Taking science to people

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Contents

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Foreword

Science communication is a practical activity undertaken by both individuals and organisations. It has always been a key aspect of the process of scientific investigation which in modern times is usually carried out by more or less competing teams working at a distance from each other on aspects of the same problem. In such circumstances clear and rapid communication of experimental results is crucial to the on-going process of discovery. It used to be the case that this communication took place between experts with similar training and backgrounds and a shared specialist language but the increasingly inter- and trans- disciplinary nature of research, particularly into complex problems, like climate change, means that this is now less often the case.
Communication of science by scientists to public audiences has a history traceable to the famous public demonstration lectures given by the likes of Faraday and Davy at the Royal Institution early in the 19th century. These events were designed, like the BBC, to entertain, educate and inform, as it might be argued, is much of the science communication activity of the present day. However the public's willingness to consume uncritically the wonders of science has diminished markedly since the times of the pioneer popularizers and this has meant that the funders of science are having to work hard to convince the public that the research they support will lead to positive social consequences.

All the above trends and circumstances have created a context for increased investment in taking science to the public and has led to an ever-increasing number of people working at the many interfaces between science and society. Many of these are active researchers, but they are being joined by considerable numbers of what are usually described as "science communicators". The first wave of this new breed of specialist communicator worked mainly as journalists within the mass media, but more recently they have begun to occupy roles that either involve them communicating science directly to the public or alternatively they are creating the contexts in which scientists have such live interactions.

This guide is designed to be of value to science communicators, scientists and indeed researchers in any field, seeking to engage a wider audience with their work and its social implications.

1. Introduction

1.1 Why communicate science to the public?

A minority of scientists have always sought to popularise science, but the elevation of science communication to the status of being a major component of many countries' strategies for building and sustaining strong, wealth generating science and technology sectors is a more recent development driven by:

1. The need for their workforces to be, at the very least science and technology literate, and preferably to have specific skills that will not only contribute to the generation of new knowledge but also to its conversion into marketable products. This latter outcome is seen as only being possible if researchers engage with the private sector;

2. The wish to ensure that their citizens have opportunities to have their say about the ways that science and technology are applied within their society;

3. The desire to reclaim science's place as a part of their main stream culture alongside, for example, the performing and figurative arts.

These three drivers do not have equal force across the world. For example, it could be argued that the first is the strongest driver of science communication activity in countries with an emerging science and technology sector like, at the time of writing, India and China. Whilst in Europe, although it's a strong driver of science communication, it exists in parallel with the second driver and has led to the commitment of significant resources to ensuring that citizens feel that there are effective means by which the applications of inventions created by the science and technology sector are regulated and that they have a voice in this process. The third reason is less motivating for countries but a strong driver for teachers and researchers who want their work to be valued by society.

Who wants to communicate science?

Science communication is not only practiced by individuals but also sponsored by several different kinds of organisation and institution. Each has their own mix of motives for investing their resources in this way and examining these provides another way of exploring why science is communicated, and can also be very useful when looking to gain their support for a particular initiative [see also Finding Funds]. Key players are:

Universities, who are major funders of science communication world-wide, even in countries that make no other kind of investment in taking science to their citizens. Their main motivator is the difficulty many have in recruiting students into science and engineering degree programmes.

Government Agencies who combine a concern to ensure the ability of their country to compete globally as a knowledge based economy with, in the developed world, a strong motivation to ensure that their citizens feel that they play a central role in deciding which science based innovations are appropriate for use in their society. This driver has increased in power since a number of innovations, like for example the use of genetically modified organisms in food production, were not accepted in some countries with a consequential impact on the companies that invested in developing them and knock on effects on national economies.

Funding agencies that distribute public money to researchers are principally interested in assuring support for their investment decisions and therefore have a strong reason for ensuring that the scientists they fund communicate the results of their research to the public as well as to their peers. They also need to convince their political masters that the work they fund will have a positive impact on the health of the economy

Businesses are mainly motivated by both their need to recruit skilled workers and, like government agencies, have a strong interest in ensuring that new technologies are accepted by the public. They also would very much like to encourage successful capitalisation of knowledge generated within Universities.

Learned societies and professional bodies are motivated by both the need to maintain the flow of new members into the discipline which they exist to promote and by wanting to ensure that the activities of their members are valued by wider society, an essential pre-requisite for attracting funds from the government.

It is not the case that all these players are active in any one country, although Universities are the most likely to be active globally and there is a definite trend for Government and Funding Agencies, which are often closely linked, to be more pro-active in seeking to ensure that research findings are disseminated to the public. However, it is the case that many scientists do not feel that they have the time, skills, and possibly most importantly the incentives to fulfil this role [see Survey of Factors affecting communication by scientists and engineers :Royal Society of London, June 2006] and this can offer job and funding opportunities to science communicators

1.3 Who are the Public?

The public are not a single homogeneous audience but many different audiences linked more or less closely to each other. Consequently, it is not possible to devise an initiative that is equally effective across all citizens and consequently science communication initiatives have to be tailored to match the characteristics of a specific audience.

A large numbers of ways can be used to segment the audience but by far the most common is by age, a practice that seems self-evident when working with children, since it is obvious that an activity that gets a specific message across to a five year old is unlikely to enthral a teenager. However, when working with audiences who have left formal education there is a tendency to assume that a single initiative will work for all, even though it is obviously unlikely that an activity designed for young adult males will be very attractive to female pensioners. Examples of other characteristics of individuals or groups, in addition to age and gender, that might define them as a distinct audience are; ethnicity; educational achievements; occupation; leisure interests; and marital status.
[see Audience Targeting]
The public audience can also be segmented on the basis of attitudes to science and technology. For example, Science and the Public a UK wide survey jointly commissioned by the Wellcome Trust and the Office of Science and Technology [OST] in 1999 asked questions designed to discover aspects of people's views. The results reveal an intriguing mixture of standpoints including:

Fascination: 75% of those questioned agreed with the statement

> "I am amazed by science"

Gratitude: 68% agreed that

> "Science and technology are making our lives healthier, easier and more comfortable"

Distrust: 70% agreed that:

> "Rules will not stop researchers doing what they want behind closed doors"

Ignorance and Indifference: 66% agreed that:

> "Science and technology is too specialised for most people to understand it"

An important finding of the survey was, as is demonstrated above, that any one individual can be both amazed by science and acknowledge its positive impact

on their quality of life whilst at the same time lacking trust in the regulatory processes relating to the conduct of scientists. Insights of this kind can be very useful for informing the process by which science is taken to the public. A further survey commissioned by the OST and conducted by MORI in 2004 included some of the earlier questions [see Appendix 3]

It revealed that the public's awareness of the significance of science and technology in their everyday lives had increased over the five year period, with increased numbers of them declaring that they see and hear too little about it and also an increase in the numbers declaring the importance of knowing about science's role in their daily lives. This could be used to argue that science communication had a big impact over the period, or that it had too little impact, leaving the public feeling under-informed

What does seem to be clear is that scientists have failed to increase the extent that the public think they are consulted over the period. Despite this being a major objective of the bodies that represent them at the science and society interface. It is also clear that the public's concerns about possible negative impacts of science on society and the ability of the UK government to control the situation were unchanged.

