a research team in the US. The report includes statements from researchers and diabetes experts from the U.S. and Greece.

Second clip

This programme is a Greek documentary series on science called „The universe I have loved“. The specific clip deals with whether there was ever extra-terrestrial life on Mars. The presenter is a scientist who takes audience through the latest scientific discoveries on this topic. Images of relevant findings are shown while the presenter is talking. The feature is approximately 10 minutes so the first 8 minutes will be shown.

Third clip

The programme clip chosen as representative of this type is a short clip of approximately 3 minutes. This programme is broadcast weekly and is called ‘Analyze this’. It is presented by a psychologist who each week discusses a topic stemming from „how and why“ questions of our everyday experiences. The particular clip deals with the issue of „why we need sleep“ and explains what happens during sleep, sleep stages and sleep disorders based on latest scientific findings.

Germany**Clip 1 – Science News Report**

„heute-journal“, August 4th, 2008 (length: approx. 2 minutes)

This clip is an extract from heute-journal, a late evening news programme on the public broadcaster ZDF. It is talking about new scientific findings regarding a cure for AIDS. Even though this report was prompted by the World AIDS conference held in Mexico in 2008, it is a typical Type I stimulus: AIDS researchers and immunologists providing explanations on this most recent study on a vaccination whose results are yet to be confirmed in practice. The report is enhanced by animations and diagrams.

Clip 2 – Report on big issues of science

ZDF, Terra X – „Die geheime Entdeckung“ (total length: 44 minutes)

„The missing link“ is part of a German documentary series on the public broadcaster ZDF, originally produced for the BBC. It describes the spectacular discovery of an outstanding prehistoric fossil of a primate in Germany which is supposedly closely related to the human being, bringing up new findings on the evolution of mankind. By using attention drawing techniques such as animations and other images and dramatic music throughout the whole length of the documentary it qualifies very well as a Type III stimulus. The 8 minute extract is taken from the first half of the clip, showing the group of scientists involved in the research project working on the fossil and describing the kind of environment „Ida“ used to live in 47 million years ago.

Clip 3 – Report on scientific explanations of the everyday world

ARD, „Wissen vor acht“ (length: 1,5 minutes)

„Wissen vor acht“ (on the public broadcaster ARD) is a series of very short clips of about 1,5 minutes length providing scientific explanations of the everyday world, answering questions sent in by the audience. They are produced with quite some effort and presented by a popular science journalist and former scientist. Sometimes elaborate animations and diagrams are used. In this clip it is explained why water drops tend to „dance“ on hot cooking surfaces instead of vaporising right away.

Ireland**Clip 1 - Science News Report**

Scientists discover coeliac genes

This clip is an extract from Six One News, the early evening news programme on the public broadcaster RTE One. It describes a new discovery by scientists in Trinity College Dublin of seven gene regions which can be linked to coeliac disease. It describes how coeliac disease is very common in Ireland and that this discovery is a breakthrough which could lead to new treatments. The clip includes interviews with scientists involved in the research, shots of people working in a laboratory and shots of people shopping for groceries including bread.

Clip 2 - Report on big issues of Science**The Missing Link, BBC Horizon documentary**

This is a programme from the BBC's flagship Horizon series. This programme describes new evidence into how fish evolved to have legs and walk on land. The programme begins by describing a discovery of a new fossil „the likes of which had never been found anywhere in the world“, but does not explain what this fossil was or why its discovery was so important, thus setting up a puzzle which makes the viewer want to keep watching in order to see it resolved. Dramatic music and imagery are used throughout the programme.

Clip 3 - Report on scientific explanations of the everyday world**Digital Intelligence - Royal Institution Christmas Lecture**

This clip is taken from the Royal Institution Christmas lectures in Britain. These are public lectures given in front of an audience of young people each Christmas. These lectures have been held in London since 1825 and have been broadcast by the BBC since 1966. This clip describes the difference between the way that humans and machines learn. The lecturer involves volunteers from the audience to demonstrate some of his points.

Bulgaria**Clip 1 – science news report**

The clip is part of the daily news programme of Channel 1. It lasts 53 seconds. The clip announces that Canadian scientists have decoded the genome of swine flu. Laboratories and scientists doing experiments are shown on the screen. The voice of an expert discusses the possibility of creating a vaccine. The reasons for the severity of the flu in Mexico as compared to other countries in the world are also discussed.

Clip 2 – Big issues in science

The clip is part of a documentary movie and lasts 8 minutes. The movie is titled „In search of God's particle“ and tells about the CERN experiment. Scientists explain what they want to learn with this experiment and also discuss the concerns related to it.

Clip 3 - Report on scientific explanations of the everyday world

The clip is part of daily news programme and lasts 3 minutes and 37 seconds. It connects news of floods in some regions in Bulgaria with information about lightning – statistics, issues about protection systems, the condition of lightning-rods, some institutional aspects of the problem and some useful information for citizens. The material also presents information about how people should protect themselves.

Assessment of clip 1**Topic**

Almost all Greek participants felt that this was an interesting topic and it was a good idea for this medical breakthrough to be presented during mainstream news since a large portion of the public might be directly or indirectly affected. Furthermore, presenting this topic as part of mainstream news more people would be able to watch it. (Group nos. 1, 3, 5, 6, 7, 8). The only criticism received was from younger participants who supported that it did not analyse the issue in depth and in not doing so maybe it was not directed to everyone but just those affected by diabetes, experts or families (group no. 3).

Irish participants thought the RTÉ news clip shown was particularly interesting as the topic (coeliac disease) is very common in Ireland: “FG8MP4: Well, I think most of us know someone who's a coeliac.” Participants agreed that they would take action if they saw the news clip about coeliac disease at home, as one male participant said: „I have a mate that has coeliac, and I'd tell him because he'd be well interested. I'd text him about it you know, I'd get the name of it and I'd send him a text about it. I'd pick that up for him, you know, I'd give him the name of it and tell him to

try it out.” Some participants believed that an interview with a person suffering from coeliac disease should have been included in the report, this human interest would, they say, have made them pay more attention to the report. FG1FP5: „If you interviewed a young person that was a coeliac and they were telling all the things that was wrong with them, that they have to eat differently, you would listen to that.“

Bulgarian participants thought that the topic of the report reflected additionally the actual need for information because of the swine flu epidemic at the time when discussions were conducted.

Many German participants from different groups criticised the selection of this clip’s topic. Some participants started to speculate regarding the reasons why such a topic could have found its way into a widely known news show. Potential reasons given by the participants included a) Media constraints. For example: Sven from group no. 4 argued that the report was broadcast due to the fact that the programme had pictures about this research finding, another argued that the correspondent may have found the topic more or less by mere chance and b) Some sort of conspiracy. For example: Eckehard (group no. 8, 58) “Well, I’ve become a bit sceptical about the news generally. First of all, the time seems to be way too short (...), it all gets chosen by certain journalists, selected, who actually legitimates those people – why do they select these reports in particular? That’s pretty dubious in my eyes (...) Because all of this is being controlled and done deliberately and people are supposed to get influenced by it in a certain direction. To me, news programmes have been very very questionable lately – especially when they broadcast feature stories like that”. The fairly negative reaction in almost all groups provoked some relativisation. The statements have been relativised by referring to the importance of the topic. This can be assessed to be the major argument to defend the clip against critics. Dieter (group no. 6): “Now and then, when you talk with a journalist – I mean: these people earn their lineage with that! So they look for some ideas to upgrade the programme, to earn their money and they come up with a scoop! The more sensational it gets, the more money they earn! You shouldn’t forget that either! You should keep that in mind whenever you watch that (kind of stuff)!”. However, the importance of the topic was judged to be very high. This importance compensated for other deficits of the clip to a certain extent. (Vivienne, group no. 1, 16): “I think every minimal step towards someday achieving a cure is absolutely correct and even though the [...] clip wasn’t that interesting it wasn’t about the animation or anything like that, it was just about this tiny, minimal step and about people still bothering to achieve that goal.“

Way of presentation

Greek participants thought that a good way had been chosen to present this topic with many speakers and expert opinions. One participant from active group no. 2 commented that „It was very forward of them to use 3D animations in a news clip“ [group no. 2, Eygenia, 26] and also commented on the role the scientist had in the clip „Did you see the scientist in the lab? They made an effort to present the scientist in a different light“ [group no. 2, Eygenia, 26]. However other participants felt that the information presented was not understood by everyone. One of the participants in active group no. 2 stated that this was surely incomprehensible and that the only information essentially offered is that the therapy for diabetes is very close. „It is purely informative, it does not offer you anything more“ [group no. 2, Markos, 33].

In Finland, the presentation style of this clip provoked much less conversation than the content of the clip or the presentation styles of the other two clips. It seems that the form and the treatment of issues in the television news broadcast are well established and taken as a given. People know what to expect and don’t seem to pay much attention to the conventions of the news narrative. However, certain details of the film that illustrated the story caused strong views in group no. 1. In fact, conversation about these details dominated the whole discussion of the clip in this group. The image of a researcher or a laboratory technician working in a lab seemed to seize considerable amount of attention. That was, at least partly, due to the fact that two participants (Mira and Piia) who dominated the discussion, were nursery students. “I don’t know, I just couldn’t help paying attention on the poor aseptic level.” (Piia) “Yes, I paid more attention to that than the message itself, too.” (Mira) “First of all, that character had too short sleeves... These people handled vaccinations and they didn’t wear masks, hoods, they didn’t have goggles, the protective coats were not appropriate and then they really bent those test tubes without gloves! (Piia) “Absolutely without gloves!” (Mira) ”That was

a terrible thing to watch!.. Even the vaccination technique was wrong!” (Piia) Members of group no. 4 also made sarcastic comments about the illustrations of the clip. Since the story was about the vaccination tests that are going to begin in the future, there probably was not authentic film of the testing available. The clip was illustrated by shots from a laboratory whose connections to the topic remained unclear. It appeared to be quite obvious that illustration had nothing to do with vaccination tests. “I think they analysed faeces there”, said Matti who has a degree in medicine. “They could have done that without all this bending of test tubes”, said Kaarina who teaches chemistry. It is possible that the film was just a general illustration of an unknown laboratory taken from the archives of the broadcasting company. The comments of Mira and Piia as well as the comments presented by a professional in group no. 4 show how important it is that illustrations of scientific details are well chosen. If there is something strange in the details or the story and the illustrations don’t tell the same story, there is a risk that viewers pay attention to irrelevant details and ignore the actual, intended content. “So if you make a thing like that, please make it so that we can watch it and without covering our eyes!” (Piia sending her regards to the programme makers).

Bulgarian participants evaluated this way of presenting information very positively. According to them the information was presented in a brief, concise and informative way, the language was understandable and sounded credible. All of the participants claimed that they would definitely stay tuned on this channel if they saw this news report; the manner in which the information was presented drew their attention and they were willing to stay tuned.

Reliability

Greek participants judged the best feature of the clip to be that scientists had the opportunity to talk about their research or what the medical breakthrough means themselves. Also, that it gave information on a medical breakthrough which would be the latest news from the medical community. They judged the fact that many individuals were included in the clip and therefore the information provided was better documented because experts were talking about the issue. Participants thought that the best feature was the presenter and also the fact that experts were involved and labs were shown etc. (group nos. 5, 6, 7, 8). However, some participants from active group no. 2 thought that that medical breakthroughs are presented in news so often that they have sort of lost their credibility. Also, that there was a fake air of „scientificness“ about this clip such as the presence of some terms and images and this was a negative aspect to this reportage according to the participants. This was attributed partly to the fact that the journalists presenting the topic were not scientists themselves and partly due to the way of presentation – quick pace, a lot of information etc.

