

Dialogue in cyberspace

By *Gert Balling and Lone Frank*

Abstract

In recent years Café Scientifique in Denmark has demonstrated that direct contact between researchers and the broad population is a most rewarding platform for communication and that it is effective for groups of up to 100 people at a time. In this chapter we will present the thinking behind Café Scientifique and outline a possible extension in a virtual dimension using new CERN-computer technology. This will allow thousands of people to take part simultaneously in interactive and engaging discussions of the technological, economic, social, ethical and design-based potential of, say, biotechnology. These interactive grid cafes will host many parallel discussion fora which, depending on whether they originated in, for example, Copenhagen or Singapore, will place different emphases, based on cultural differences, on the various aspects. In the first place, new viewpoints, and possibly new frameworks for understanding, can thus be introduced into the linguistically limited debates within nations. Secondly, we might expect the public discussion about science and new technology to be opened up to a wider audience leading to a greater focus on the larger societal and cultural contexts, and that it will ultimately also become more global, and less local and lead to participation by a broad section of the population.

Introduction: Dialogue in cyberspace

"We need to engage the public in a more open and honest bi-directional dialogue about science and technology and their products, including not only their benefits but also their limits, perils, and pitfalls. We need to respect the public's perspective and concerns even when we do not fully share them, and we need to develop a partnership that can respond to them."

Alan I Leshner wrote these words in an editorial in the periodical *Science* in February 2003.¹ He wished to shift the discussion between researchers and the people away from the realm of monologue to that of dialogue. But can this be done? And if so, how? In this chapter, we offer a practical suggestion for establishing a wide-reaching and engaging dialogue by means of existing technology, some elbow-grease and a modest financial contribution.

There has long been a focus on communicating research to the population, caused not least by the discussion of modern biotechnology – in particular, gene technology. There is an ongoing and heated debate about gene-modified foods as well as cloning and research into stem cells from human beings, and if we look aside from nuclear power, gene technology may well be the technology that causes the greatest resistance amongst lay people. We have heard time and time again from researchers and research institutions that widespread scepticism is due to ordinary people lacking knowledge about these technologies. The assumption has been that people only had to be introduced to the opportunities and the potential of technology in order to give up their resistance to the inevitable.

The kind of communication method so far attempted seems largely to have been the good, old-fashioned syringe theory, which 'injects' knowledge. Here the knowledge injected, or the information given to the recipient equals the knowledge absorbed by

this person, the motto being "Call again, when you've learned something and we'll talk". This injection model, based as it is on one-way communication, fits into a hierarchical society where knowledge is passed downwards in the hierarchy. The focus now is slowly shifting from monologue to *dialogue*. The dialogue model takes the perceptions, expectations, fears and concerns of the broad population as its starting-point. The raising of people's knowledge is not its primary purpose but is a significant bi-product of using their own perceptions as a base. It is a model which corresponds better with the anti-elitist ideal of mass democracy.

The ensuing dialogue should not be regarded merely as a natural respect for democracy and for the population, who, will ultimately be paying for the research. Viewed in an overall societal perspective, the dialogue is also necessary for the sake of science itself. The public's attitude towards a given technology, regardless of the basis for this attitude, will be a contributing cause of prioritising or re-prioritising research initiatives. The controversy about research funds for European plant biotechnology is an example of this influence. In the aftermath of heated popular opposition against gene-modified plants and foods, both the EU and a number of member nations have reduced public funding for plant research for some years. This has not only caused research to shrink but also meant that much of the plant-orientated biotechnological industry has left Europe. Yet another example of public influence is the difficulty the natural sciences have in *branding* themselves. For several years the natural sciences in most of Europe have had difficulty attracting sufficient talent. A poor public image must undoubtedly carry much of the blame.

If we take a look around us there is no shortage of communication about research. During recent years the printed as well as the electronic media have raised the priority of research in the natural sciences, which now has its own TV programmes as well as dedicated Sunday supplements. Dialogue, on the other hand, is in short supply. We lack fora where non-experts can come into direct contact with the scientists. These fora would provide an opportunity to test one's prejudices, ask the questions that arise from the general stream of information and gain insight into not just research, but also the researchers and their conditions.