The overall picture, therefore, is that there are many publics and their attitudes to science and technology are subtle and complex. A very significant percent combine being both fascinated by scientific phenomena and the natural world with considerable distrust of the motives of scientists. It does not appear to be the case that greater knowledge of science equates to increases public sympathy for science and scientists as was pointed out by Jon Turney in "To know science is to love it" and little evidence to suggest that knowing the science behind say genetic engineering, re-assures the public that it will be responsibly applied in society.
Given what is now known it could be seen as surprising that a very substantial amount of the effort to communicate science is still focused on convincing people that science is amazing, something which the great majority already believe. However, the fact that so much of the communicating is done by Universities as part of recruitment activity may go some way to explaining this apparent paradox.

1.4 What is informal learning?

Science Education and Science Communication tend to exist in different professional compartments and not always harmoniously. It is relatively common for science communicators to see themselves as rescuing a situation that's been created by poor and uninspiring teaching, an attitude that understandably fails to endear them to teachers. However, it would be hard to dispute that both professions are involved in the business of providing learning opportunities. What

follows is a brief exploration of how people learn placed in the context of science communication.

Learning can be placed in three categories:

Cognitive, knowledge or understanding of what, how and why; and also the ability to bring together disparate pieces of knowledge to produce a coherent synthesis of them.

Psychomotor, skills that require physical co-ordination [like bicycle riding] or manipulative dexterity [like using a screwdriver]

Affective, attitudes, awareness, interest, involvement, motivation

Past work by science communicators in the developed world has generally been focused on cognitive learning.
However, in many countries, particularly those that have experienced diminished trust by the public in both science and scientists, the emphasis has shifted towards affective learning, since it is now the attitudes to science rather than the knowledge of it, which has become the core concern. The aim therefore is to move away from one way communication models and use two way models that reduce or eliminate the extent to which there is a sender and receiver relationship between the scientific community and the public.

For both communication models there is an oft quoted Chinese proverb that neatly sums up the relative effectiveness of different approaches to getting people to learn, it is:

I hear – I forget

I see – I remember

I do – I understand

As you can see the average ancient Chinese philosopher would not have been impressed by an invitation to a lecture, but might well have enjoyed themselves in a laboratory. More modern data, presented in the form of a learning pyramid would seem to suggest that they knew what they were talking about but it comes with a health warning provided by the National Training Laboratories who originally published it at some point in the 1960s who when asked recently, and persistently to produce the original research on which the pyramid was based responded in 2003 that:

"It [the Learning Pyramid] was developed and used by NTL Institute at our Bethel, Maine campus in the early sixties when we were still part of the National Education Association's Adult Education Division. Yes,

we believe it to be accurate--but no, we no longer have—nor can we find--the original research that supports the numbers".

In my mind this gives strong grounds to suspect that the pyramid is more the product of intuition than quantitative research. The insight being that not all learning experiences have the same long term impact on the learner, and that one way communication methods are likely to be less effective than two way methods, something which I learnt during my own professional journey from Bus Posters to dramas designed to trigger discussion, like Meet the Gene Machine.

I wish I had a pound for the times that I have encountered scientific organisations and institutions who believe that a series of mini-lectures is the ideal way of communicating their research to non-experts, and have been surprised by the less than enthusiastic response of their audiences.

In the context of the three categories of learning formal science education is often perceived as:

- focused principally on the cognitive domain
- dealing with a subject in isolation from its social and cultural context with knowledge being seen as an end in itself
- placing the learner as a passive spectator being stimulated by the teacher/trainer rather than an active participant
- treating learning as an attribute of individuals, rather than groups

[Source: Beckett and Hager 2002, Life, Work and Learning
London: Routledge]

In contrast to learning in informal environments, which is perceived as:

- placing the learning in a social or cultural context
- ensuring that activity and experience are key elements of the learning process
- creating links to other activities in a holistic way
- activated by individual learners, not by teachers/trainers
- collaborative /collegial rather than a solitary experience

Comparison of the two sets of characteristics produces criteria that could be used to determine the position of a particular learning activity along the formal to informal continuum these include:

- Teacher – learner relationship [Is the learner active or passive?]

- Extent of contextualisation
- Linkage to other activities or disciplines
- Collective or individual

It quickly becomes clear that it would be a gross over simplification to describe all science communication activity as informal and all science education activity as formal using these measures. For example, is working in groups on a project in a laboratory more formal than an individual listening to a scientific talk in their village hall?

However, there are other criteria that can be added to the list like the length of time for which the individual is exposed to the experience and the extent to which knowledge gain is measured, which are characteristics of science education that increase its formality.

It could be argued that the proponents of informal and formal learning have never been as far apart in practice as they have been in image. Indeed there is a continuing trend for them to join each other in a middle ground where the original champions of informal learning like Science Centres often split their staff into a team that interacts with schools in the context of the curriculum and a team that works with family groups and other types of visitor to give them open-ended experiences of science.

1.5 How does science reach the public?

Two main channels have been traditionally available to communicate science to people. The first has been events and initiatives within the community that take science directly to more or less targeted groups; the second has been through the mass media.

Science communication texts tend to focus more on communication of science through the media:

D.Nelkin; Selling Science, Freeman [1995]

E.Hancock; Ideas into words : mastering the craft of science writing, John Hopkins University Press [2003]
K.Baake; Metaphor and Knowledge ; the challenge of writing science, State University of New York Press [2003]

but useful texts also exist that include direct approaches to taking science to people:

S.M.Stocklmayer, M.M.Gore and C.Bryant; Science communication in theory and practice, Kluwer Academic [2001]
J.Gregory and S. Miller; Science in Public: Communication, Culture and Credibility, Perseus, [2000]

Before focusing on direct communication it is important to discuss the relative strengths and weaknesses of the two traditional channels.