In Finland, the issue of whether the clip is reliable came up in all focus group discussions. Doubts about the reliability of the clip were expressed by some participants e.g. Jarmo (group no. 2) said that he didn’t believe what was said in the clip. His criticism was not directed so much at the news programme but rather at the “politicians and officials” who informed about H1N1 in the media. In his view information about the disease “has not been trustworthy but only guesses”. On the other hand, several participants expressed trust in the clip (and the television news in general). “I think it was very neutral and matter-of-fact.” (Annikki, group no. 7). However, in spite of the trust on individual facts, several participants expressed some doubts about the overall picture of the H1N1 presented in the clip. Especially the members of the oldest age groups (groups no. 6 and 8) wondered about the aspects that were left open in the clip. Members of these age groups are also the heaviest users of television news. “They mentioned the risks (of the H1N1 vaccination) but didn’t mention what the risks are” (Matti, group no. 6) or “I never trust the news as the only source of information.” (Seppo, group no. 8) or “It was a typical piece of news which leaves many questions open... Maybe there was a current affairs programme after this that answered the questions... Which are the risk groups, are we in a hurry with these testings, how fast is the swine flu diffusing?” (Heikki, group no. 6). Some comments linked the reliability of the clip to the channel. Elja (group no. 3) trusted on the piece because it was broadcast in the public channel which he considered more reliable than the commercial channels. “But on the other hand, you have to remember that this was broadcasted by YLE. Basically you can trust it, the information should be checked up. If it was broadcasted by MTV3 MAX (the cable channel of the main commercial television company)... you would have second thoughts. (Elja, group no. 3). Sami (group no. 7) pointed out that some other media could have scandalised the use of children in vaccination tests. “If this had been broadcasted in a more

sensationalistic media like the Fox news in the US or tabloid newspapers here, I think it would have been put different way like „kids are tested while they are sleeping without knowing it or something like that.” (Sami, group no. 7).

Genre

According to the Greek participants from active group no. 4 although it is good to have news coverage of scientific breakthroughs within a news programme it should not be to such an extent (group no. 4). Participants from mixed educational backgrounds aged 50 + pointed out that reporters of health issues (or science issues in general) should be specialised in this – not just any reporter (group no. 8).

Ambivalence of message

Greek participants find the feeling of hope transmitted via this clip as very important and with an aim to inform people about the direction research is taking. Moreover, it gives people the motivation to search in depth about this topic (group no. 7). Some participants felt that the medical breakthrough should not be presented as if the solution is already there and give false hope „There is an ethical dilemma however – scientists have responsibility when presenting a health topic“ [group no. 2, Vicky, 45]. Participants also mentioned that news is usually presented in an overdramatic way because the program broadcasters sometimes are more interested in triggering a sensation rather than presenting credible information i.e. this can have the effect of scaring people - the example of the flu vaccine H1N1 was given (group no. 1, group no. 3). One participant felt that the media „use“ medical breakthroughs to create a sensation [group no. 7, Theodoros, 37] and that it would be much better to actually announce a breakthrough when it is already used or applied rather than announce something which is still under investigation and give people false hope (group no. 7).

Some Finnish participants thought that a reassuring tone is appropriate for a health issue in a science news report. For example, Antti in group no. 2 thought that there were good reasons for a reassuring tone, because in his view there were unnecessary rumours circulating about the threat caused by H1N1: “This was a good programme and the timing was good. It gave confidence to the people in the middle of unnecessary rumours.” (Antti, group no. 2). Many participants thought that the purpose of the clip was more to reassure than inform people about the epidemic. This was typical in groups nos. 2, 6, and 8 and to a lesser degree in groups nos. 2 and 3. The attitudes towards the testing of the vaccination seemed to influence to the attitudes towards the news clip, too. Those who were sceptical about the tests were also sceptical about the neutrality and the purpose of the piece of news. “They tried to give as positive picture of testing as possible.” (Liisa, group no. 8) or “Sounded like advertisement.” (Lea, group no. 8) or “Different media follow each other and create hysteria. Then they recognise that, damn, people are in panic. Then they back off and try to calm people down.” (Erkki, group no. 6) or “The main purpose of it was not to disseminate information but to tell that something has been done, don’t worry, the state will take care of this... The main purpose was purely to prevent panic.” (Otto, group no. 3) or “I’m not saying that it is necessarily a bad thing to vaccinate people and doing these vaccination tests in Finland but they tried to give a positive picture of this, they had sort of reassuring intention.” (Johanna, group no. 2) or “But as a comment to the programme, the research in Finland is rather safe and produces a lot of good things... You usually don’t hear about any major risks or serious flaws in these tests.” (Marianne, group no. 6).

In Germany, the clip was sometimes heavily criticised that the message is a “could be – could not be” message. In the majority of groups judgements the statements referred primarily to this character of the clip. This is very meaningful, since the majority of news on scientific findings are like this. They show a link to the usefulness of what has been found, to the same time they cannot make sure if the intended use of what has been found is realistic. For example (no 6: Win): “Well, this is... if it was broadcast or wasn’t broadcast.... that’s of no interest. Completely brainless people who represent entirely opposite opinions, so first they say ‚yeah, hmmm...‘ and then it’s ‚no, first we have to await (the results)‘ - why? What for? Why (would they broadcast something like that) at that stage? I don’t understand this at all. My opinion is they should research further for another year until they get some genuine results”. In group no. 6, the ambivalence of the message was used to

lead the expectations. Gud “Anyway: What are the new scientific ideas now? First of all that means they’re miles away from any kind of result – and it really should be left clear in a very speculative case like this! Apparently something could still come out of this – that guy said so: COULD come out, it’s an idea but could still come out... But in any case you would only place this (kind of clip) in a speculative programme where it’s clear ,hey, I’m watching idle speculations here!‘ (...) I think this could work in a show like ,Science in Action‘ on BBC because it IS Science in Action.”

Bulgarian participants thought that this type of information (about epidemics) should not be overexposed. They thought that the focus should be on what people should do; what kind of precautions to take and not on instilling fear and mass psychosis. In group no. 8, but also in other groups due to the onset of the swine flu epidemic in Bulgaria, this material was more criticised than in the rest mainly because of the fact that it only touched on the subject without giving any specific advice to the viewers on how to take precautions and what to do if they experienced any symptoms. The main criticism was that the report did not give any specific advice to viewers on how to protect themselves and how to act in case they had any symptoms. We can claim, however, with a great deal of certainty that these criticisms was provoked by the different context in which this report was made and broadcast and the fundamental change in the context in which the group meeting and the testing took place. Most of the time the participants criticised the material for not being very informative, taking into account the epidemiological situation: „What do we know about the medicine masks and should we wear them?“ „Why are pregnant women at most risk?“, „There is too much sensationalism in the information provided; we would like some additional information“, „They use this material just so that they can claim that they have provided people with some information.“, „This is a precondition for causing panic.“, „Why do they emphasise so much on information about Mexico? We are interested in Bulgaria; there is also an epidemic here!“, „It is not very serious to write so much about the genome and not provide any information on how people can protect themselves.”

Background used – Visual effects

Irish participants in all of the focus groups said that they were used to seeing the same types of “generic” images of laboratory scenes in any news report about a new scientific discovery. Participants admitted that they did not understand what the scientists in these shots were doing, as one male 30-old participant said: “FG7MP9: But it makes you wonder: they could have been dropping bits of coca cola into the test tube or whatever.” Participants discussed how they were not engaged by these repetitive images of scientists working in a laboratory. As the exchange between these 16-year-old school students shows, these images were regarded as irrelevant by the focus group participants. “FG1MP4: Like you always see stuff on but you never listen. FG1FP5: Aye, there’s always someone in a lab doing something but you don’t pay attention to it. FG1MP4: It’s nothing to do with you. FG1MP7: There’s always stuff like that on, really it just goes in one ear and out the other, like an hour after watching the news you wouldn’t even know what they were on about.” Participants in the two focus groups comprising people with an active interest in science, i.e. science teachers, science communication professionals, scientists etc., reflected at length the value of the images used in news reports about scientific subjects. They talked about the production routines of news programmes and the need for easily recognisable “wallpaper” images of scientists working in laboratories. FG4FP1, MSc Science Communication student, said: „I really wonder as I was sitting here, and I suppose it’s because I’m sitting here, at the value of the generic lab for quite as long as it did have it. I think it’s nearly like the generic picture of the politician, because I can imagine them saying „oh, let’s show some pictures of scientists doing things,’ but watching it I thought: „why are we still watching people putting things into things?“ I’m getting really bored of that.” Participants in some focus groups made suggestions about graphical animations that could have been used to explain the science behind the story. The difficulty and expense of producing these animations was emphasised by FG4MP4, a producer of science television programmes. FG4MP4: “Another aspect of it is the visualisation of scientific concepts, you don’t have to worry about the pictures on radio and that makes it easier to talk about nanotechnology or whatever, you know TV, you need a new picture every three seconds at least, and all those pictures have to be moving, so it’s a, it’s a real challenge to visualise that, and its interesting. I was on the website today of the company that did

that Ida documentary and one of their big selling points was that they team up with an animation company a lot to bring everything to life, and that kind of stuff, it's great when you can do it right, but it's very expensive."

With the exception of participants from older groups who did not usually integrate any reference to the way TV reconstructs reality, German participants from many groups, criticised visualisation, more specifically the selection of images and the graphics used to illustrate how the potential vaccine actually works. In group no. 3, one participant found the graphic "babish", all the participants in group no. 4 agreed that the visualisation of the clip was not what they expect to be high quality.

Production

In one of the Irish focus groups, one male participant, FG8MP6, aged 54, immediately classed the news story as a "filler-inner" which would be used on a "slow news day". This led to a discussion about how television news stories were produced. Participants discussed press releases and how stories were structured for television. One participant referred to this story as a "standard off the shelf science news story", it included everything that he expected to see.

Bulgarian participants after seeing the clip wondered about the motives of the production team. The material also provoked some reactions and raised some questions: participants tried to find „a motive“ for presenting such material. They fluctuated between a conspiracy theory (purposefully presenting the swine flu virus story), spreading fear, urging people to buy vaccines, which would be in the interest of the pharmaceutical companies.

News relevance to country

The fact the RTÉ news clip showed scientific research being carried out in Ireland elicited a positive response from the Irish focus group participants. "There was something on the news as well about the Irish guy who discovered water on the moon, and I was like „Great, brilliant, an Irish man and he's out there in NASA or wherever he is', but it's great to think there's an Irishman. I told my father about that, and I told my husband about that, and it's just, I think it's a thing about the way Irish people are, we just love to have a little boast if it's an Irishman." One participant complained that not enough Irish research was shown on television compared to newspapers. "FG8FP1: You'd think from the television we're doing very little here."

Continuity of topic on news

Another criticism put forth by the focus group participants was that the report stood too much on its own, it was not linked into any other scientific or medical research and also these types of news stories about scientific discoveries were never followed up. The clip was taken from the main RTÉ evening news programme in March 2009, and the focus groups were held the following November and December. Two female participants discussed the lack of follow up. "FG2FP6: Well, I think that's the downfall of many of these news stories, they are never followed up as well, because I mean that was March FG2FP5: That's exactly what I was thinking. Oh it was March, I haven't heard about that at all." Participants also said that they would have liked it if the story could have contained some more information. "FG6FP7: I would like to see more on it FG6FP10: Yes past history and what they do FG6FP7: And how did they actually find the gene? How did they actually do it? FG6FP10: They said they can find it but how did they find it? is it in the DNA or were is it?"

Scientificness

In Finland, comments about the scientific nature of the first clip were not very common. However, some questions were raised about the genre and the content of the clip. Three participants marvelled

why a piece of news was considered a „science programme“. “I thought we are going to watch science programmes and this was a part of a news broadcast.” (Siru, group no. 8). “This was more like slogan type of information and not science it that sense.” (Matti, group no. 6). “I began to wonder what is the definition of science programme since this was part of television news. Can all the programmes which cover something that is related to the science called science programmes? I didn’t consider that a science program.” (Eki, group no. 2). Four participants claimed that the content of clip was not scientific. “There was not much science in it. It was about bureaus and procedures.” (Timo, group no. 5). “This was more like marketing of vaccination than about science.” (Sointu, group no. 5). “There was not much scientific content in it, they just noted the situation.” (Venla, group no. 3). In Aulikki’s (group no. 4) opinion the clip was not scientific because “it didn’t include certain facts.” In her view the piece did not tell whether the tests are good or bad. These sceptical comments about the scientific nature of the clip were dispersed in different age and education groups.