The meeting between 'people and researchers' is at the core of the Café Scientifique concept. This has resulted in hundreds of Café Scientifiques throughout most of the world, where ordinary citizens meet scientists face to face in a dialogue on science and new technology. In Copenhagen, they have taken place since 2001. Our experience indicates that dialogue about new technology and science becomes meaningful to the participants when it is placed in a larger framework that includes social, cultural, artistic, political and economic dimensions. Quite often, the discussion starts with the myths and fictions that surround science and it is obvious that the dialogue spurs a confrontation with many ill-conceived ideas thus paving the way for a debate on a more realistic basis. Naturally, the individual events take place in a micro-format as the physical framework typically allows for between fifty to a hundred participants. We suggest that the format be electronically 'upgraded', so to speak. In actual terms, we envisage a widening of the potential of Café Scientifique by adding a virtual dimension to the well-known physical structure. With software developed and made available by CERN, Café Scientifiques around the world can be connected directly to one another, thus not only multiplying the user groups but also

enabling debates on biotechnology to take place across national borders as well as cultures.

From fiction to ‘facts’

As a result of the growing focus on research, the Ministry of Science, Technology and Innovation established a think tank *Tænketank vedrørende forståelse for Forskning* (*Think Tank concerning the understanding of research*), in 2003. In its 2004 report *Forsk og fortæl* (*Research and tell*) the think tank concludes that there is a large and growing interest in research and that television is the most important transmitter of information about it. This conclusion is based largely on a previous report from *Analyseinstituttet for Forskning* (*The Danish Institute for Studies in Research and Research Policy*), which examined the Danes’ interest in research and their sources of information in 2000 and in which as many as 94 % gave television as their main source. The interviewees were not asked however *which* programmes their information and knowledge came from. Was it from news and debate programmes or was it perhaps rather from soap operas and science fiction films?

This question is not as unreasonable as it may appear. Over the years several researchers have pointed out that fiction plays a considerable role in the shaping of lay people’s perceptions of science. In 1987 George Gerbner claimed in the influential article ‘*Science on television: how it affects public conceptions*’² that scientific communication is influenced by television as a mass information channel. It is not merely television per se, but especially TV-transmitted fiction, which appears to act as a communicative prism when it comes to a perception of science and new technology in the general public. In the 1990s this idea was carried further by the German science sociologist, Peter Weingart, who organised research into ‘Hollywood science’ at the University of Bielefeld.

According to Weingart and the Australian chemist and man of letters, Rosslyn D Haynes, Hollywood creates a distorted image of science and scientists. An examination of the classic Hollywood science fiction films shows that 96 % of the scientists portrayed are white, while 82 % are male. In 60 % of these cases, these white men are working on dangerous experiments. More than half of these experiments go wrong and in almost one out of three instances the experiments lead directly to Armageddon.³ To put it crudely, scientific research in this fictitious world is an obscure activity carried out by mad, greedy and vicious researchers, all of whom are male. One can of course argue that science fiction has never been successful by trying to reflect real or actual scientific issues and so there is nothing dubious about this misrepresentation. It is, nevertheless, interesting to note how difficult it can be to separate fiction from reality.

“Scientists were mad, obviously. Or evil. Or godless, immoral, arrogant, impersonal and inhuman. In the best instance, they had good intentions but were blind towards the dangerous forces, which they could barely manage. They were Faust and Frankenstein, Jekyll, Moreau, Caligari and Strangelove – scientists on film and in fiction, cultural archetypes.”⁴

In the quote above, Haynes uses as a point of departure the research that was first carried out by the anthropologist Margaret Mead and Rhoda Métraux in 1957. They examined schoolchildren’s views on researchers in the USA and found that the children had an

“overwhelmingly negative” attitude to becoming natural science researchers themselves as well as to becoming married to one. In 1975 the periodicals *New Scientist* and *New Society* launched investigations into their readers’ attitudes to scientists. Here it appeared that scientists saw themselves as “generally approachable, socially open, unconventional, socially responsible, and popular, with broad interests; while non-scientists generally saw them as the opposite”.⁵ According to Haynes, nothing has changed since then and several more recent studies have pointed in the same direction.