A major strength of direct communication is that it provides an opportunity for the public to meet a scientist face-to-face rather than learn of their latest discovery through a media piece that often reveals no more about the scientist than their age and academic title. It could be argued that, given this treatment of science stories by the media, it is unsurprising that many members of the public do not think they have ever met a scientist and when children are asked to draw one they almost always produce a wild looking bespectacled man in a white coat. It can also be argued that creating circumstances under which the public can meet real scientists is important because it challenges a stereotype which is likely to increase people's fear of science itself being beyond their control.

A second strength is that it is easier to make two way communications between experts and non-experts a feature of public rather than media based interactions. In this context it is interesting to note that the most prestigious mass medium, television is, at the time of writing, the least interactive while the least prestigious, the internet, is the best suited for two way communication and used intensively to do so. In fact, it is rapidly becoming a third channel through which science is shared and discussed by individuals and communities.

However, it can be argued that direct communication has a number of disadvantages relative to mass media. The first is that the audience reach is much smaller. The second is that it is easy to waste resources devising events that are rarely repeated. And the third, that unless audiences are carefully identified and targeted events can end up being attended exclusively by people who are already very engaged with science and technology, and therefore arguably least in need of further input.

2. TIPS AND TECHNIQUES

2.1 Getting started

[Cautionary Tales: Biology for Bank Raiders; Musical Science; Cheltenham Festival]

The majority of science communicators are or have been research scientists and their first initiatives are frequently related to their place of work. In many cases, this will be the outreach activities of their University department or research institute and will involve events devised for children delivered either within their department or at local schools and colleges. The next step for many who start in this way is to find the financial support that will enable them to mount initiatives of the kind that cannot be easily justified as being linked directly to their department's needs, like for example those that target primary school age children or adults.

Suggested strategies for making this step could involve all or some of the following:

- Cultivate connections with science communicators with known track records and if possible work with them on a specific project even if you are giving your time for nothing.

- Join electronic news groups like psci-com [http://www.jiscmail.ac.uk/cgi-bin/webadmin], British Interactive Group (BIG) chat [http://www.big.uk.com/chat/index.htm] and International Network for Public Communication of Science and Technology (PCST) [http://mailmanlist.net/cgi-bin/mailman/listinfo/pcst] and use them to get advice and if appropriate to let the community know what you are doing.

- Attend meetings and conferences being sure to:

    - ask a question at the earliest possible opportunity so delegates can put a name to a face

    - carry professional looking business cards

    - network at the, glass in hand, mid and end of day gatherings

In addition to these moves designed to get yourself known within the science communication community, give priority to carrying out a small project of your own. The ideal project should have potential to grow either:

- linearly by scaling up to more venues and larger audiences

or

- laterally by developing parallel strands building on the same concept [see also How to Generate Ideas]

Most of the small grant schemes are run by:

- Scientific institutions,,like The Royal Society of London
- Learned Societies that represent a specific academic discipline, like The Institute of Physics
- Research Councils as represented by RCUK

Funds can also be extracted from:

- businesses, like Glaxo Smith Kline
- Universities, the most likely is the one local to you.
- charitable trusts like The Wellcome Trust, The Leverhulme Trust and The Gatsby Charitable Foundation

[For more detailed advice go to Finding Funds]

Assuming you do manage to separate someone from their money, you will, of course make delivering a great project your primary concern, but in the midst of the hurly burly of making it all happen remember to keep half an eye on the future by:

- Involving as many other practitioners as possible in what you are doing, possibly by having some kind of on-line advisory panel, and certainly by inviting them to launch parties and first performances where appropriate.
- Capturing as much evaluation data as possible about what did and did not work. This information will be the key to getting funding for the next project [see also Evaluation].

- Talking about the project at meetings and events, something you can do before it is completed.

- Keeping a project portfolio that includes all examples of materials you are generating, be they

    - interim reports

    - press releases and clippings

    - tapes/dvds of radio and TV coverage

    - photographs of the event

    - quotes from audience members

If it is your intention to become a full-time science communicator you need to be planning your next move before the final project report has been written.

It may be that you are already being offered jobs that provide you with an institutional base, but if you decide to remain independent, its time to identify a funding scheme or consultancy opportunities that will cover your living as well as project costs. Make the maximum use of all your contacts and evaluation data, and make the bids that will make your portfolio grow.

2.2 Devising a project

The starting point for most science communication projects is some kind of challenge, question or problem.

Like, for example:

How to communicate the centrality of science to everyday life to young adults
or
How to get more girls to consider engineering as a career

or
How to trigger discussion of the implications of advances in genetic screening for expectant mothers

What follows are a series of tips and techniques that may help you overcome some common challenges faced by science communicators in the development of projects.

2.2.1 Targeting Audiences

[Cautionary Tales: Science in the Fast lane; Science on the Buses [1996]; Pub Genius; Check Out Science at Tesco]

Science communication has always been targeted, principally at children.

So, for example the majority of the events for UK's National Science and Engineering Week are explicitly for that audience. Children are targeted because they:

- have long been seen as turning away from science, so a need for effort and expenditure can be demonstrated [see for example Physics in Schools and Universities: Patterns and Policies]
- are a much easier audience to recruit than adults [you contact their school or teacher]
- come in quanta [the class or bus load]
- can be neatly classified on the basis of their age and likely educational level
- are enthusiastic about most things [until they hit puberty]

All these reasons have made them one of two audiences of choice for science communication activity, the second being the professional classes who are more likely to be comfortable in academic venues, like Universities, and are also likely to have studied science to a reasonably advanced level.

Consequently science communicators have frequently been accused of preaching too much to the converted and there is no shortage of data to support this contention. An often quoted example being that the visitor profiles of Science Centres and Festivals which in the UK, and elsewhere in the developed world,

tend to be heavily skewed towards children and their above averagely educated parents.

What follows are annotated notes about approaches to targeting new audiences from around the world, which may be useful to you and are grouped under broad headings.

Role Models

Several types of initiative exist that seek to reach a specified target audience through use of positive role models of scientists including:

- the use of undergraduate and postgraduate students as tutors/ mentors working with pupils in schools which do not have a tradition of sending their students into higher education, a highly contagious initiative started as the Pimlico Project which became the UK-wide Science Ambassadors scheme.