Expectations towards a news programme

German participants had certain expectations from a news programme namely, they expected short and clear messages about really important topics. For example: (Barbara, group no. 7, 48): “When something like this gets broadcast in the news my expectations are that something meaningful had happened that should easily be described in two or three sentences – the way news are generally structured – and will give me information on something that will have a positive effect on me. This was simply a filler, providing zero information. ‚Could be, could not‘, looked somewhat appealing, they (the editorial team) filled in the time, they had the topic (AIDS) – and that might actually be the only positive aspect about the whole thing: we’re still aware of this topic and are still conscious about the severity of it.”

Acquisition of knowledge

German participants judged this aspect negatively, namely they thought that the clip did not get the knowledge through, due to the way the clip was set up. This argument appeared in almost every group. An example taken from active group no. 4 may illustrate that: Angela: “I personally didn’t understand it – it wasn’t well enough explained for my liking.” Or an example taken from group no. 8: Karin (58): “Well, I didn’t understand it: it was too scientific with all that stuff about getting cut and docking. I only have very general information on AIDS; on the disease – I don’t know in particular how these cells connect – the blue and red ones and all that – that’s why I didn’t understand the report.”

Potential effects of the clip

German participants judged positively the fact that this report might have some positive impact on the ones who are affected by AIDS. Furthermore the report is assessed to be necessary, since it confirms that research is still active in fighting against AIDS. This aspect was mentioned several times, either to relativise critics or as own specific point as in group no. 8: Karin: “Well, in my opinion it awakens hope – I see it as part of the audience and I realise it’s still being worked on, there are still experts dealing with it – I think that’s alright.”

Assessment of clip 2

Topic

Greek participants thought the clip on big issues in science was interesting in terms of content „interesting and larger than life’ [group no. 5, Hlias, 41]. Conversely, Irish participants in some focus groups agreed that they enjoyed the clip from the BBC *Horizon* documentary series about evolution, whereas the participants in other focus groups did not like it at all and “couldn’t wait for you to switch it off”. This was due to the topic chosen as some participants felt evolution had been “done to death”.

For Finnish participants participants’ personal interest on the topic seemed to have a considerable influence on participants’ comments about the clip. Most groups seemed to be divided between those who were very interested in cosmology and those who were not interested at all. Those who don’t usually watch space documentaries tended to be critical and found the clip uninteresting and would not have watched the documentary at home “I almost started to laugh in the beginning. This is an area of science that interests me less than anything else. It is so far away from my life, I don’t even understand what is the use of the black hole, what can we do with the knowledge about it?” (Erja, group no. 1). Out of those participants who were interested in cosmology, some liked the topic but not this particular programme. Others, however, would have watched it precisely because of the topic “This was astronomy which I think is interesting and important and everything. But this was not made well.” (Leena, group no. 4) or “There was not too much new information for me but I probably would have watched this at home. This topic has interested me since I was a little boy.” (Pauli, group no. 7).

German participants both praised and criticised the topic. As in Finland, interest in the topic field was the most important criterion, which was mentioned when defending the clip against critics (group nos. 6 and 3). The –critics referred primarily to the specialisation of the topic, which requires vivid interest into the subject matter. Group no. 6: HD: “Well, this might be an issue for someone who’s just read a lot of books on the history of the development of mankind, Darwin – (incomprehensible) – pretty interesting. But I don’t see a real benefit in there for me. I link everything to benefit and to the advantages humanity derives from it. It’s a programme to watch, as was said before – but not much more.” Or group no. 3: „That topic doesn’t have anything to do with general knowledge in my opinion – that’s something you learn in school – what would be general knowledge in regard to archaeology and the finding of some kind of ape is not really general knowledge. I’m interested in sciences, I would say, but rather in like general science, not specifically (...) archeology and that’s why I would have switched it off.” Or group no. 5 and others: Interestingly the topic was classed to something about dinosaurs: Sylvia 47: (...) I would need privacy and the topic must interest me, since when I come back from work and want to relax a little bit, want to get lulled by something, I need news. But I see just: Ah, this is about dinosaurs, this doesn’t interest me right now.”

Finally, Bulgarian participants expressed a unanimous opinion that the clip was interesting to them and they would definitely watch it if they stumbled upon such a show on TV. The main reason for watching such shows is curiosity. The fact that there were Bulgarians involved in the project also drew their attention. According to some participants the theme was important because it made news on a global scale „The popularisation of such world news stories is important in terms of civil control - people should be informed that such an experiment exists and questions can emerge. However, very few Bulgarian participants understood and appreciated the scientific effort of CERN project. According to them the report had mainly informative value and almost no practical use „This is fundamental science. One cannot expect any benefits from it” or „The goal of fundamental science is to study nature, and it is difficult to expect any practical utilisation from it“. The participants criticised the material mainly in terms of the difficulty in justifying the purpose of the experiment “They show a bunch of wheels and hardware. This above my level of knowledge and it does not interest me”. The participants recommended that the rationale should be presented i.e. the previous history of the project, where the idea come from, what its purpose was, what the outcome would be, what its benefits were, as well as its risks.

Way of presentation

Greek participants made quite a few negative comments regarding the style of presentation. Specifically, participants thought that these professors had not been advised by TV people (i.e.

individuals who know about television and how to use television as a means of communication) so that the end product is more appealing to the audience. „The presence of scientists contributes to the reliability of the programme. But experts are not experts in communication! I understand that programmes are presented by scientists to enhance status but in this case they should receive some training on communication“ [group no. 2, Eygenia, 26]. The majority of participants felt the tone was „didactic“ and the presenters spoke „painfully slow“. Participants thought that this production is actually representative of Greek state TV and if this was presented by SKAI, a private channel it would be much more serious and interesting. It was also observed that this programme could lose an audience due some of its features such as „There is a didactic element to it though... This is a rather conservative way of presenting science“ [group no. 2, Vicky, 45].

Finnish participants were critical about the effects and the music resembled too much of old science fiction movies. Those elements may help to illustrate abstract issues but most of the participants were not impressed. Star Trek or Star Wars kind of visuals were considered clumsy and naïve since the quality cannot match with the expensive fiction productions. They were also considered a bit worn out and cliché. Visuals might attract the attention but don't necessarily hold much informational value and therefore weaken the scientific reliability of the documentary. „Those animations looked so poor that they should not be shown in the television anymore. There are a lot of nerds like me in the audience.“ (Otto, group no. 3) or „I can make better myself and I don't even have the education.“ (Piia, group no. 1). The pace of the documentary provoked critical comments, too. The same things and the same visuals were repeated several times which clearly irritated many participants. „It was too slow. I remember watching part of this when it was broadcasted, short pieces here and there... In the mean time I was surfing in the net.“ (Make, group no. 7). Some participants felt that the programme makers underestimated their audiences. Repeating the same things over and over again made them feel that the programme was targeting younger age groups. „I think it's this yankee thing, I felt that I was underestimated because they repeated the same things over and over again... Of course if it is targeted to the secondary or primary school... but if I was made to watch this, I would be a bit annoyed because I would not be considered as an intelligent person.“ (Johanna, group no. 2). The appearance of the professor in the documentary amused some of the girls in group no. 3. „His glasses looked funny! They probably were more fashionable in 1980's.“ When Mari saw the professor's glasses she wondered when the documentary was made. Rosa, too, couldn't get her eyes away from the glasses: „When the documentary began, I realised that I can't concentrate on the black holes. My thoughts started to wander to other things, like to those glasses.“ (Rosa, group no. 3). Although the vast majority of the participants seemed to be critical of the animations and other visuals, the older participants seemed to be more positive. Group no. 8 (mixed education, 50+) was the only group in which the comments were predominantly positive. It's great that they can illustrate these things with computer animations these days.. it makes it easier to understand and piece together what it means... I like to watch this kind of programmes.“ Seppo (group no. 8) or Saima-Liisa (group no. 6, 66 years) said that this was „absolutely the most impressive documentary about the black hole I have seen yet.“

The presence of scientists, who present the project themselves, was accepted very well by Bulgarian participants. „It is much better if a scientist who understands what he is doing speaks on the show, not someone who retells an interview that he has taken.“

Overdramatisation

Greek participants from the younger focus group participants judged the clip to be very boring and the effort to dramatise the issue it dealt with not successful at all „this music they use, it is like a thriller, spooky“ [group no. 3, Janine, 16].

Overdramatisation in this clip on big issues in science was an element also criticised by Irish participants. Specifically, participants expressed that it was over-dramatic and that the music was overpowering. „It's set up like a feature film, you know, with the drama and the music. The music is too overpowering and you can't, you're straining to hear what he's saying, and it can get very annoying when the balance between the narrator and the music is wrong.“

Dramatisation was very dominant in the clip shown in Germany. Group no. 8 and group no. 1 judged the dramatisation uniformly positively. The judgements, especially from group no. 8, often lacked further qualifications. The participants of this group did not explicitly praise the

dramatisation, they praised the clip without reflecting upon the question of what actually made the clip “fascinating”; “informative” or “super-duper”. Dramatisation techniques are not perceived consciously, their statements never included thoughts that the producers for instance may have targeted exactly the reactions that the clip provoked: Peter, 58: “Just taking in account age statement: 49 million years – makes me dizzy!” The active group no. 4 was divided into two factions, but a majority of participants judged the clip positively, although some participants found it “perhaps a bit too much”, but this does not change their positive judgement overall. The different judgements in this group correspond with two factions, one faction who expected mainly information from science programmes did not like the clip (exclusively women) or comparable clips, another faction who also or predominantly expected entertainment liked the clip (exclusively men) or a comparable clip. This means, the judgements, not only in this group, were led by their expectations either toward science programmes or TV in general. In group nos. 7, 6, 5 and 3 (in active group no. 1 this clip wasn’t shown) the majority of participants disliked the clip due to the dramatisation, some disliked it heavily, for instance Florian in group no. 7, who claimed “to hate” this kind of programme. Or Martin, also group no. 7: Martin, 32: “It’s not even the information that bothers me about it, it’s rather the style of presentation. It’s just pseudo-American and I can definitely see how kids and teenagers would like that kind of presentation and that I would have liked to watch something like that in former times but now (...) that pseudo-suspense that is being created and sentences are being left incomplete – I cannot stand that!”

Credibility / reliability

Irish participants felt the over-dramatic presentation style made the content of the documentary less credible “It makes it like, not believable” “Well, It was presented as fact but you would wonder how much of it was actual fact and how much was, you know, personal opinion. Or a group of people’s personal opinions” (FG7MP5).

In Finland, this clip provoked interesting conversations about science and the nature of scientific knowledge. It seemed that among many participants the concept of science is closely related to empirical science, “certain” facts and “proving” of things. On the other hand, the nature of black holes or the future of the universe is a battlefield of theories. The fact that scientists are “only” able to produce theories or assumptions seemed to confuse several participants. In their eyes these assumptions weakened the reliability and scientific value of the documentary. Sceptical comments were typical especially among the participants with no scientific background (especially in the groups no. 1 and 7) “Come on, if you seriously claim that there is such a thing (black hole), please show me a picture of it.” (Piia, group no. 1) or “And not such a fine 3D graphic.” (Mira, group no. 1) Mira was suspicious because the professor in the documentary said many times that he “believes” this and that. “The researchers believed that the black hole eats this and that, it was always „believe“, then it was a truth and then they believed and then it was a truth again – they changed it all the time. I didn’t understand, I don’t think that anything can just disappear into some black hole.” (Mira, group no. 1) or “There is only very limited number of people researching these things. They can really say whatever they want and nobody can prove them wrong. Those black holes are like UFOs, we can’t prove that they (scientists) are wrong.” (Jasu, group no. 7) or “There was not much real information, all those Star Trek copies there were just fantasies. And those black holes, this was only one perception of them and I wonder about the base of it.” (Make, group no. 7). Finnish participants were quite aware that the visuals were artificial, distances between the galaxies and the stars were out of scale, the schedule of cosmological changes were speeded up and so on. Part of the group was critical about it, but the choices made by programme makers were also understood “You should not trust too much to those because I know by experience that the animators don’t use real simulations or mathematical models. They just put stars to the left corner to make things look better”, said Eki (group no. 2) who works as a film animator. “It looks like everything would happen really fast... this gives you a picture which is speeded up”, said Antti. Johanna replied to this (sneering): “Well it would be rather boring to watch (the realistic development)”, “Yeah, the next move happens in part 2022”, Jarmo said and Raija laughed. Eki, too, understood the choices made by the programme makers. “You have to make things compact, you have to take short cuts, and simplify things maybe even too much in order to fit the time frame. In order to say something you have to be inaccurate.” (Eki, group no. 2).