We can enjoy the demonisation of science and its people on film when it appears in the shape of amusing characters such as Dr Frankenstein, Dr Caligari, Dr Moreau, Dr Jekyll and Dr Strangelove. However, according to Rosslyn Haynes this demonisation has a way of spreading into the media’s coverage of scientific topics. A most obvious example is the sharp and rather effective ‘frankenfood campaign’ which certain English papers have been running against gene-modified food. There are of course examples of excellent coverage of science in the media yet it is a notoriously difficult subject to handle for a daily press which likes to tell stories with clear messages and which is often given to sensational presentations of the stories. The so-called Monarch butterfly scandal was a good example of how difficult it is to deal with the scientific method and its inevitable uncertainty. In 2000 American researchers conducted a series of laboratory tests where they fed pollen from gene-modified rapeseed to Monarch butterfly larva. The larva died from the treatment and most of the world’s media seized the opportunity to make the most of the story – writing that gene-modified rape in the fields would lead to the extinction of the Monarch butterfly. These results were quickly refuted by other scientists who proved that there was no risk of extinction. The correction was hardly mentioned.

The Café Scientifique

At present, there are a hundred Café Scientifiques around the world based on the British, French and Danish models, all working towards the creation of a dialogue between experts and an interested audience in an environment free of prejudice and using a civilised tone. The framework for these exchanges is neutral, but a specific set of ground rules exists to determine the roles of the experts as well as that of the audience. This, however, will not be explored in greater detail here.⁶ The discussions take place in a café, thereby creating an untraditional and intimate setting in a relaxed atmosphere where everybody can feel at home.

Whereas the British and French models largely focus on well-defined natural science topics, the Danish model is more cross-disciplinary. Typically, this is apparent in the broad composition of the expert panel which includes participants not merely from the world of natural science and technology but also from the social sciences, from the humanities and from art and culture. A good example of this cross-disciplinary approach is a Café Scientifique event such as: *Fremtidens design med nye smarte materialer (Future design with smart new materials)* where innovation researcher Torben Lenau from the Technical University of Denmark (DTU) took part in a panel discussion with the highly experimental designer, Alex Soza. We can also mention *Nye muligheder og etiske udfordringer i nanoteknologien (New opportunities and ethical challenges in nanotechnology)*. Here, Lene Lange, chief-of-research at Novozymes’ R & D, and Professor Thomas Bjørnholm of the Nano Science Centre, met a critical philosophy class from a sixth form college, Skanderborg Amtsgymnasium, who were invited to discuss global responsibility viewed from a micro perspective. In *Science møder fiction i rummet (Science meets fiction in space)*, the debate focused on the reciprocal inspiration between fiction and space travel. Here, the panel consisted of an editor of a science fiction periodical, Klaus Æ. Mogensen, and engineer Flemming Hansen, Technology Manager at Dansk Rumforskningsinstitut (*The Danish Astronautical Society*).

Café Scientifique is intended to bridge the gap between techno-science and society. On the one hand, Café Scientifique helps provide a more natural position for techno-science vis-à-vis society and culture. On the other hand, it helps make social and cultural issues a more natural part of techno-scientific practice. This is all happening in a conversation-based environment, where the audience actively takes part in setting the agenda as equal partners.

The Café Scientifique format has been successful. After some years of events in Copenhagen, a sister café was set up in Aarhus in 2004 and in the same year Danish science journalists awarded Café Scientifique their *Genius Prize* for its science communication. Since then the Danish Café Scientifique has been awarded the Sven Bergsøe-Foundation's prize for communication 2006 and has been nominated by the European Commission for the Descartes Prize for the most innovative science communication in 2007. So far, so good. However, Café Scientifique still has the inherent problem of its small format or, as Francois Grey, the former Vice President for the Centre for Micro Electronics (Mikroelektronik-Centeret) also known as MIC, at the Technical University of Denmark put it:

“If one should criticize Café Scientifique, one would have to say that it reaches far too few people. Even when the room is completely full and it often is – there are only about a hundred people present. Is not this far too little compared with an exhibition or a televised event? It is a question of quality versus quantity. Two-way communication is not possible between a thousand or a million people at a time.”⁷