- the selection of a group of young scientists of both genders who are young and funky for a mix of personal appearances and PR and media purposes mainly targeted at children, but also at those who influence them. Two examples are from the UK the EPSRC funded NOISE initiative and from Australia the Shell Questacon Science Circus

- the featuring within specific events or campaigns of celebrities with science degrees who are known to broad cross section of the public. A favourite is TV weather forecasters like Lisa Burke [UK] and also pop stars, like Alex James of Blur.

Targeting adults through children

Possibilities include:

- development of initiatives that offer opportunities for parents to learn about the science being taught to their children. The incentive being that they can then better support their child's learning at home.

- creation of schemes that encourage children who visit a science event or centre as part of a school group to return subsequently with their family

- featuring within science events of interactive experiences of science billed as being targeted at children but often also involving their parents and grandparents.

Involving people in “live” data gathering or processing

Examples include:

- the Breeding Birds Survey organised annually by the RSPB and the British Trust for Ornithology since 1994 which uses thousands of trained amateurs as its data gatherers.

- the Search for Extra-terrestial Intelligence project involving computer operators in using their equipment to analyse cosmic radio traffic.

- mass experiments like those devised by Richard Wiseman for broadcasting in the UK by the now defunct Tomorrows World. Topics included, criminal stereotypes, eyewitness testimony and suggestion, and memory. These Megalabs were broadcast to coincide with National Science Week.

The Mobile Laboratory

A contagious idea which has been realised in many parts of the world: examples include:

the Institute of Physic’s [UK] Lab in a Lorry project initiated in 2005 during Einstein year and involving three different specially equipped Pantechnicon scale lorries trundling to virtually every part of the country

the Indian Science Jahtas initiative that involves groups of artists, scientists and students taking small travelling shows into rural communities.

the Chemistry Dept of the University of Edinburgh’s award winning Chemical Connection taking chemistry around Scotland.

and, once again, the Shell Questacon Science Circus

Responding to the needs or concerns of a local community

An approach that builds on the observation that a personal or local angle can turn a non-scientist into an expert in a particular field like, say, leukemia clusters. An initiative of this type is Science Shops invented by the Dutch in the 1960s and now found in many parts of the world, their general mission is to "*provide(s) independent, participatory research support in response to concerns experienced by civil society".* and they vary considerably in how they operate, some having "real" premises while others appear to work as virtual clearing houses based at a University and offering student and staff expertise to the community at no or low cost.

Partnering science with the arts

An example is what has become known as SciArt which has been extensively promoted and were until 2006 supported in the UK by the Wellcome Trust and NESTA and the Calouste Gulbenkian Foundation

Reasons for this include:

- an expectation that you are targeting people who, for example, would use their leisure time to visit an art gallery or watch a play but not to go to a science centre
- a view that figurative and performance art can do more than just sweeten the science pill, they can actually provide a cultural and emotional context for science which has been eroded by its professionalisation.

Linking science to everyday activities

Examples of such activities include:

Cooking, whose links with science have been the subject of many books and TV programmes, popular examples include :

- On Food and Cooking: The Science and Lore of the Kitchen, Harold McGee, Scrivner, 2004
- The Science of Cooking: Peter Barham, Springer- Verlag 2001
- Science Experiments You Can Eat: Vikki Cobb and David Cain, Harper Collins, 1994
- Kitchen Science [Discovery]

- Science of Cooking [BBC]

Drinking, the subject of events like Pub Genius and also demonstration lectures at events, as well as books and articles about the science of wine and beer.

Other topics that regularly get the Science of…… treatment include sex and sport

Broadening the interests of topic enthusiasts

Individuals with a narrow but intense interest in one aspect of science and technology are often the target of publicity by event organisers, particularly when they need bait to get, for example, a robotics enthusiast or a dinosaur lover to visit a Science Centre or Science Festival. However, the usefulness of this approach in getting the specialist to broaden their interest in science has not been directly evaluated, although it would have to appear likely in at least a minority of instances.

Use of public places as venues

The hardest of all audiences to target are those who rarely leave their immediate neighbourhood to attend events and have a low level of interest in science and technology. To be successful in targeting them you need to devise and run entertaining and informative events in venues that your audience visit and spend significant amounts of time as part of their everyday routine. Places where they feel comfortable and relaxed.

Such venues are present in almost any centre of population in the developed and developing world. Examples from European culture include bars/pubs, supermarkets, shopping malls and motorway service stations.

It is important that the activities designed for a particular venue type fit the public's expectations of what they might encounter there.

Factors to consider in choosing a particular venue are:

- Significant dwell times – Members of the audience have to be in the venue long enough to get involved in the proposed activity. If your audience is in a rush you may annoy them if you attempt to distract them.
- Sufficient space appropriately laid out – Don't try to perform your activity in a cramped location or a long distance from your audience
- Good relationships with the managers/owners of the space. This can be crucial if, as will sometimes happen, you need assistance during the

event. It's worth investing the time to visit the venue in advance and get to know the staff.

2.2.2 Getting noticed in crowded spaces

[Cautionary Tales: Selling Science; Pub Genius; Check Out Science at Tesco; Science in the Fast Lane]

Many opportunities to take science to the public involve events at which you will be one of a considerable number of exhibitors/stall holders jostling for the visitor's attention.

Some tips that may help get you noticed are:

- If you are given a choice, choose a "pitch" that is close to the entrance to the exhibition hall or generic venue. This will mean that you can't be missed by potential audience members. If you do end up in a corner and suspect it will be little visited, find some way of drawing attention to yourselves. Using some members of the team as human signposts can be quite effective, but they need to be distinctively dressed or equipped, and that requires advance planning.

- Even if ideally placed, you will need some kind of attractor that works close to the visitor. A simple demonstration is often very effective in this role, ideally something intriguing that the visitor can learn to do in real time [like how to stick skewers into balloons without bursting them, twenty of these can be found at Physics to Go].

- Your display needs to be visible or audible from a significant distance.

- Plan the distribution of activities within the space so that it invites visitors to enter it, rather than walk past, for example, by placing something that will catch their attention against the back wall of your stand.

- Limit the textual content of your exhibit as much as possible, using demonstrations, animations and cartoons to make your key points and placing more detailed material in a booklet or on a website to which you can refer visitors that seek deeper levels of information.

- Have something to give visitors to your stall that carries your organisations name or logo. Most Universities have stocks of these give-aways used in

recruitment activity. If you need your own they are not prohibitively expensive.