In Germany, participants criticised the fact that the need to dramatise the stuff leads producers to speculations about things they do not know, which accordingly leads to misinformation of the public and to mistrust towards the content of the movie (group nos. 6 and 5). Interestingly, young groups and participants with lower education level never brought up this criterion. Group nos. 3 and 1 did not compare the content of the clip with the reality behind what is reported. In effect, accuracy wasn't an issue at all, possible distortions by media representations were not an issue. This age group, like lower educated strata of any age, did not integrate the relation between media representation and a reality in their judgements. They judged it as a media product, which they can - unlike participants with lower education - describe almost professionally by using professional terms. But if the media representation is "true", it does not matter or is not a topic of any concern. This becomes implicitly obvious in a statement by David (group no. 3), who criticised how the researchers were introduced in the clip: "I don't really care for the researchers – you hear the name once and then never again. They said something like that one guy there was one of the rarest but I'm pretty sure there are another hundred or another thousand (of that sort). They just got lucky that this guy said yes in the right moment and he was willing to play in the film or in the series (...) then (there was) this guy, the woman who walked through the woods – I would have switched off there." Furthermore, the style of presentation affected the credibility of the information provided, as illustrated by two statements from group nos. 7 and 5. Barbara, 42: "In that case I always get the feeling they're pulling my leg. That things get defrauded." Robert (30): Well, I noticed – eh – (...) this blockbuster, this cuts, this quick cuts – dramatic sound effects – this can make it ridiculous quickly, I mean when he sits in the library and says ‚Dreamteam‘ and whatever else: It is simply difficult."

Interestingly, Greek participants did not doubt the credibility of either the information or the images presented in the background. This could be attributed to the fact that the images presented behind were not so sophisticated i.e. 3D graphics etc. as in other countries but mainly showed generic images from space. Furthermore, since there is a lack of such programmes, the Greek audience is not trained in actively watching and critiquing these programmes. Finally, the presence of scientists was overpowering and none of the participants doubted their status and the information they conveyed.

Bulgarian participants viewed the format in which the material was presented positively. However, its specific content was perceived as PR, as propaganda, due to the rather excessive positive way in which the topic was presented „This is a propaganda film which aims to convince people that this is necessary“.

Genre

Irish participants in the younger groups in particular found interviews in the documentary to be dull. "I prefer sciencey things when they act them out, like they don't just interview scientists and say like explain it, whenever they act out how it happened and stuff, it's interesting." (FG1FP5). Participants who reacted positively to the documentary clip did so because they liked the way the narrative unfolded step-by-step, and they also liked the imagery used: "The editing is beautiful" (FG2FP6).

In Germany, the dramatisation was criticised because it incorporated the style of fictional genres. Group no. 6: Gud: "Yeah, and just the way it was constructed – you have picture that – constructed like a fairy tale because HE's the best and the greatest and HE's (done this) a thousand times before and they show how HE opens the door – that scientist, that German native speaker, right? - that's really in the style of a fairy tale or an American catastrophe movie – HE's the greatest, HE has to come there now to solve the problem though he hasn't been with the CIA for years. And the way these programmes are made is very similar and that's genre mix I'm not fond of. I simply don't like it (...) either I'm being told a fairy tale or I'm being told hard facts."

Comprehensibility

In Finland, the documentary presented was taped from the Swedish language channel FST5. The interviews in the documentary were in English but the presentation and the background voice were in Swedish (with Finnish subtitles). The mixture of three languages bothered some participants but basically Finnish audiences are used to subtitles in television programmes and movies. There were

occasional comments about the Swedish language in other groups too, but the reactions were not as strong as in group no. 3. Teresa, Iris K and Rosa said that the Swedish language irritated them because for them it is important to understand what people say without reading the subtitles whereas that did not seem to bother other participants “In fact, it was interesting to hear something else than English or Finnish for a change.” (Mari, group no. 3).

Bulgarian participants suggested that the material be presented in a more understandable, accessible and popular language. Because of the specificity of the topic, it was hard for the viewers to understand so a lot of comments were made regarding the difficulty in presenting it in a comprehensible language „The material is very vague. It is true that it is extensive and the information presented cannot be covered in 5 minutes, but we are not familiar with the terminology and cannot understand the information completely. It has to be clear, specific and understandable“ or „It is not clear what the essence of the project is“. According to the participants this report was slightly more complicated – for some, in purely linguistic terms, for others, the complexity came from the experiment itself, which created difficulties for its presentation „Honestly to me it was not very clear how this machinery worked and it was not until the end that I realised what it was about. It would definitely be interesting for each of us to understand how all this has happened“ or „I think that the experiment itself was difficult, and they had no way to explain it“.

German participants came up with positive judgements when judging comprehensibility in relation to dramatisation, group no. 7: Beate, 42: “(...) I really didn’t find it being too explosive or overstated. For my part I could follow the storyline quite well even though he talked for about 40 seconds about how this thing had to look like to actually be a girl. I wouldn’t have guessed there had to be a bone for it to be a girl.” Group no. 1: Christopher: “I would say, in this case you didn’t need as much background knowledge as in the other clip – probably because everything got explained from the very basics on.... that way it was easier to understand.”

Scientificness

The fact that the programme was presented by professors who knew their field of study well was judged as a positive thing by the majority of participants irrespective of age and educational background. Some of the Greek participants mentioned that this was indeed a scientific programme with real scientists exclaiming statements such as „Purely scientific. It encompassed history of science, methodology and began to answer a scientific question“ [group no. 2, Vicky, 45].

In Germany, the clip was judged negatively in group no. 5, since it does not correspond with what they think the essence of science is. Andreas (39): “What I found problematic is how they emotionalised, just at the beginning, when he says: ‚We have, or I have the best‘! (referring to the scientists in the team of Jörn Hurum). Okay this was exciting; But science works actually without such valuations, scientists present facts – of course somehow in the contrariness always – and here, there is this cinematic aspect behind..”

Entertainment / Education

The dramatisation was criticised, since it leads to a peripatetic style. Ju: “I also found it kind of lengthy, I have to admit. Your thoughts started to wander – probably because there wasn’t anything happening there.” Group no. 7 Annette, 49: “In terms of the design (layout) I got the impression the publicly regulated channels wanted to adapt the model of the private stations. I get bored to death when I don’t get challenged at all.” Group no. 5 Laura (37): “It doesn’t matter basically whether I learn something or you learn or we all learn something. It only matters to catch the human, like “wow gee, this is amazing” and then they try to pull you through the programme.” In group no. 3, Andrea compared the clip with what is usually broadcast by the commercial programme Galileo. Compared to this, she comes to different conclusions about why the clip is not that entertaining. Group no. 3: Andrea: “That really differentiates strongly from Galileo or something like that – I mean that’s really something you have to be interested in and you look in the TV schedule and say ‚oh, I’ll watch this‘ – I believe Galileo comes up rather coincidentally, principle of contingency... so when I switch through the programmes and I see something funny in Galileo, I rather stick to that than to the other one. It’s just not as entertaining as Galileo. Rather basing on facts.”

Assessment of clip 3

Relevance of topic

The majority of Greek participants felt that a daily life topic is much more personally relevant and accessible to everyone compared to other scientific topics such as big issues in science. In a similar way, Bulgarian participants rated this material positively because of its clarity and relevance to the daily lives of ordinary people. The fact that it contained warnings for people to take the necessary precautions was also rated positively. „It was well-balanced“, „It was useful“, „Prevention was mentioned“. Participants felt that such everyday life topics were very useful for the specific benefits for the viewer and almost all of the participants stated that they would watch this material if they stumbled upon it. However, young participants seemed divided in terms of their assessments for this video material. According to some, this topic was presented too often and everybody was familiar with lightning phenomena, its dangers and the precautions that need to be taken while others thought that even though the topic was quite familiar to everybody, it was still very interesting, lightning could occur any day. Bulgarian participants criticised the material because of the excessive concentration of facts, the lack of a clear answer to the question „who is responsible and who should monitor the damaged lightning rods“. „They only add new problems and do not propose any solutions. It was not clear who will repair the damaged lightning-rod“.

Irish participants criticised the content of the clip, saying it was a subject that did not interest them at all, and held no relevance from them: “FG8FP1: But it won’t change my life if a computer can’t tell the difference between a dog and a cat.”

Finnish participants came up with both positive and negative comments about the topic. The main positive comment emphasised was usefulness and proximity of the topic. “This was certainly a very close thing to many people. Unlike those galaxies which are three billion years ahead, somewhere far away. And it was short. First I thought – I had not seen this guy before – what is this character with the cook’s hat on? Is this some kind of joke or is it about real facts? But then the things he talked about turned out to be real. But in the beginning there was a contradiction between this character and the topic.” (Virpi, group no. 4) or “It was fun to watch for a change kind of everyday science. You often get new insights out of these.” (Jasu, group no. 7). The strongest criticisms were voiced by participants in group no. 3 (upper secondary school). The clip was considered to be irrelevant and childish and the humour was not appreciated “It was insulting... Why champagne or sparkling wine bubbles for idiots!” (Otto, group no. 3) or “First I thought it is targeted for children, not for idiots but children. But when you think that it handles alcoholic beverages, maybe the idiots is a better guess for a target group after all... Personally I like more serious presentation style, I think humour is just confusing if you really want to disseminate information. “(Sakke, group no. 3) or “I’m not interested in such small things. It is targeted to different kind of people (giving a laugh) who are interested in such small things instead of being willing to understand anything bigger... Or if somebody wants to party a lot and she starts to wonder, hey why is this bubbling... but it didn’t interest me.” (Iiris K, group no. 3). There was not much enthusiasm about the clip in group no. 3 but the whole group was not as critical as Otto, Sakke and Iiris K. “I think the presentation style fitted well (with the topic). It was explained in a few minutes – it was trivial information of course and I wouldn’t have watched a deadly serious topic presented in the style. But for this, I think it was alright.” (Mari, group no. 3). Some participants thought this clip was more interesting than the other two and that it included some interesting information, too (like the fact, that sugar adds bubbling in the glass). However, others claimed that it is not relevant to know how many bubbles or how much gas there is in the bottle of champagne and thought of this information as „trivial“, childish and ridiculous.

In Germany this clip provoked statements which were not exclusively positive. Christiana (69), group no. 8: “If I really want this information I’m leaving undecided. But when I see this I’m thinking ,oh! It works like this as well‘ But you don’t reflect on it beforehand... But there’s always the excitement: what will he talk about today?” The two younger groups questioned the relevance of the topic which was judged to be just entertaining. Some youngsters further criticised the selection of the topic, for instance in group 1 one participant judged the topic boring, since the presenter uses water instead of oil, which certainly would lead to much more spectacular result. In contrast to these younger participants, other participants praised the clip because of the presenter and its set up. What was judged as a really positive aspect was that the topic was very close to every day experiences.