This challenge was addressed at the CERN *Open lab student programme* in the summer of 2004 when a virtual dimension of the Café Scientifique concept was outlined in close cooperation with the Danish Café Scientifique. The idea was to use available technological resources and, through new platforms, make it possible to maintain dialogue, engagement and intimacy while dramatically increasing the numbers of participants. The outcome of the discussion was the idea of a global Café Scientifique network, based on an alternative use of the CERN grid technology. Here, this is presented with the working title of *The Grid Café*.⁸

The Grid Café

To the vast majority of us the Internet is merely a tool for communication or for searching for specific information. *The Grid*, on the other hand, is a means by which to share one's computer capacity and storage via the Internet. For instance, a calculation task can be started by having all computers in a grid use their free capacity to help to process data. This will not delay the work but will in fact use the computer's capacity to the full.

At CERN the grid development corresponds with the wish to build the world's largest scientific instrument: the Large Hadron Collider (LHC). In 2007 this experiment will produce data equivalent to one gigabyte of data per second. For this reason, CERN and its partners have set up an LCG (LHC Computing Grid Project) in order to process the enormous amounts of data. The grid consists of clusters of computers at research institutions in CERN's member countries, but CERN *Open lab on data grid applications* has demonstrated that LHC can be extended to a heterogeneous computer environment, which means that quite ordinary individual computers can be connected to a grid.

The Grid Café project is an extension of the Café Scientifique concept with a virtual dimension. By connecting their computers to a grid, ordinary users can benefit from the shared processing and storage capacity which is freed up, thereby making possible a considerable interactive flow of communication with pictures, sound, and of course text. In the following, we will give a short description of how we envisage the relationship between a real Café Scientifique (the main Café Scientifique) and the virtual Café Scientifiques

developing, and we will outline some of the features which will be available through the latter. In order to demonstrate the scope of the project, we have used a biotechnology scenario. Here, a main Café Scientifique is set up in Copenhagen together with a real time parallel virtual Café Scientifique connected from Singapore. The technical details have been presented to two experts, Christian Sørtrup, who is working on grid-linking software at Public Resource Computing at CERN *Open lab on data grid applications*, and the Finnish programmer, Antti Kalervo Pirinen, who previously worked in the same place. They have both confirmed that the technical requirements exist and that programming of the software for this project (both the software for the main part as well as that for downloading on to the users' individual computers) exists or is relatively easy to create.

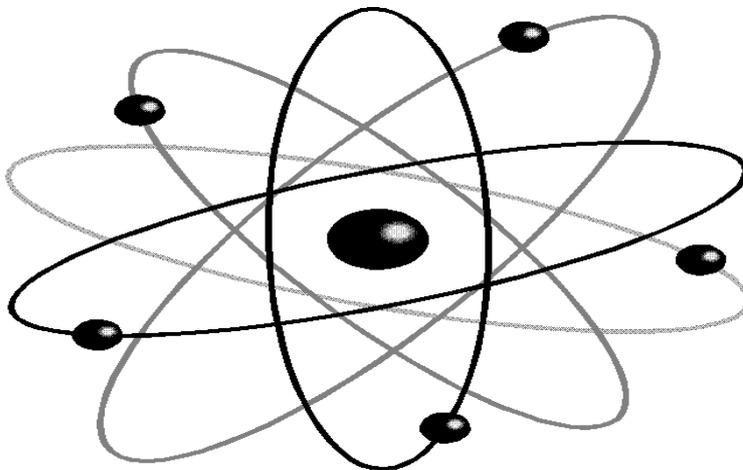


Fig. 1. The atomic nucleus can serve as a graphic illustration of the relationship between the main Café Scientifique – the atomic nucleus – and the virtual Café Scientifiques, which are electrons in orbit.

The Main Café Scientifique

The scenario envisages a Café Scientifique event in its usual format – here referred to as the main Café Scientifique. It can be compared to an atomic nucleus. The main Café Scientifique is recorded both visually and aurally and is converted to text through voice text software.⁹ This then forms the basis for all the virtual cafés which each orbit in their own path just as electrons orbit around the atomic nucleus. All Café Scientifiques are part of a whole but while the virtual cafés depend on the presence of the main Café Scientifique, the main Café Scientifique does not depend on the virtual cafés.