- Offering on the spot prizes can be a very effective way of attracting and holding the attention of visitors, particularly young people. These inducements need not be large; any item bearing your logo works well, particularly overseas where they have greater curiosity value.

- In many settings it will be children who engage first with your activities, with the accompanying adults only getting involved subsequently, so be sure that what ever you offer is accessible to as wide an age range as possible

- Do not assume that your audience has a long attention span. A visitor's initial dwell time in front of your exhibit will be a few seconds.

- if you decide to include a quiz element in your event, take care to ensure that the average member of the audience will get most of it correct, otherwise you may risk re-enforcing their feeling that science is intrinsically difficult and inaccessible to lay people

- be sure to include opportunities for the public to say how they think something works.

Other venues, used by self-selecting audiences may also offer opportunities to target harder to reach groups examples include:

- Topic Enthusiasts – Garden Centres, Do-it-yourself outlets, Race Courses, Gliding Clubs

- Parental status – school playgrounds, antenatal clinics, holiday villages, 18-30 singles resorts

- Gender – beauty salons, sports clubs

Other ways of reaching specific audiences might involve organisations that represent or support them:

- Gender – Women's Institutes, Working Men's Clubs

- Ethnic background – religious groupings, community centres, cultural organisations

Using a representative organisation provides some clues about the likely attitudes of audience members to a particular topic and places you within a pre-existing community. However, the audience will differ along many other possible dimensions, like for example age or educational background and an active champion within the community is a vital starting point.

2.2.3 Choosing your approach

[Cautionary Tales: Science on the Buses; Meet the Gene Machine; Hot Topics]

In many cases the starting point for an attempt to target a specific audience is the communication of a particular message to that group and the mainstream media are skilled at devising formats that appeal to particular audiences. However, as any adult who has had to watch an hour of kids' TV will tell you, one audience's favoured format is unlikely to hold the attention of another one. Consequently it's important when devising ways of taking specific messages to an identified target audience to:

- take care to ensure that your chosen medium and format will catch and hold the attention of that audience
- realise that in tailoring your message for one audience you are inevitably "turning off" non target audiences.
- have only one message and keep it simple

Although these guidelines hold for the use of any medium, they are particularly easy to illustrate using poster design as an example.

First, it is crucial that you allow for the fact that the advertising and publishing industries use conventions that allow us to receive and understand their message with the minimum of effort. So, for example, we can all work out at a glance whether a particular poster is selling L'Oreal perfume rather than the latest version of Playstation.

Failure to obey these conventions can mean that your message is never received by the target audience you intend. Strategies for avoiding this problem could include:

- involving members of your intended audience in the devising process for your initiative

- testing the effectiveness of prototypes/drafts in getting your message to your target audience [not proxies for it, so avoid for example using teachers' opinions to test what will engage their pupils]

- using consultants who are making everyday use of different techniques for to reach particular audiences [your organisation/institution's graphics department may not employ people with this depth of commercial experience]

- evaluating the extent to which your key messages reach both target and non-target audiences in a live campaign

It is difficult to find data that compares the effectiveness of different advertising campaigns, in part because such information is often regarded as commercially sensitive by those who gather it, but also because the measure of success or failure is usually simply the impact on the sales of the product featured. This yard stick is rarely relevant in science communication where the deviser's desired outcome is usually some kind of attitudinal change in their audience. However, some characteristics of commercial advertising campaigns that are designed to increase their impact are worth noting:

- keep your message short and snappy [the optimal number of words on a poster for a public space is below twelve; events need to be fast moving and absorbing]

- use humour to increase memorability

- ensure that every element of your activity is re-enforcing your message

- avoid multiple or layered messages.

- events and posters in public spaces and places tend to be only one part of the campaign and often have the sole purpose of pointing the audience to another medium, like the internet, for more detailed information / opportunities for discussion

- repetition is crucial to message reception. Financial considerations usually make this difficult for science communication campaigns, although coverage of a campaign as news or feature material by local and national media can sometimes be achieved. It is a mistake to see this as having any more than a very transient effect on the public's awareness of your message. As advertisers demonstrate continually, people need to hear or see things on several occasions before they are likely to react.

Finally, the focus of the advice so far has been the devising of events and posters for public spaces where they compete to attract the attention of the public alongside many equivalents, most of which are selling goods and services. However, many science communication activities and materials are produced for schools and colleges and it's important to establish whether this different context changes any of the advice already given. The main point worth noting is that schools and colleges contain two kinds of space:

- classrooms, which have a specific ethos controlled by teachers and they need to be closely involved in the devising of any activity or materials for use in class or for display on the walls.

[Posters for classrooms usually have an explanatory purpose, like say an annotated diagram of a biological cell, and will often include considerable amounts of text. These posters are mini text books and do therefore have a distinct style that suits them to the space in which they are intended to be displayed, but which is quite different from those that would be effective in a public place].

- corridors / common rooms, which are public spaces and anything devised for them, like for example an advertisement for a University Open Day a science busking event will only have a significant impact if created using the guidelines given earlier.

2.2.4 Triggering Dialogue and Engagement

[Cautionary Tales: Sci-Bus; Meet the Gene Machine; Hot Topics; Cheltenham Science Festival]

The shift in emphasis of science communication away from one way communication approaches to two way ones was encouraged , if not triggered by the Jenkin Report, published in 2000.

The context was a series of science linked debacles, including the BSE and Salmonella outbreaks combined with the UK public's mainly negative reaction to innovations such as genetic modification of organisms.

The Report's Summary begins:

"Society's relationship with science is in a critical phase. Science today is exciting, and full of opportunities. Yet public confidence in scientific advice to Government has been rocked by BSE; and many people are uneasy about the rapid advance of areas such as biotechnology and IT - even though for everyday purposes they take science and technology for granted. This crisis of confidence is of great importance both to British society and to British science"

This was to become one of the most quoted paragraphs of the Report, particularly by those wanting to justify expenditure on science communication.

The Report also used the word "dialogue" to describe the process that needed to be encouraged if citizens were to regain the trust that had been lost and made large numbers of recommendations for action by the different actors involved which would contribute to this process of bridge building between science and society.

Words like *understanding, awareness, appreciation and explain* were no longer seen as reflecting the new ethos and were replaced by *dialogue, discussion, deliberation, debate, engagement and consultation*. Many funding agencies changed the names of their schemes to reflect the new priorities and with them their criteria for making awards.