Presentation style / setup

Greek participants both criticised and praised the set up of this clip. Younger participants especially thought that it was much more memorable since there was a quick pace, and that the topic was approached in a good way so that it left no issues unaddressed and no questions unanswered and that easy language was an advantage (group nos. 1 and 3). Participants aged between 30 and 49 judged the programme structure positively as it went from general to specific, it was of short duration and there was limited information presented on a single topic in a concise way (group nos. 5 and 7). All participants thought that the summary points presented at the bottom of the screen were really helpful for viewers so as to retain some of the information in a better way – also very useful for people with disabilities. Participants also thought that the programme was successful as it combined image, sound and reading. Participants of mixed educational background aged 50+ felt the strong point was that the presenter mentioned results from research studies while using few words to explain and educate (group no. 8). Interestingly, participants with a higher education aged 50 + thought it was a programme with a good pace while participants aged between 30 and 49 with a higher education judged the rhythm as being anxiously fast whereby the viewer does not have time to take in all the information presented, „bombarded with information“ [group no. 5, Georgia, 32]. However, participants also commented that this programme seemed more like an advertisement or a trailer for a programme and that the way it was made was like opening up an encyclopedia. They thought the format of the programme was unsatisfactory as the production team cannot expect the audience to „have an appointment with the programme“, in other words go out of their way to watch this programme or make arrangements to be there when the programme starts since it only lasts 5 minutes. Participants of mixed educational background aged between 30-49 thought that a programme of such short duration does not have such a strong identity – no viewer will run home to watch it as there is such a huge possibility that viewers might miss it (group no. 7).

Some Irish participants criticised the clip from the Royal Institution Christmas lectures for being too “slow-moving”. Some participants felt that the lecture format was outmoded and that they would have difficulty sustaining an interest for the duration of the entire programme. As one male participant, aged 30, said: “FG7MP9: You see we’re not really used to seeing that on television any more, or like, you would never have a TV camera pointed at one thing for like half an hour or an hour, it’s always images and different things, so it’s kind of strange you know”. Even within the lecture itself, some participants felt that the information was not coming at them quickly enough. One participant said that she would give up watching after a few minutes because “life’s too short”. Participants reflected that young people in particular would not have the patience for the slowness of the presentation. One participant, a science communication blogger and a parent described how his son expected information to come at him very quickly: “FG4MP7: I have a twelve-year-old son and its not entertainment but he will expect the information to get there a lot quicker. I mean sometimes he will ask me a science question and I will explain it to him and he’s looking at me like: „Get to the point, where are you going with this? You know, get to the point with this!“ and I’m trying to give him the background to lead up to the point because I believe that telling him the point isn’t going to make any sense, you know, unless I lead up to it, but they do, everything happens so much quicker, you know what I mean, like I don’t want to say: ‚in my day‘, but you know well it is like that, everything happens so much quicker, I mean from the age of six or seven playing PS3s and X-Boxes.”

In Bulgaria, participants thought the language used in the clip was understandable and the information was concrete. However, they felt that the text could have been illustrated with different video material. According to one of the participants it would be nice if the opinion of a person who had experienced and seen the falling of lightning to be included this material. „What is missing in the material about lightning was an eye-witness account of a person who has experienced it, thus the story will be more interesting and intriguing for the viewers when they see it, because we are all human, we see a completely normal person like us who has experienced this, not just dry theory“. Other participants thought that it might be nice if more scientific information was included in this report – an explanation of lightning as scientific phenomenon. Notwithstanding these recommendations, participants accepted positively the more detailed and comprehensive presentation of the topic. „It is interesting, we learn something new“ or „This can happen to everyone, you need to keep this in mind“, „Everyone must know what to do in order to be safe“. According to the majority of the

participants this material could be shown in a very broad range of programmes: about science, health, household, etc. At the same time, some of the participants claimed that the „science“ itself was missing here. They pointed out that the material was presented in a colloquial language, without touching on the scientific nature of the phenomenon. „Nothing was said about the scientific nature of the phenomena. I am not sure why it is defined as popular science. It just provided information“, or „I did not like the wording that they used; they underestimated the viewer by using these colloquial phrases“.

The presentation style of the clip shown in Finland was rather unconventional for a science programme although it is a regular part of a rather popular science magazine. Many participants were familiar with the programme and the presenter of this particular section of it. There were more positive comments on the presentation style than critical ones. Typical attributes mentioned were funny, informative, useful, precise and compact. “I think it was a compact and quite well presented package of information. I like this journalist.” (Heikki, group no. 6) or “If they had shown something like this when I was in school I would have got much better grades. Pace was good... this was good. More like this!” (Make, group no. 7). Although some participants were sceptical about the elements of entertainment and fiction in science programmes they however, did like the clip. In fact this was rather typical for middle aged, well educated participants of the focus groups. It is quite clear that they are not against entertainment or humour in science programmes in general. Rather, they did not appreciate those elements in all science programmes, especially in documentaries “This was absolutely fantastic. It had a good rhythm, it moved forward fast and there was no blathering.” (Timo, group no. 5). This indicated that participants distinguish clearly the programme types in which lighter elements are appropriate or inappropriate. Specifically, science documentaries should remain serious, informative and pertinent but new means are suitable for new programme genres. Interestingly, the most critical comments about the presentation style were presented in the youngest and the oldest age groups, especially in group nos. 1 and 8. Several participants in group no. 8 (mixed education, 50+) liked a more traditional approach and were suspicious about elements which in their view do not belong to a serious science programme. “I think that the presenter should behave properly in Prisma Studio, he should not swing his hands like this (swings his wrists) and he could speak normally and leave the clowning somewhere else. He probably thinks he is funny but when I watch Prisma Studio and see this Mäkinen (presenter’s name) on the screen, I look somewhere else. I don’t think that the purpose of a television programme is to make the audience look somewhere else.” (Kari, group no. 8) or “This topic was irrelevant and too childish for me. It must have been targeted to children... Why did he have a cook’s outfit on?” (Ruben, group no. 8). It was a bit surprising that there was so much criticism towards the clip from the youngest participants (group nos. 1 and 3). The clip was short, humorous, entertaining and unconventional, elements often connected with the tastes of younger generations but interestingly the clip seemed to be more appreciated by the middle aged and highly educated participants. There are some possible explanations for this. First, the makers of the Prisma Studio are middle aged people with university degrees. Their sense of humour and choice of topics appeal most the people whose background is similar. Second, it might relate to the phase of life the younger participants are living. The participants in group nos. 1 and 3 are on the verge of becoming adults. They are not children any more but maybe yet not quite adults, either. Maybe they want to distance themselves from childhood and act more adult than they really are. In several comments they argued that the third clip was “childish” or “targeted for children” and maybe they don’t want to be part of that target group any more. Maybe they even exaggerate their willingness to be part of the serious adult world. As Iris K said about the third clip: “It is targeted to different kind of people who are interested in such small things instead of being willing to understand anything bigger.”

In Germany the set up of this clip was judged predominantly positively. Even the group of youngsters praised the pictures, but disliked the backdrop like Antonia from one of the active groups. All other participants judged positively the fact that the length of the clip is short, because a longer clip would not work. However, the group of youngsters found the clip too long. The set up reminds participants of children’s programmes and in fact a minority actually thought that this clip was targeting children. This was also judged predominantly positive, with the mentioned exceptions. The example is taken from group no. 6: Dieter: “Well, in the past I liked to watch ‘The show with the mouse’ (,Die Sendung mit der Maus‘) together with my daughter because it was interesting, I learned something myself since she asked a lot of questions and I had to explain to her: I don’t know everything – that’s just the way it is. And that other programme (,Wissen vor acht“) - well, I liked

it as a short teaser, right before the news programme but: I wouldn't watch something like that for a whole hour – I simply wouldn't! But a short teaser like that, sure, why not? It makes me think for a while and then I think: ,ok, that was it for today'."

Presenter

Greek participants heavily criticised the presenter of this clip. Only group no. 7 participants mentioned that a healthy young person is very suitable to talk about health topics and give health related advice. Participants from other groups felt that this was a cheap production which is only based on the appearance of the presenter. One participant stated „the particular presenter was chosen because of her looks and because she would attract more viewers“ [group no. 3, Elena, 16]. Younger participants commented on the lack of credibility of the presenter with statements such as „these programmes should be presented by a scientist so that the information is correct and credible“ [group no. 3, Maria, 16] or „the research team gathering the scientific information should have a scientific background“ [group no. 3, Maria, 16]. Furthermore, participants aged between 30 and 49 thought her appearance compromised her credibility as a scientist as a viewer could easily think she was a model and that she was not convincing in her role although she was introduced as a scientist (psychologist).

Most Irish participants were of the opinion that the presenter of the Irish clip was funny and engaging, “the strength of the last one was definitely the presenter”. The importance of the role of presenter was emphasised by one female participant, aged 27: “FG2FP3: I think the presenter is hugely important and that mightn't transfer well, you know, like, he's got presence, He's really good at explaining things and he's really interested and if that was Pat Kenny or someone like that, you know it wouldn't be the same.”

By and large, Bulgarian participants rated the participation of a specialist and a journalist in the programme positively. They thought that it would be appropriate for an expert to be included in the report, but they thought that this person should be able to talk in front of the camera. In almost all discussions the participants believed that the expert, whose opinion was included in the report, was not convincing enough. Though the material was presented in a clear and understandable manner, participants voiced some criticisms toward the experts. For example „I did not like the man who was stuttering (the expert). They should choose people that can talk to be on these shows“.

In Germany, all groups except 1, 3 and 2, judged the presenter fairly positively. Group nos. 1, 3 and 2 did not find him very convincing. Especially the way he was presenting the physics behind a drop of water on a hotplate provoked emotionalised negative reactions in both groups of youngsters. The example is taken from group no. 3: Nico: “I can't stand that moderator. His way of speaking and... I cannot look at him.”

¹ A questioning route was developed for the sake of an international comparative focus group approach. We have avoided to discuss method matters in this final report. The discussion guide is uploaded on our website (www.fu-berlin.de/avs).

Chapter 5

Raising public engagement with science through audiovisual media? Current state and future of science programming in Europe

Summary

This chapter attempts to set crucial findings of AVSA into a broader context by discussing the meaning of the findings with regard to the current state of science programming and its future, which also includes the printed press, where applicable. The focus is on information, popularisation and edutainment.

Regarding specialised information programmes we do not believe that information journalism on science can overcome its marginal position in audiovisual media in the foreseeable future, due to structural constraints. Diffuse societal expectations, increased specialisation within science and uncertainty regarding the relevance of practical applications lead to a pronounced arbitrariness in choice of topic among specialised science units. This limits their ability to raise topics that have a perceptible resonance in society. The future of specialised information journalism may not mainly be in science units but rather in already well established editorial sections on politics and/or business for instance.

Unlike in information journalism, the significant impulses for the future of popularisation are most likely not from innovative content-related concepts. Its future particularly in TV but also in Radio is more likely influenced by an ongoing segmentation of media markets with special emphasis on new thematically specialised niche channels, and by solving its main problem regarding the lack of topical reference through internet provision of popularisation contents.

Edutainment has the greatest potential, conceptually as well as economically, in TV. Edutainment in Europe is rather dynamic. This is evidenced by the fact that new formats are developed regularly. Our findings indicate that the reason for this is twofold: edutainment offers a new option to re-evaluate established TV genres such as the family show, the quiz show and even reality TV in regard to concepts and contents. Furthermore, the combination of existing TV genres with explanations offers the possibility to plan the popular success of these developments more reliably than was possible with popularisation. For this reason, edutainment is an option especially for commercial providers and for public broadcasters heavily exposed to market pressures to cover science. The main challenge regarding edutainment from an audience point of view lies in increasing the societal relevance of its contents.

We finish this chapter and this report by proposing potential actions, which should be undertaken by various stakeholders, in order to increase public engagement with science. AVSA considers that political institutions concerned with science broadcasting as a means to facilitate greater public engagement with science need to shift their perspective from a largely science-centric one, as at present, to more media-centric and audience-centric views. This implies taking fuller account of the constraints of media production, of the established expertise of broadcasting organisations and of individual programme-makers in making programmes that attract and sustain audience interest, and of audience needs and interests as reflected in patterns of media consumption.

Current state of information journalism in Europe

Television in Europe is generally characterised by relatively few specialised programmes that would qualify as information journalism, i.e. those that at least to some extent pick up recent events in science and process them into news-shaped journalistic products. The chances for new scientific findings to be picked up by a TV science journalist and published are slim. The exception is science news related to the treatment of diseases. Such news items can be found in health magazines which are not specialised in developments in current medical research but are rather interested in the applications of medicine and medical research. It is mainly in this sector that events can be found that can be turned into more or less reliable, topical health tips for the audience.