The Virtual Café Scientifiques

Through contacts to universities or Café Scientifiques across the world, a network of volunteers is established. This will typically consist of enthusiastic students or existing founders of Café Scientifiques. Their most important preparatory task is to put together, for their virtual Café Scientifique, a local panel of experts and moderators based on the expert panel in the main Café Scientifique. The volunteers must ensure that the three experts or moderators have access to computers with the appropriate hardware and software, either as a

group or individually. Likewise, they must be instructed on the format of a Café Scientifique and on how to create a successful dialogue with the users who will hook up. The main Café Scientifique will always take place in English, whereas the virtual Café Scientifiques will take place in the local language. It is hoped that interested parties will always be able to log on to a discussion in their mother tongue, or, at the very least, in a widely-used language such as English, German, French, Spanish, Portuguese, Italian, Russian or Chinese. This will create the best basis for encouraging the broad population to take part in the debate.

Anybody can hook up to the discussion. All it needs is a computer with broadband, camera and microphone or access to a local Internet café library or university. Potential users will have to send an e-mail in order to receive a password and access to download the necessary software. The software will unzip itself onto the computer's hard disk so no particular knowledge is required to prepare the computer.

The user can follow the transmission from the main Café Scientifique on the screen with or without sound. Under the live picture there is a simultaneous transcription of what is being said. It is therefore possible to choose to listen to the main Café Scientifique or to remove the sound and just let the text run underneath the picture. The latter will be necessary if the user is actually sitting in a virtual Café Scientifique taking part in the debate. In this text we have made a conscious decision to avoid more technical and IT-orientated descriptions of a possible system but interested readers are welcome to contact the authors for more detail. The fact that many users from different countries are being connected simultaneously to the virtual Café Scientifiques and selecting a virtual room according to their linguistic preferences, will create some intimate debate fora. At the same time it will provide a shared experience of taking part in a large event which cuts across geographical as well as cultural boundaries.

A scenario

There is hardly any technology which causes as much debate as modern biotechnology. Since artificial insemination became possible in the late 1970s, regular discussions about the application of biotechnology have arisen. Some obvious examples are genetic diagnostics (whether foetal diagnostics or general diagnosis of illness) gene-modified organisms, cloning and stem cells. Typically, the debate focuses on the ethical aspects: when is it ethically justifiable to allow the use of the technology? It is equally typical that the discussion is rather narrow in scope. Thus, biotechnology is very rarely discussed in the broader context of the correspondence between technology and the science behind it, and society and culture. There is no doubt, however, that views on biotechnology are strongly influenced by precisely the cultural context in which the technology exists. We see the linking of parallel Café Scientifiques (the main Café Scientifique and the virtual Café Scientifiques) as a unique way to clarify and include the cultural aspect. On the one hand, a set up of this kind will illustrate in a very direct manner *how* viewpoints and concerns differ and, on the other hand, will allow us to explore *why* the differences exist.

The differences between two geographically separate Café Scientifiques will be initially apparent from the emphasis placed by the panels on the various aspects of the topics for discussion. The overall topic will be the same but there may be aspects which will be emphasised by people in one context, but which people in a different context may not find relevant at all. Similarly, questions and comments from the audience will show what is important and what does not trigger curiosity, indignation or interest.

We can illustrate this point by outlining a hypothetical main Café Scientifique and a parallel virtual Café Scientifique where the overall topic is cloning. Let's imagine a main Café Scientifique in Copenhagen and a virtual Café Scientifique connected in Singapore. The composition of the two panels will be the same as regards professional expertise, for instance

a biotechnological scientist, a theologian and a science sociologist. The biotechnologists will contribute a concrete insight into cloning technology while the theologians will each have a background in the religious tradition of their respective countries. In other words, they can discuss cloning from the perspectives of Buddhism and Christianity. Finally, there is the science sociologist who can provide an insight into how popular beliefs about cloning are inspired or influenced by fiction and the media, and show the effects they have on the public's attitude to cloning.

The main Café Scientifique: the Danish attitude to natural

A classic Café Scientifique will take its point of departure from the questions identified as being the most central by the panellists in a preliminary discussion. Therefore, in Copenhagen the debate will begin with the relationship between cloning and the idea of what is natural. Is cloning unnatural? What happens if we move the boundaries between the man-made and the natural? Is the man-made sufficient? This is an approach that has been prominent in the Danish debate about cloning.