It was not the case however that this meant that, for example, science centres and museums radically changed their mix of exhibits, although most introduced a minority that were designed to prompt discussion. Their key audience, young children and their families, pay their money to have science–based fun, not to discuss the pros and cons of genetically modifying organisms. Nor would Universities necessarily restructure their outreach and open day activities to reduce the extent to which they present science as a potentially interesting subject to study rather than a source of potentially divisive issues for society.

That said, the shift in emphasis was broadly welcomed by the UK public, 75% of whom when surveyed five years later wanted to engage in the sense that they "want to have a say in how the country is run". Although it is well worth noting that the same survey revealed that 50% of the sample thought that public consultation events were just PR activities and only a small minority [17%] thought they had an impact on policy [Source: OSI/MORI 2005]

It would appear therefore that the public see dialogue in the context of science communication as a consultation process specifically designed to channel their

views to policy makers. Denmark has the most robust arrangement through the Danish Board of Technology (DBT) which was set up in 1985 and given a permanent legal foundation in 1995. Its stated objectives are to "further the technology debate, assess technological impacts and options, and advise the Danish Parliament and Government"; it reports to the Parliamentary Committee on Research. Written into its establishing Act is a commitment to "take up participatory procedures", and it has experimented widely to find technology assessment methods, like consensus conferences and citizens juries, that suit the Danish ethos of open government. A small number of public consultations using these approaches have subsequently been organised in the UK and elsewhere. However, in other countries the important link to decision makers and the legislative process has either been weaker or absent, thus diminishing the extent to which they foster dialogue in the sense originally intended.

Instead the majority of events aim to draw a more or less targeted audience into what is often termed “engagement” with a specific issue raised by science for society.
Engagement being distinct from dialogue in that the former does not imply that there is necessarily a channel through which views expressed at an engagement event will be communicated to anyone who did not attend it.

Engagement events tend therefore to be about:

either

creating an opportunity for the public to discuss the implications of research with researchers

or

raising the audience’s awareness of the implications of a particular innovation for themselves and society

The most numerous engagement events are *Café Scientifique* which are based on the French Café Philosophique, and offer an informal opportunity for wide ranging discussion between the public and an expert in a particular field.
At the time of writing the UK had a loosely coordinated network of over 40 Cafés Scientifique spread across the country. Each one is organised by a local group who find a suitable bar which is willing to be the venue. Costs are low because most bar owners do not charge for the use of their space providing that people will be buying food and drink, and speakers are usually local and not offered a fee. Consequently, the only costs are for publicity and speakers’ travel expenses. The simplicity of this format has been a strong contributor to its rapid spread [see also Contagiousness] and the symbolism of scientists leaving their labs and encountering the public on equal terms is powerful. However, the limited evaluation that has been undertaken shows that the majority of the audience are

well educated and already engaged with science. A finding that somewhat undermines any claim that Café Scientifique take science and scientists to the common man and woman.

Drama has also been found to be useful in triggering discussion of issues, particularly amongst young people who may not be aware of the implications of particular innovations.

> Pioneering work in this field was carried out by Y-Touring in the UK [see www.geneticfutures.com] and a simplified version of the approach is now being used by many science centres and festivals.
>
> These venues also stage public discussions involving one or more experts. The way that events of this kind are staged can have a large impact on their audience, particularly if the intention is to generate a lively discussion.

Important tips for running a successful discussion event are:

- Selecting and carefully briefing the right chair/facilitator figure for a particular discussion is crucial since they are usually more critical to its success than the speakers and need to combine authority with accessibility

- Whenever possible choose panel members with different viewpoints and make it clear that it is OK to disagree with each other during the event

- For a one hour event, speakers should be allocated a strict maximum of 10 minutes for their presentation, less if there are more than three invitees.

- Keeping invited speakers to time can be a challenge; they need very unambiguous briefing a considerable time before the event [although someone is always likely to turn up saying “It was 30 minutes wasn’t it”] and on the day be sure there is a formal briefing session from the chair/facilitator that includes the information that they will be kept to time, even if it involves interrupting them. It usually helps to agree on some sort of signal that the speakers have two minutes left.

- Preventing particular audience members from hogging the question session can also be necessary. It’s a good idea for the chair/facilitator to say before opening the session to the audience that they have asked the speakers to keep their contributions brief and would appreciate if audience members would also do so, since that will ensure that all who want to contribute to the discussion get a chance.

- The momentum of discussion sessions does sometimes drop and it can be useful for the chair/facilitator to have pre-prepared provocative questions they can ask the speakers or audience to prompt further debate

On layout and procedure

- Crowding a small space works better than giving people too much room [so long as you don't upset the fire officer].

- Events work better if the speakers are at the same floor level as the audience, although this is only practicable if the audience is less than 50 people and the space is small

- Use of AV support by speakers should be discouraged, particularly if the audience is going to be small, as paraphernalia associated with lecture theatres tends to re-enforce a feeling that they are unassailable experts, thus distancing the audience

- It is not always necessary for the chair/facilitator to stay beside the speakers during a discussion session, a greater buzz can often be created by their moving amongst the audience, if necessary, with a radio mike

- Discussions usually work better when the audience is seated round tables rather than in rows. The creation of a group in this way will give opportunities for less confident individuals to get their views heard and offers the chair/facilitator the option of asking a group a question rather than singling out individuals.

- If the audience is large [>100] it is an option to create a mechanism for the submission of written questions by audience members who would prefer not to speak in front of this scale of crowd.

- It can be useful for the chair/facilitator to collect more than one question at a time from the audience. One advantage is that panel members can pick and choose what they respond to and another that questioners cannot hog the floor. Care has to be taken however to ensure that no-one in the audience feels ignored.

2.2.5 Making Initiatives Contagious

[Cautionary Tales: Musical Science; Selling Science; Science on the Buses; Sci-Bus]

One of the most difficult challenges faced by a deviser of projects is trying to ensure that whatever they create enters the frequently performed rather than the rarely or never performed repertoire. To make an analogy with music; a composer has to consider a number of factors that are more or less within their control that have an impact on the long term fate of a particular piece such as:

- the number of musicians needed to perform it
- the mix of instruments
- its power to catch and hold an audience's interest

So when Mahler wrote his Eighth symphony which required a full orchestra eight soloists, two full mixed choirs and a pipe organ, he was taking a calculated risk by knowing that few orchestras would have these resources, but gambling that the sheer scale of the symphony would increase the probability that the premiere of the piece would be attended by leading music critics, other curious composers and managers of leading orchestras, some of whom might mount further performances.