To understand what this means, one has to be aware that journalism is the organised production of statements that are made available to the public. It requires a specialised editorial unit to provide relevant news from the realm of science regularly, that does nothing else other than collecting and distributing relevant news events from the sciences. Because a specialised editorial office or unit does this on a regular basis, they accumulate expertise; they develop efficient routines to find relevant news items, they develop assessment valuation standards that serve to distinguish relevant from irrelevant news items; they accumulate knowledge about research progress in the particular fields of science they observe. It does not mean that science news is never on television if these specialised programmes

did not exist. In fact, science items can be regularly found in television news (Leon, 2008). It rather means that only few specialised units exist, that are specialised in the handling of science news items in the previously mentioned way.

Consequently, the medium in general is organisationally ill-prepared for the handling of new science findings. Hence, television is commonly surprised by groundbreaking findings. From virtually nowhere a significant finding suddenly appears, and in the face of the evident importance, the news editors absolutely have to report on it. But they do not possess any established routines for how to go about it. Instead, they apply the routines they use with their bread-and-butter issue of politics, but unlike political events, they have little expertise in communicating science news in a high quality way due to the lack of specialisation. To achieve high quality, thorough background knowledge is indispensable. Without this background knowledge, for example, it is not possible to evaluate scientific findings. In some cases, the extensive lack of specialised units can have far-reaching consequences which is well exemplified with the case of the “Venus of the Swabian Mountains” (see Lehmkuhl 2009a for details).

On 13th May 2009 at 11:00 AM, the University of Tübingen held a press conference in the Fürstenzimmer of the castle Hohentübingen. The promise was that a “sensational discovery from a cave in the Swabian Mountains“ will be presented. It referred to the oldest known figurine in human shape which the university planned to hit the headlines as “Venus”. However, it only should do so at 7:00 PM the same day, because this was when the embargo of the important science magazine Nature ended.

Embargos such as this are common practice in science. Science journals check the quality of articles that scientists submit, in a more or less laborious peer review procedure. In return the journals reserve the right to be the first to report about the new results. The notification sent by the university’s press office vexed the newsroom of the biggest German public service TV broadcaster. In the 18 lines of the meagre press release, seven lines (about 40 per cent of the text) concerned the embargo and the plea to observe it. At the same time, enquiries piled up in the newsroom from broadcasters everywhere in Europe. They wanted to see pictures of the sensation that was to be shown in Tübingen.

What is Nature? Why wait with the announcement of this sensation? Is that not the curtailment of a right to publish information as soon as it is available? Is an embargo binding? The last question especially occupied a lawyer who was asked on short notice by an employer of the news editor office. Result: embargoes are - from a legal viewpoint - inconsequential. Nobody can be prosecuted for violating an embargo. Subsequently, a dispute ensued, especially between an employee of the legal department and the author of the Nature paper, the scientist Nicolas Conard from Tübingen. The lawyer rated the embargo immediately before the press conference as “illegal”, thereby completely misjudging the purpose of this convention, whereupon Nicolas Conard refused any interview with this news station. However, the lawyer’s assessment caused a regional news studio of the broadcaster to report on the sensational finding at 1:30 PM and at 5:30 PM. This in turn caused the journal Nature to exclude all radio and TV employees of this public service broadcaster from pre-publicity service. The pre-publicity service informs specialised science journalists about forthcoming contents one week before publication to help journalists to prepare news coverage. By excluding all science journalists of the biggest German public service radio and TV broadcaster, the journal deprived a considerable part of German science journalism of an important resource for the planning and production of topical science news items.

There is no question that this story would have taken another course if an editor’s office in charge of reporting on the topic had been specialised in science. A science unit would not have been surprised by the information, because they would have learnt about the find from the pre-publicity service of Nature at least a week before. This would have given them the time to prepare. And they would be familiar with the formalities of the embargo. They would not have instigated a legal posturing, but would have been practised in dealing with embargoes.

This is, without doubt, an isolated case. Nonetheless, it is likely that in many TV stations in Europe similar events take place frequently, because only a few countries have specialised editorial TV units, and hence specialised expertise for the selection and publication of science news. Among those are Germany and Sweden. In these countries programmes are established that address science news regularly at least to a certain extent. The lack of specialised editorial units probably means that the specialised treatment of science news constitutes a threshold of specialisation that TV can only cross in exceptional cases.

Compared to TV the situation of information journalism on the radio and in national broadsheet

newspapers is very different. About a quarter of 217 science programmes on the radio that were identified in 13 European countries were primarily information-based. In these programmes current science is edited in a specialised way.

There is no reliable, cross country data available regarding national broadsheets in Europe, but based on some indicators it is possible to assume that in many countries, science units have been established, however, their staffing is not comparable with the traditional units, such as politics, culture or business.

These indicators allow us make inferences about the development of science units in individual countries across time. Based on those studies, one can assume an enlargement of the market in Germany, although only on a low level. In 1984, 63.6 per cent of all daily newspapers (including regional newspapers) had dedicated science divisions or units. However, the names for the divisions were very heterogeneous.

The publication of one newspaper page on a weekly or irregular frequency was predominant. In 1998 Klaus Meier calculated a share of 69.7 per cent. The differences regarding the degree of institutionalisation are considerable. Whereas in 1984 just 3 per cent of 110 analysed German daily newspapers had at least one editor who was solely responsible for science and research, in 1998, it was 21 per cent. We cannot conclude from this that considerably more science pages are produced, but we can conclude that science gained status in the editorial offices through the designation of special responsibility. It can be assumed that in some of the various segments of the newspaper market in Germany the changes are more noticeable, especially in the leading media - the national broadsheets with their science editorial offices that have increased their staffing considerably in the past years (Lehmkuhl, 2009b). It cannot be overlooked, however, that these tides may have started to turn. We observe, especially in the USA but also in other countries like Germany or Finland, signs that with the diminishing circulations there are pressures to decrease the staffs in specialised science departments.

Several studies found that science has taken a greater share of news coverage in national broadsheets over time. Such results are available for Bulgaria, England and Italy, but also for Germany (Bauer et al 2006; Bucchi 2003; Badenschier et al. 2008), thus countries that are different in essential features of their media structure (Hallin, Mancini, 2004). This indicates similar developments across Europe. But information about how much science there is in newspapers is difficult to interpret, especially with regard to professionalising science journalism or the re-evaluation of science in the editorial offices of a newspaper reflected, for example, in the number of journalists that are specialised on science.

Radio, like newspapers, has units available that are specialised in information science journalism. Whereas with newspapers one can assume that at least national broadsheets nearly everywhere within the European Union have these units, with regard to radio this can only be assumed within certain limitations. The differences between the countries are too big. Measured by the number of radio shows that consist of specialised information journalism, one can assume that in Germany, Great Britain, France and Sweden there is a relatively large amount of information journalism produced. This, of course, should not be taken to mean that there are hundreds of specialised editorial units. Even in Germany - which has the most daily programmes - the number is only 18.

The current state of science popularisation in Europe

The popularisation of science compared to information journalism in television is much further developed as measured by the number of programmes. These programmes generally deal with a single scientific theme or thematic area without any topical relevance that is presented in a more or less complex way with the means of television. Many of these programmes are distributed Europe-wide, especially BBC series, for example 'Planet Earth' or 'The Planets' are offered everywhere in Europe.

Accordingly, in science popularisation individual programmes or seasons with four to 12 episodes are dominating the market - very different from information programmes. The popularisation programmes are backed by an editorial office in the classical sense, i.e. a department whose sole responsibility is for content and creation in exceptional cases. In that respect the number of programmes broadcast does not indicate the existence of a specialised editorial office (as it would with information programmes), because in theory every country can distribute a multitude of these programmes, without employing

a single TV author, that produces such content regularly and consequently could be considered specialised in the communication of timeless beautiful science matter with mass appeal.

Great Britain and probably the USA are the countries that - measured by the number of programmes - have the biggest number of specialised authors and production units. This is due to the size of the home market as well as the comparatively high success in exporting programmes or series into other countries.

The big European countries come second; Germany especially has a well-developed market that is fed mainly by the demands from within Germany. This country imports a relatively small share of its programmes, but produces a relatively high number of popularisation programmes. The situation in France is similar, albeit the number of programmes is lower than those of Germany

The Scandinavian countries Sweden and Finland also broadcast a relatively large number of popularisation programmes, whereby the contents are to a greater extent than in Germany or France imported formats, especially from Great Britain. Additionally, they are also considerably more often repeated elsewhere. In Scandinavia the limits become apparent that result from the size of the media market.

In Southern Europe (Greece, Cyprus, Spain, Italy, and Portugal) and also in Eastern Central Europe there are relatively few science programmes. This is most likely not because the audience would be less interested than in other places but the lack of provision is a result of the precarious financial situation of the public service broadcasting sectors in these countries.

Popularisation in radio plays a less important role than in television. Radio is not (any more) the medium through which popularisation programmes can reach a large audience. Merely 20 per cent of the 184 popularisation programmes were from radio. The lion's share of those radio programmes could be found in only three countries: Great Britain, Germany and Finland. This is without doubt related to the user's habit specific to this medium that is difficult to reconcile with the requirements of popularisation programmes. These programmes tell stories and for that they need time. Radio is a classic background medium; only in exceptional cases does it keep the attention of the listener longer than a few minutes. The times are gone when a mass audience followed a programme for 20 minutes or even more with undivided attention. The fact that producers of these contents have only a vague idea who is using them is probably one of the reasons why popularisation programmes on the radio still exist at all. The supply of these kinds of programmes that are produced with great effort depends on the country's specific traditions and on the resources that are available to the public service broadcasters.

Whereas the information programmes prefer stories related to medicine, the structure of topics is completely different in popularisation programmes: history, palaeoanthropology, archaeology and contemporary history prevail. About 50 per cent of all popularisation programmes address these topics. After a big gap, physics, especially astronomy, follows with 13 per cent of programmes of this type. This means that the thematic restrictions in popularisation programmes are great. Not every scientific topic has the same chance to be popularised through TV or radio. There is no reliable data for an empirical comparison of the market in Europe for print products that are primary popularising, especially magazines like *Scientific American* and the *National Geographic*, or their respective national spin-offs. There are analyses of national markets (e.g. Lobigs, 2008), but to our knowledge, there are no international comparative studies in regard to popularising print magazines. To get a rough idea of certain dynamics, one can infer from national markets onto international circumstances.

Clearly, the producers of popularising magazines in large international markets, such as USA or Germany, try to launch spin-offs outside the original country as happens also with popularising TV contents. If this happens successfully this leads to a higher threshold in this market segment for market entry from national start-ups. Correspondingly in at least a number of European countries spin-offs of imported foreign magazines do exist.

Also noticeable is that at least in some selected national markets (noticeably the German) an effort is made to satisfy the relatively high interest in popular science of the newspaper readership (that has been found with copy-tests or the new reader-scan procedure) by supplying popularisation content in daily or weekly newspapers. It is not known at the current time if this kind of strong interest in science can be found among readers across the whole of Europe. Furthermore, little is known about where this interest in science, for example in the German market, originates. Without this knowledge, inferences referring to the European market are not possible. For example, it is possible that the levels

of interest in science in different media mutually strengthen each other. A great interest in science on TV (that is at least partly supply-driven) could stimulate the popularity of this content especially in the print-media. This is supported by some successful trials in Germany, to place print products with titles of popular TV science shows on the market (Lobigs 2008).