Ever since the birth in 1996 of Dolly, the first ever cloned sheep, cloning has been on the agenda, and in Denmark the discussion has been characterised by strong opposition. The idea of cloning humans has been met with outright objections from all sides since it is regarded as being fundamentally wrong and has been described as “inhuman” and “offensive to the dignity of the human being”. Human cloning per se has not been a subject for discussion as nobody has argued that it could or should be allowed. When it comes to the cloning of animals, there is disagreement. A temporary parliamentary agenda allows scientific researchers to clone animal foetuses and insert them in surrogate mothers, but forbids the clones to be born. Denmark has no actual legislation in this field but a number of Danish researchers have been pressing for a law that allows the cloning of animals. Politicians as well as the public are divided on this question. One group regards the cloning of animals as a fantastic tool for the improvement of animal husbandry and the breeding of cloned and gene-modified animals for the production of medical proteins. The other group does not care for this technology. As with human cloning, the idea of what is natural plays a role. One of the very frequent practical arguments is that a large proportion of the animal clones that see the light of day have malformations of one kind or other. Therapeutic cloning is a third variation on the topic. In therapeutic cloning, the cloned human embryo is used to isolate embryonic stem cells. The idea is that one can create new tissue for a patient by cloning a cell from the person in question, isolate the stem cells and cultivate tissue for the treatment. A foetus will in fact exist, though no living human being will result from this clone. Therapeutic cloning is forbidden according to Danish law. The prevalent argument against such technology has been that it reduces human life to a means. Many people believe that it is wrong to create a potential human life with the purpose of destroying it in order to use it for spare parts.

In the Danish context the audience sticks to a discussion of the grounds for the argument of what is natural. In other words, what does “natural” mean? Biologists may argue that cloning happens in nature anyway, as identical twins, triplets and so on are clones. It is also obvious that not very many human activities in the modern world are natural if one applies a pre-scientific definition. In this way, one soon reaches the conclusion that modern man is a creature wrapped up in a finely woven tissue of technologies, and yet we still possess a vivid and strong belief that the natural is good whereas the unnatural is undesirable or dangerous. The question is whether technologies such as cloning challenge this belief, for the simple reason that we see that clones do not differ from animals (or humans) that have entered the world in the 'natural' way?

One discussion that evolves from the argument of what is natural is how biotechnology influences our ideas of the nature of “life” and what life can be used for. Concerned members

of the audience draw on various examples from films, where cloning is often presented as anything but respectable research, in order to emphasize their points. Here, on the one hand, the science sociologist could demystify the perception of science by demonstrating how far from the scientific approach the premise in films such as *The 6th Day* starring Arnold Schwarzenegger is. On the other hand though, she could mention several films that have served as inspiration for future international scientists. She may repeat the differing perceptions of “life” from the introductory presentations in the café: there are those, she may claim, who see life as a resource, an outlook where the use of cost-benefit analysis and the like are obvious tools to use when evaluating the feasibility of developing a certain technology. Others, on the other hand, regard life as something sacred.

The discussion will thus often begin with culturally based perceptions of cloning but by demystification the debate can be lifted to a more nuanced level.

The virtual Café Scientifique: pragmatic Singapore

In the virtual Café Scientifique, connected in Singapore, the cloning debate takes a slightly different course to that in Copenhagen. The idea of what is natural is not at the centre. Instead, the interest is centred on usability and its limitations.

Cloning of human beings is in fact forbidden in Singapore, and the official explanation is in line with the prevalent international opinion: cloning of humans offends human dignity. Nevertheless, attitudes to human cloning are a lot more varied than they are in Denmark. This is apparent not least in a survey carried out amongst college students who had taken part in a bio camp, where they received lessons in life sciences. The students were asked what they thought about cloning of humans and asked to draw up a list of its potential advantages and disadvantages. Initially, the students did not think that cloning of humans should be allowed. They were though in favour of cloning in the case of lost relatives, Nobel Prize winners and 'good' leaders, and they saw a number of potential advantages in human cloning. In their view the fact that cloning can create a race of superhumans or an army of particularly aggressive soldiers and can make it possible to bring outstanding human beings back to life was a desirable thing. One can hardly imagine finding these attitudes in a Danish audience in anything other than a horror scenario. A local science sociologist could present examples of Asian cultural expressions regarding new technology and science showing that these are indeed very different from the ideas we hold in the west. Reservations here are not so marked – on the contrary in fact.