Returning to the world of science communication, it is possible to identify "pieces" that once devised have been frequently performed. A contemporary example is the *Café Scientifique*.

Key features are:

- a simple event format [scientists sitting in bars chatting over a few drinks about their research and its implications]
- an easy to find venue [bars with more or less similar layouts exist in almost every urban community, [see also: Audience Targeting].
- low cost [bars welcome events which attract customers and so usually don't charge for their use as a venue]
- attention grabbing [the idea of talking about science in a bar is quirky enough to attract publicity and can symbolise the eagerness of scientists to let their hair down and meet real people]

Another example of a contemporary initiative that fits all these criteria is scientists performing science based demonstrations in shopping malls.

However, the great majority of initiatives languish in the rarely or never re-performed category, like for example my very own *Evolutionary Notes* [see Cautionary Tales: Musical Science], Reasons for this include complex or costly requirements such as:

- specialist expertise on the part of the practitioner [useful to have some knowledge of theatre]

- fundraising from external organisations [orchestras are expensive]

- hard to source equipment or resources [few people have easy access to a full orchestra]

However, other subtler forces are also involved in contagiousness. For example;

- practitioners re-perform other's work if they can view the outcome as original and owned by themselves [see Cautionary Tales: *Science on the Buses*]
- existing networks are the best things to infect [eg COPUS funded small projects devised by Women's Institutes that were then transferred from one local group to the next]

And finally, the initiative has to be seen as timely and badly needed [WI's as a way of involving women in SET, Café Scientifiques as dialogue opportunities], so be sure yours fits the latest trend.

2.3 Getting and refining ideas

[Cautionary Tales: Musical Science; Pub Genius; Science on the Buses; Chemistry and Physics on the Buses; Sci-Bus; Meet the Gene Machine]

Many stages in the devising of a project can be greatly assisted by having techniques you can use to generate and refine ideas, which is very definitely a skill that can be learnt, not a mystical attribute of a tiny minority of people who are labelled as being creative.

2.3.1 Working alone

If you are going to be creative you need to be relaxed, with your mind uncluttered by the trivia with which we are all bombarded as part of everyday experience. People vary in how they achieve this state of mind, it might be

- a favourite chair in a familiar room

or

- standing at a vantage point overlooking a beautiful landscape

or

- it's a time, like just before falling asleep

Very few people achieve this state whilst in a formally convened meeting, which is why the failure of committees to come up with viable solutions has entered the English language as a way of describing clumsy compromises.

2.3.2 Working with a group

Getting a group of people to work with on your idea is often more productive that than lone cogitation. What follows is a technique for the development of an idea by a group of people. It has been created by bringing together key aspects of several descriptions and critiques of idea generating processes including:

De Bono, E. [1970] *Lateral Thinking,* Penguin.

Lewis, G. [1999] *Successful Creativity,* Hodder &Stoughton 1999

Rawlinson, J.G.[1981] *Creative Thinking and Brainstorming,* Gower 1981

Adams, J.L.[1974] *Conceptual Blockbusting,* Penguin

Runco, M.A. and Pritzker, S.R [1999] *Encyclopaedia of Creativity,* p629-638, Academic Press

A number of points are worth making about it before describing it in detail:

1. The technique brings together someone with a challenge [the challenge champion] and a group of people whose job it is to generate ideas that might be useful in meeting it [the idea generators].

2. The group needs to believe that the challenge is that of the champion, not for example, their manager. Otherwise sessions can deteriorate into complaints about systems or individuals that it is not within the power of the group to control.

3. Ideally the session should be facilitated by someone who comes from outside the group. Use of someone from inside, and particularly the group leader, will tend to limit the extent to which the idea generators are willing to relax and allow their imaginations free rein.

4. The challenge needs to be clearly defined, rather than a tangle of related challenges. So the challenge champion needs to discuss how they are going to present their challenge with the Facilitator in advance of the session

5. The challenge champion and the idea generators are not allowed to ask each other questions, they just listen to each other. The reason for this is that questions usually arise from ideas, and it is new ideas that this process is designed to generate.

.

6. The idea generating group needs to be as diverse as possible in terms of background and expertise. It must not be limited to people who already know of the challenge, and may have attempted to meet it previously.

7. In and Out Listening

   Note taking for most people is about making as accurate a record as possible of what people are saying. However, listening to someone make a presentation, particularly about a problem, will from time to time trigger associations and ideas in the minds of individual listeners. This gold dust may not be captured because doing so involves the listener switching out of recorder mode for a few seconds. A simple technique for avoiding this loss of material of potential value to both yourself and the speaker is to divide your note taking paper with a vertical line and use the left hand column to do the verbatim recording and the right hand one to capture your own reactions and insights. If you do this you reduce the possibility that the presentation will end and you know you had an idea that led to a question but can't at that moment remember what it was, an experience most people have had many times.

<u>Session Structure</u>

Step 1. The session starts with a clear 5-8 min presentation from the challenge champion that covers the following:

- The context and background of the challenge/opportunity
- Why the challenge/opportunity exists
- What has been thought of or tried already [Note: it is important for this to be as comprehensive as possible, the idea generators will be discouraged if they keep discovering that the challenge champion has tried their idea before, but has forgotten to tell them]
- Estimation of their power to act
- A description of the ideal outcome/solution

The idea generators write notes and ideas on “in and out listening” sheets [see earlier in this section]

The Facilitator summarises the challenge to be met, usually as a question in a form like “How to….. as a heading on the top of the first sheet of a flip chart

Step 2. Idea Generation – First Round

The Facilitator asks the idea generators to contribute as many ideas as possible expressed as for example “I wish…”/ “How to….” / “What if….” statements. They are encouraged to be as off the wall/zany as possible, and whenever possible to build on each others ideas.
The Facilitator writes each idea on the flip chart under the heading. The Facilitator does not vet or edit inputs. This session usually lasts for 5-7 minutes.

Meanwhile the Challenge Champion writes notes and thoughts on his or her: ”in and out listening” sheet

Step 3. Idea Selection

The Challenge Champion selects 1-3 ideas on the basis of INTRIGUE not practicality
[3mins]

For each idea he or she:

- States why they think the idea is intriguing
- Lists 3 positive points about the idea
- Tells the idea generators what remaining issues he/she has and what kind of ideas might be useful

The Idea Generators write notes and ideas on in and out listening sheets

The Facilitator summarises the new challenge at the top of a fresh flip chart sheet

Step 4. Idea generation – Second Round

The Facilitator asks the Idea Generators for as many ideas as possible however impractical or implausible

The Challenge Champion takes notes as before.