The current state of edutainment in Europe

Measured by the number of viewers that are reached by individual programmes in Europe, edutainment is a domain of TV. No other science-specialised broadcast type defined here reaches as big an audience and no other reaches such a large proportion of young viewers. For this reason, edutainment is particularly interesting to commercial TV stations. Whereas information journalism on TV and popularisation journalism are dominated by the public service channels, this dominance is much less strong in edutainment. In edutainment commercial TV succeeds especially with advertisement-relevant target audiences. A good example is the Spanish programme “El hormiguero” on the station Cuatro in which a likeable, mad scientist character named Flippy demonstrates spectacular experiments to millions of Spaniards. Worth mentioning are also some formats that were developed in Germany: “Clever”, “Galileo” or “Wissenshunger”. That 56 per cent of the 80 million Germans have seen at least one episode of “Galileo” within the period of one year highlights the popularity that these programmes can gain in some cases.

It is notable, especially in the commercial programmes of this type, that they connect scientific explanation to everyday phenomena in only a limited way. They no longer aim primarily to provide the viewers with a light-bulb moment, when they learn that the dancing water drops on the hob have something to do with the water’s surface tension. Instead, these programmes aim more for the wow-factor, by manipulating the everyday phenomena that are to be explained, in such a way that they become spectacular. This is the case, when the force of common car brakes is demonstrated by braking a car by parachute. This is also the case when the power of a household blender is documented by first preparing it so that a broom stick fits into the blender and bursting the broom stick with the force of the blender. The reason for television to dominate this type of science journalism (in comparison to radio or to the print-media) is mainly because this type needs visually staged, often spectacular experiments to be attractive to a mass audience.

Also fairly typical for commercial edutainment formats is that it uses a broad definition of what counts as everyday experience and subsumes under this also phenomena that are more from the realm of the mysterious. These “mysteries“ can be assumed to be known by many people. Such “phenomena”, like Chakras or time travel, are then (para-)scientifically explained, sometimes with scientific experts taking on the role of explainers. There might be an argument here that such programmes cannot be included in the catalogue of scientific formats. There is a case against this argument as that some groups of viewers will happily except these programmes in the catalogue of scientific broadcasts. That can be seen very clearly from our group discussions. Another argument against the exclusion of these programmes is that their narrative techniques have entered into classic science programmes (Lehmkuhl 2008).

Edutainment is a German speciality, as can be seen in the fact that with “Galileo” and “Clever”, two especially successful programmes that have found their way into other European and Asian countries across the so-called format trading. Compared with the popularisation type the trade of these programmes is rather irrelevant as it is not finished productions that are traded but recipes (“formats”) on how to make a regular programme (Lantzsch et al. 2009). These recipes need at least sometimes the addition of national ingredients, otherwise they are not successful.

The future of science journalism in Europe

Based on the description of the current state, we would like to conclude with a look into the future, guided by insights into what factors influence the degree and the structure of science coverage in Europe. We will start with the specialised information journalism that has to fight with structural problems that it has to accommodate conceptually.

Theoretically, information journalism is understood to have an important societal role because it scans science for events that have at least the potential to be relevant for others outside the field of science that it concerns, such as politicians, that want to reform pensions, health and traffic systems, or entrepreneurs, that want to market innovation, or scientists that are alerted to trends relevant to them in other disciplines, or people that are suffering from a disease or look for orientation.

Hence, one problem of this type of science journalism is, in the first instance, it has to meet very heterogeneous expectations that are not very clearly defined – this is quite different from political or business journalism. Besides these diffuse societal expectations, another problem is the object under investigation: the sciences are extremely complex. That remains true, even if this journalism generally limits itself to news from the natural sciences. This complexity is a result of highly developed specialisation that is a feature of modern research.

Moreover, information journalism faces the problem that scientific news is often essentially ambivalent, in the sense that their practical meaning - lynch pin of their societal relevance - is rarely clear at the time of reporting. Set phrases are abundant in information journalism; such as: the result, breakthrough or cornerstone xyz could lead in three, five or ten years to this or that. It might be possible to avoid such set phrases. But information journalism cannot avoid the dilemma that scientific research needs to be application-oriented to become relevant to society, but that this application orientation is uncertain and often has to be arduously investigated. The dilemma would only be avoided if journalism limits itself to pretty, colourful news about distant galaxies or exotic animals, to collect curiosities or news about dinosaurs, mammoths and stone-age humans.

Diffuse societal expectations, increasing specialisation of science, and uncertainty regarding the relevance of practical applications lead to a pronounced arbitrariness in the choice of topics in specialised editorial units. Even though, as far as we know, there is only one empirical analysis about this available (Wilhelm, 2008), there is little doubt that these findings are transferable to other countries. If you read ten science pages or listen to ten specialised radio shows in any European country, it would be exceptional to find the same topic more than twice. This does not reveal anything about the popularity of these pages and programmes with the recipients. It only shows that this journalism is hardly able to raise topics that have a perceptible resonance in society, such as prompting political discussion.

It is exactly this structurally determined property that makes it unlikely that science information journalism can overcome its marginal position in the structure of editorial offices in the foreseeable future even though its topics are at least in some countries popular with its audience.

Especially with regards to newspaper journalism the real question of the future is not only, if the users of daily newspapers read the science part, but also if the profile of science reporting contributes to reader loyalty. We have some doubts that this is the case, as long as information journalism mainly sees itself as collector and evaluator of (natural) science news who are specialised on the selection and interpretation of things that are in *Nature*, *Science*, *The Lancet* or *The Proceedings*. This concept will survive or die with the newspaper as a marginal phenomenon; real impulses for the future are not to be expected from this concept.

It can be assumed that a gain in status of information journalism depends on its success in raising topics that are highly relevant to society. Ideas on how this could happen do exist. One such idea is to design information journalism as a watchdog of science. Such ideas can be challenged as they do not consider the expectation of the audience, nor the structural difficulties that stem from the specialisation of the sciences. Journalism could be overwhelmed by the role as a science watchdog.

Other ideas have to be judged differently. These propose to use the accumulated expertise of specialised editorial offices to connect relevant societal topics more strongly than previously with scientific expertise, or to communicate new insights into relevant societal problems. This concept was already discussed in the 1980s by the German Philosopher Helmut Spinner (Spinner 1985). The core of these concepts is to make science usable as a decisive resource for investigative inquiries. According to this concept, journalists would no longer merely proclaim a government declaration but also at the same time do a kind of science-based check of rationality, to uncover its ideological contents. This would without question accommodate the increasing need for orientation of its clients.

These concepts, however, would mean a radical change in observational angle. The search would no longer be event-related, for new, relevant scientific studies but instead problem-related, for relevant scientific expertise. Not experts in certain science disciplines would be in demand but excellent investigators with scientific expertise in many disciplines including especially the social

sciences and humanities. Furthermore, journalistic expertise would not be organised into science departments but instead all reporters should possess science expertise.

There are many reasons to doubt that such a radical change would be possible within the current structures. But in our view the future of specialised information journalism will take place not in the science units but in the politics and/or business sections. This applies to all media. In our view, the TV information programme of the future will follow the format of the US show “Frontline” (<http://www.pbs.org/wgbh/pages/frontline/>) more than that of the classic “*Vetenskapsmagazinet*” on Swedish television or “Nano” on German TV. They practice investigative journalism that uses scientific expertise on a case to case basis in varying degrees. To promote such a change, targeted media funding programmes are needed which support the development of concepts capable of making science usable as a decisive resource for investigative inquiries outside established science departments.

Unlike in information journalism, the significant impulses for the *future of popularisation* are most likely not from innovative content-related concepts. This would be different, if journalism suddenly were in a position to re-evaluate popularisation with topical references.

What conditions are needed for this to happen and what possible consequences this opportunity would have for public attention and for science itself, can be demonstrated with the example of Ida, a primate fossil that kept not only information journalists all over the world busy in summer 2009 but was at the same time popularised through a book and television documentaries. We do not know of any other case in which a single scientific finding has received so much attention. The scientific article that describes the findings has been downloaded over 100,000 times from the server of the online-magazine PlosOne in autumn 2009. This makes it probably the most popular scientific publication of a single finding that has ever been published (Mäder 2009; Lehmkuhl 2009c).

It cannot be expected that this will be repeated with any regularity in the future. This, of course, does not mean that popularisation contents in the long-term will be produced in the same way as they have been so far - it is rather very likely that maybe innovation in camera techniques or something of that kind will result in new visualisation possibilities or the like. However, this does not essentially change its basic conceptual orientation. The main concern in the future will still be to find the largest possible audience for science topics of timeless beauty.

At the current time the degree of popularisation in non-pay TV depends largely on the supply side on the number of specialised stations that can live off or make do with a market share of between 1 and 3 per cent. The more such stations are available in a country, the more popularisation programmes are broadcast. One can assume that the disappearance of technical restrictions for sending and receiving of TV signals will at least aid the establishment of cultural and educational stations.

This applies especially to those European countries whose markets are big and/or whose public service broadcasting is financially relatively well equipped. Thematically specialised public service broadcasters are especially dominant in science popularisation on TV; this is especially visible in Germany, France and Scandinavia. Considerably more popularisation can be expected in the future in Great Britain due to the establishment of digital special interest channels supported by the BBC from a very big available pool of popularising contents.

Evidence suggests that a Matthew effect will apply in popularising TV contents: Those who already have are given even more. The situation in South and East Europe is different and more difficult. It is to be expected that the segmentation into niche TV channels has a similar effect, but there is reason to doubt that a comparable niching into special interest channels will happen at all. This is basically because the public service broadcasters in these countries are generally very under-funded and the markets for national commercial niche channels are too small. The German market is the only market in Europe in which commercial broadcast companies entertain also niche channels that have popularisation contents to an appreciable degree. And even there, the channels are usually loss-making. It can therefore be assumed that more popularisation content in these countries would only be possible through extended operations of foreign-based broadcasting companies. This certainly will have no or little effect on the amount of popularisation that is produced in these countries, which in turn considerably limits the probability that “national” science is covered.

Popularisation on radio depends even more on the structure and resourcing of the public service broadcast system of the respective country than does popularisation on TV. The peculiarity of radio is that it has only a vague idea who is using it, at least as far as public service talk programmes are

concerned in which popularisation contents can mainly be found. Its supply is more influenced by programme politics than by demand. This circumstance, in our view, is the reason for the existence of several popularisation programmes on German radio, that have not changed in the last 20 years in regard to their content or their concept (Lehmkuhl 2008). This is unimaginable in TV. How popularisation on radio will develop in the future is difficult to assess. However, the times of relative cosiness of European talk radio seem to have come to an end if available technical systems start to be established with which the use of the radio can be monitored precisely to the second. What this means for popularisation on radio is difficult to say because data collection of download numbers of internet podcasts show that these programmes are quite popular, albeit they cannot be classified as having mass appeal.

Edutainment is essentially a speciality of TV and its future will be mainly there. That is why we will focus below on this medium. This type has the greatest potential, conceptually as well as economically. Edutainment in Europe is rather dynamic. This is evidenced by the fact that new formats are published regularly. The reason for this is twofold: edutainment offers a new option to re-evaluate established TV genres such as the family show, the quiz show and even reality TV in regard to concepts and contents. Furthermore, the combination of existing TV genres with explanations offers the possibility to plan the popular success of these developments more reliably than that was possible with popularisation. For this reason, edutainment is an option to cover the segment of science especially for commercial providers. Public service broadcasters are less dominant in edutainment than in any other type of science journalism.

The potential that this type in all its variations has for TV is not realised in all European countries as evidenced in the cross-country comparison. The stronger establishment of edutainment (unlike popularisation) is not prevented by primarily economic factors in Scandinavia, East or Southern Europe. Additionally, the popularity of edutainment is not confined to a clear-cut cultural area, as can be seen in the successful internationalisation even outside the borders of Europe of German formats such as “Clever”. Thus, we can expect that the presence of edutainment in European television will increase in the mid-term.

Raising public engagement with science through audiovisual media?

We have tried to set some selected findings of our research in a broader context, in order to justify recommendations on how to influence the way science is broadcast by TV and Radio. We end this chapter by naming some potential actions, which take into account especially the insights in what actually determines or influences at least the methods of science broadcasting in Europe. We will restrict our proposals to those, which can be achieved with a certain change. It goes without saying that changes in selected characteristics of the media systems in Eastern or Southern Europe, namely the amount of subsidies available in public service broadcasting would likely have a significant impact on the extent to which science is broadcast in these countries. But, we think, this is far away of being a realistic task to address.