Singapore has very liberal legislation regarding research into stem cells and the country has opened up to therapeutic cloning. In this connection the national bio-ethical committee has held consultations with ethnic and religious groups and they have concluded that the embryo has a kind of 'intermediate status'. It is not merely a lump of cells but neither is it a human being. Therefore it can be used as 'a means'. The dominant religion in Singapore is Buddhism and the discussion in the country has thus taken place largely on Buddhist terms. On an overall level, one can say that their stance is 'relativistic'. When it comes to evaluating a given biotechnological application, the judgment depends on the specific context. Thus, the Buddhists ask: is the purpose of therapeutic cloning to do good or to do evil? And they conclude that if one destroys embryos in order to save the living, then it can be accepted.

Conclusion

The interesting point about the parallel Café Scientifiques is that, for little money, and with the same point of departure for the discussion, very different debates can develop - involving thousands of citizens. The differences between the individual virtual Café Scientifiques will become apparent to everybody and will make the participants aware that their own attitudes

are to a large extent shaped by cultural context and society. This is an eye-opener that will be apparent in the difference between the main Café Scientifique and the individual virtual Café Scientifiques, seen directly on the screen by all users of the virtual cafés. It will even be apparent on a larger scale, as a main Café Scientifique can be freely downloaded once the session has ended as can all the virtual Café Scientifiques. Users can thus see how differently the individual debates developed, and become aware that their own attitudes are shaped by a cultural and social context.

In the first place, this will allow new viewpoints, and possibly new frameworks for understanding, to be introduced into the linguistically-limited debates within nations. Secondly, we might expect the public discussion about science and new technology to be opened up to a wider audience leading to a greater focus on the larger societal and cultural contexts, and that it will ultimately also become more global, and less local and lead to participation by a broad section of the population.

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Originally a trained biologist, Lone Frank is a science journalist with the newspaper, *Weekendavisen*. She holds a PhD in neurobiology and has worked, among other things, as a researcher in an American biotechnology company. Since 1997, she has exclusively concentrated her efforts on the communication of natural science. She has produced items for radio and television, written articles for a broad range of Danish and foreign newspapers and periodicals and published the debating book *Det nye liv*. In terms of topics, Ms Frank has focused particularly on modern biotechnology and our attitudes towards it. She has described the conquests of this technology and how its potential for manipulation of different forms of life is becoming one of the most significant cultural and intellectual challenges of our time.

¹ Leshner, Alan, I.: *Public Engagement with Science*. Science 2003, Vol. 299, p 977.

² Gerbner, George: *Science on television: How it affects Public Conceptions*, in Science and Technology, spring, 1987. Pages 109 – 115.

³ Weingart, Peter: *Von Menschenzüchtern, Weltbeherrschern und skrupellosen Genies – das Bild der Wissenschaft im Spielfilm* in Stehpan Iglhaut and Thomas Spring: *Science + Fiction* Jovis. Berlin, 2003. Page 218.

⁴ From the abstract of Haynes, Rosslyn: *Mad, Bad and Dangerous to Know. Why do scientists have such a bad press?* Conference paper.

⁵ Haynes, Rosslyn: *From Faust to Strangelove; Representations of the Scientist in Western Literature*. John Hopkins University Press. Baltimore, 1994. Pages 1 and 2.

⁶ For a more detailed treatment of the concept, see Balling, Gert & Emmanuelle Schuler: *The Science Café: Science, Art and Culture*. Hovedland, 2004.

⁷ Ibid. Page 9.

⁸ The Grid Café concept was started as an “educational website” (www.gridcafe.org). From the very beginning, people have speculated as to how a grid café could be distinguished from an ordinary web café. Here, the grid café is merged with the idea of the virtual Café Scientifique.

⁹ Translation of speech for text software is available in functional versions suitable for English speech.

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Illustrations

Fig. 1. A model of an atomic nucleus.