Any proposals aimed at increasing or improving the contribution of science broadcasting to public engagement with science need to take into account two major elements of diversity within science broadcasting and its audiences:

- there are many different genres of programme in which scientific information is represented
- there are many different audiences for science programmes within and between countries

The AVSA project has explored both of these dimensions and other sources underline their importance. Jenny Kitinger (2007), an expert on science, risk and media, advises that „anyone reflecting on the potential of the mass media in relation to public engagement needs to consider the different genres in play, the professional practices of those involved, and the industry pressures“. To counter the argument that engagement is mainly or only based on explanation and popularisation by scientists, she outlines the different demands of producing dramas and producing news stories and concludes that „the questions some journalists ask about the socio-political context of science, and the visions that science fiction raises about future consequences might be very good bases for some ‚public engagements‘.“

In relation to differentiation of audiences, the Special Eurobarometer survey, *Scientific Research in the Media* (European Commission 2007), presents in addition to our findings some important evidence. The survey showed that television was the most frequently and radio the third most frequently used medium across the European Union for information on scientific research. But this EU-wide finding hides very considerable variations. EU-wide, 61% of survey respondents said they regularly or occasionally watched TV programmes about scientific research but, within our sub-group of member-states, this ranges from 48% in Ireland to 77% in Finland; Ireland had the highest figure (28%) in the EU for never watching such programmes, which coincides with our estimation of the comparably low societal dispersion of science programmes in Ireland (see chapter 3).

The variation for regularly or occasionally listening to radio programmes about scientific research was much smaller – all but one of our sub-group of countries were within three percentage points of the EU average of 26%; the exception was Finland at 33%.

The strongest preference among sources for information on scientific research was by a wide margin for ‘traditional TV channels’ – 34% in the EU, though ranging from 27% in the UK (perhaps surprisingly low, considering the generally recognised high status of the BBC as a producer of science programmes) to 62% in Greece. ‘Thematic TV channels’ attracted 14% support across the EU – from 6% in Greece to 24% in neighbouring Bulgaria – and there were much lower ratings for ‘interactive TV channels’ and radio.

Previous policy proposals

Internal diversity within Europe tends to be downplayed when policy plans and programmes are under consideration at European level. However, a report to the European Commission on the public culture of science and technology in EU member states (Miller et al 2002) drew on a good practice example in Spain for a recommendation to “promote the presence of science issues and scientists in public television through specific science programmes and debates, where possible, with special emphasis on local scientists and local TV networks [emphasis in the original] this will show the public that science, like politics or other issues, is something close to their daily lives”.

The expert group report also observed that “pressure on schedule space and time leads to information simplification and the transformation of news pieces into a sort of showbiz. A rebalancing of scientific information and its showbiz-like treatment is needed”. This view on the appropriate balance between information, education and entertainment has not been generally supported in the practice of science broadcasting in the years since then. The argument will be revisited in several of the following sections.

European-level initiatives through the European Broadcasting Union and the European Commission have tended to emphasise the informational and educational dimensions of science broadcasting. In this domain, the thrust of EU support for production of science programmes has been on news and documentaries. The EBU has concentrated its efforts on supporting the production and co-production of documentaries.

However, *Earthwake*, an EU-funded project, noted the possibilities for innovation within these genres, suggesting “the time may now be right for big European level TV initiatives in science and technology, to mirror those already existing in sport and music; the environment initiative by the EBU is an excellent example of how to use entertainment formulae to convey important messages” (Earthwake 2007). This recommendation emerged from a forum of scientists, science communicators and broadcasters, including leading European scientific institutions and broadcasting organisations. In the reference to an environment initiative, it was apparently alluding to the European Broadcasting Union’s *Green Daily* one-minute programmes, each consisting of two comic-strip drawings on an environmental topic sketched live with an off-screen commentary “that is both humorous and informative”.

Other recommendations from that forum that are particularly relevant to the AVSA project are these:

- measure the impact on the audience of science and technology pieces in non-science television programmes
- help programme-makers to know more about how science and technology affects their output area
- find more mechanisms to engage the public with science and technology in ways that relate to their daily lives

- a project, supported by EC funding, to promote science strands within existing television formats could be productive; areas like sport and general magazine programmes could be encouraged via well-crafted proposals for science items supported by appropriate funding
- reaching new, wider audiences with science and technology is a priority, but this should not be seen as an alternative to dedicated science programming, rather an addition made necessary by the greater profile of science in today's issues

At a national level, an expert group report in early 2010 to the UK government on science and the media addressed 'Science Programming in a Changing Landscape' as one of its four themes. Among the actions it proposed were setting up a lobby group to "advocate for more and better science programming" (Science and the Media Expert Group 2010). It declared its support for initiatives to facilitate relations between scientists and programme-makers and suggested that broadcasting organisations should seek to attract more science graduates into programme-making positions. The report declared that "great science programmes can influence attitudes to science and inspire future generations to embrace science", thereby revealing what the UK expert group considered to be the main purpose of science broadcasting.

Recommendations

In public discussions science programme-makers have raised concerns with balancing entertainment and information as well as those of the changing demands of meeting audience needs and responding to technological changes. Peter Goodchild, a former editor of the long-running BBC science documentary series *Horizon*, expressed his concern about the shift from emphasis on science content to emphasis on human stories (Goodchild 2004). Nobel prize-winning chemist Harry Kroto, who has used television and video for science popularisation, earlier reported with evident disdain that "a producer one told me that even the BBC's *Horizon*, which has the best track record, is more about entertainment than about science" (Kroto 1997).

The trend away from explaining complex science towards telling human stories has strengthened and the current editor of *Horizon*, Andrew Cohen, argues that his challenge is "finding ways of reaching an audience who would not naturally tune into a science documentary" (Cohen 2008). He believes that a strong 'science' label on programmes may alienate part of the potential audience; more diverse techniques and formats should be used "that enable an audience to feel comfortable with the delivery of often difficult content". Among these techniques are "celebrity presenters, computer graphics, constructed formats and emotionally engaging human stories".

BBC radio producer Martin Redfern has commented on the impacts of technological change both on reception and on production (Redfern 2009). He noted the popularity of science programmes among downloads from the BBC's web sites but also noted that newer technologies were contributing to the competitive pressures on the BBC for listeners' attention: "In this competitive world, it is no good just making the programme you want to, or giving listeners what you think they ought to hear, or worse still what scientists think they ought to hear" (Redfern 2009).

BBC radio presenter Toby Murcott (2010) also sees opportunities for more diverse and better science broadcasting through technological developments. "The science broadcaster of the future will use a very different set of tools, and have different ways of connecting to their audience ... The Internet will allow talented novices to show their wares whereas traditionally it has been difficult to break into broadcasting" (Murcott 2010).

Scirab, an EU-funded project, conducted surveys of radio programme-makers, profiled science radio programmes across Europe and hosted several meetings of scientists and journalists working on science radio programmes (Mazzonetto et al 2005). The project leaders drew attention to the poor quality of audience data available to radio programme-makers: "Journalists and producers do not actually know the precise audience of their programmes and most of them do not have any quantitative information on the profile of their listeners" (Scirab 2005). AVSA's interviews with programme-makers confirm that this remains very largely the case for radio, though less so for television. Among other observations in Scirab's final report that are relevant to the present project are:

- education is not perceived by European science radio journalists as part of their tasks. Rather the contrary. In some producers' mind, not only should education not be there, but information is also optional alongside entertainment.

- specific pressure should be put on radio stations to stimulate competition on innovative use of the Internet (through webcasting, podcasting, and other foreseeable technologies) in science radio programmes.
- local radio could be extremely powerful in bringing science closer to society; financial contributions to local radio stations or to journalists to allow them to seriously research and cover scientific issues would have a very high impact.
- science enters many other programmes in general news, news features, cultural programmes, etc; identifying and monitoring the presence of science topics in such programmes at European level would be interesting.

Arising from its research over two years, AVSA considers that political institutions concerned with science broadcasting as a means to facilitate greater public engagement with science need to shift their perspective from a largely science-centric one, as at present, to more media-centric and audience-centric views. This implies taking fuller account of the constraints of media production, of the established expertise of broadcasting organisations and of individual programme-makers in making programmes that attract and sustain audience interest, and of audience needs and interests as reflected in patterns of media consumption. It does not imply a case for populist programme-making, and even less a case for devoting all efforts to mass entertainment. Rather, it represents a case for recognising the validity of various programme formats matching various audience needs and interests.

As has been seen above, policy proposals in this area have tended to focus on the relations between the institutions of science and media organisations and professionals. In our proposals, based on the interpretation of findings from several aspects of the AVSA project, we focus more on the relations between different categories of media professionals, including science specialists, and between media producers and their audiences.

In considering the coverage of science by the audio-visual media, we regard it as restrictive and reductionist to concentrate on a hoped-for outcome in terms of scientific literacy or public confidence in science. As the AVSA focus groups indicate, media audiences derive various uses and gratifications from science programming, including many that are pleasure-oriented. Media producers aim to meet these various needs through various formats.

Based on these general principles and recognising the diversity of production and reception conditions for science programming in radio and television across the European Union, the AVSA project proposes the following actions for consideration by broadcasters, the European Broadcasting Union, national governments and the European Commission.

Broadcasting organisations should

1. improve their collection and analysis of audience data, particularly qualitative data, on audience responses to particular programme segments and items; ensure timely dissemination of these data to programme-makers and facilitate discussion of this information with relevant parties
2. recognise the contribution to their organisations of programme-makers and other media professionals with a specialist interest and capacity in monitoring and reporting current developments in science; protect and support that capacity as an important resource for the organisations in times of increasing impacts of science on society
3. explore further the opportunities to include science content in various programme formats; promote such opportunities by integrating more effectively science specialists into news, magazine, chat, current affairs, business, drama and other programme genres as advisers on science-based issues and/or as direct contributors; promote interactions between science specialists and others on issues such as integrating science content into news reporting and making edutainment science-based programmes more relevant
4. develop further the use of web-based media, including 'social media', as means to enhance public participation in science-based programmes and the topics they cover; explore and develop further other means of public participation, e.g. 'citizen science' projects, encouraging audience ideas and questions as the basis of programme items, organising face-to-face public events and facilitating audience members to perform experiments online.

The European Broadcasting Union should

5. further incentivise innovation in science-based programming through targeted programme development funding, commissioning of science-related series in innovative and diverse formats, encouragement of co-production of such series and staging of programme competitions in science-related fields
6. promote forms of audience data collection and wider access to audience data in order to support responsive programme-making more fully across the EBU membership

National governments and the European Commission should

7. recognise the particular contribution of public service broadcasting to the development of science-based programming and protect the autonomy of public service broadcasters to develop such programming further; recognise that increased difficulties for public service broadcasting represent increased difficulties also for science programming
8. encourage innovative science programming in diverse formats for diverse audiences through targeted programme development funding schemes
9. defend and promote the independence of media professionals, e.g. in making judgements of the newsworthiness and merit of developments in science
10. acknowledge the value of many forms of public engagement with science, including critical engagement with the ethical and other social aspects of science, and avoid constraining broadcasting organisations with demands for science programming to meet political needs for boosting support for science

The European Commission should

11. highlight to EU-funded researchers the opportunities and challenges of radio and television and audio-visual communication as valuable means to disseminate scientific research; support researchers in facing those opportunities and challenges through training schemes, developing relations with broadcasting organisations and contracting production companies to prepare audio-visual packages
12. establish targeted media funding programmes to support in-service training of non specialised programme-makers on the use of scientific sources and expertise and to support the development of new concepts targeting at linking scientific expertise with societally relevant subject matters
13. promote and support mechanisms for ongoing interactions across the EU between broadcasting organisations, media professionals of all media, media researchers and independent audio-visual producers and other freelancers and communication consultancies (SMEs) that could address issues raised in this report as well as other issues; such mechanisms could include occasional meetings, an online forum and an independent online publication for the professional communities, which observes and reflects upon recent trends in science reporting across national borders.

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