Step 5. Idea selection and focusing

The Challenge Champion selects one or two ideas that they see as moving in the right direction

The Facilitator asks the Challenge Champion whether they literally want to action the idea[s] as written down.

If the Challenge Champion says “Yes”; they are asked to:

- List all the pluses
- List all their remaining major concerns

The Idea generators are then asked to provide ideas/suggestions designed to address these concerns

The Challenge Champion chooses the best ideas

If the Challenge Champion says “No”; they are asked why they find the idea intriguing.

The Idea Generators then build on this intrigue and the cycle is repeated from Step 4.

Step 6 Wrap up and thanks

At the end of the session the Challenge Champion is asked to:

- Say why the eventual concept interests them
- Identify how it needs to be developed further
- Affirm what they are going to do with the ideas
- Thank the idea generators for its contributions.

The Facilitator gives the Challenge Champion all the flip chart sheets.

2.3 Creating a Project Plan

Cautionary Tale: Cheltenham Science Festival

So now you have your idea and a series of suggestions about how to pursue it. The next step is to convert it into a concrete plan.

The first steps are:

- Define your broad aim
- Specify your objectives, these need to be defined well enough to make their achievement measurable, not general or vague [see also Evaluation]
- Identify all the different kinds of expertise that will be needed to achieve all your objectives, and identify any that are going to have to be added to your own or those of your team.
- Identify the major project deliverables and at what stage of the project they will be produced
- Take a sheet of flip chart paper and some post-it notes and begin to map out the major stages of your project in a chronological order.
- Break down each stage into a series of tasks and identify which are dependent on the completion of a previous one and which are not.
- Identify people/expertises needed for each task and estimate how long they will need to complete it.
- Designate at which points in the project evaluation will be carried out
- Identify the risks associated with each stage of the project plan and build in risk avoidance or mitigation strategies
- Integrate a communications strategy into your plan which identifies the reporting milestones and dissemination routes and methods.
- Develop a sustainability strategy which will enable the project to continue beyond the point where its funding has ended.
- You are now ready to create a spreadsheet that assigns costs to each stage of the project

2.5 Costing Projects

[Cautionary Tale: Science on the Buses]

A few simple tips that will help you make the costings of your project credible are:

1. If you are applying to a Grant scheme be sure to read the parts of their Guidance to Applicants which spells out what they will and won't fund. It won't help your overall credibility if you include the costs of items that they have specified you they will not cover.

2. Be sure to check whether the charges of external suppliers and contractors will be subject to taxes [like VAT in the UK]. It is not unusual for suppliers to quote you costs that do not include this significant amount.

3. Take time to identify all the costs of the project that will not be covered by the funder; these can usually be re-described as your financial contribution to the project; things like:

    - office and premises costs [likely not to be covered by UK Charities]
    - the cost of your time and that of your co-investigators [likely not to be covered by national research councils and foundations]
    - any discounts you have negotiated with suppliers; almost all of these can be described as sponsorship.

    It is often worth pointing out what is going to be contributed by others to the project; even if there is no requirement for you to find matched funding.

4. Avoid making your costings contain too many round numbers: so:

    - include real quotes for equipment and services whenever possible
    - show how figures are calculated [eg x days/£y fee per day= £xy]
    - when estimating [which is almost inevitable] choose un-round numbers [£120 not £100]

5. Be conscious of the likely scale of the impact of the project in terms of audience numbers in deciding on the approximate size of your bid. It is difficult to come up with a rule of thumb for this, but I would suggest that you should not ask for more than the equivalent of £10 per audience member, and considerably less if possible. If this unit cost is going to be at the high end of the range, there are a number of justifications that you can consider using including:

- events involving face-to face contact with the audience will have a higher unit cost, particularly dialogue events.

- pilot projects can be more expensive because they involve the one-off cost of generating materials that will be re-used when the project is rolled out.

- projects may have secondary audiences reached either through the primary audience [eg parents through their children] or through another medium [eg the www version of a live event]; but a word of caution here, it is easy to sound like these are very much late additions to the plan. Only include justifications of this kind if they have been included in the project plan and have been costed.

6. Funders are interested in seeing exactly what they are paying for; so

    - justify your costs by linking each expenditure to a particular point in the project plan

    - avoid the inclusion of anything but very small percents of the budget for contingencies

    - explain why you choose particular figures for items like overnight accommodation

    - provide extra-strong justifications for expenditure on things such as lap top computers and overseas travel. It is easy for the inclusion of items of this kind to label you as a free loader.

2.6 Getting Funding

[Cautionary Tales: Selling Science; Chemistry and Physics on the Buses; Confessions of a Euro-expert; Cheltenham Science Festival]

2.6.1 Funds from Grant Awarding Bodies [Trusts/ Research Councils/ Learned Societies]

Once your project has been planned in detail and carefully costed you are ready to apply for an Award or Grant. This process will almost certainly involve filling in a form. A process for which you will need to set aside considerable amounts of time, particularly if you are going to work with partners and have to agree their role in the project and share of the funds.

Remember that the funders and their proposal reviewers, who may not be specialists in your area, will want to be certain that your project will:

- **meet their funding criteria**; so consider:

  - sending brief outlines of what you plan to the Officer running the scheme [or even better getting them to visit your place of work]
  - discovering what kinds of work a particular funder has supported in the past
  - volunteering to be a referee for specific funding schemes

- **meet a need**; evidence you sight might be taken from:

  - the conclusions/recommendations of a relevant report produced by a learned society/ independent think tank/ Govt dept/select committee
  - a statement of support from a prominent representative of the community/audience at which your project will be targeted
  - your existing audience that wants its experience to be further enhanced

- **work**; so make reference to:

  - other projects of a similar kind where outcomes are known
  - evaluation of your own pilot project/previous related activity
  - general track record of delivery of quality projects by yourself and your partners

- **deliver value for money**; so:

  - include as much detail of your costings as space allows [see previous section on Costing Projects]

- **have a measurable impact on a defined number of people**; so:

  - provide as much detail as possible about how you arrive at your audience numbers, avoid including over-estimates of secondary audiences [see Costing Projects]
  - include the costs of any measures, like subsidising transport, which are designed to enhance attendance of your activity/event
  - be specific about evaluation methods and try to ensure that a range of measurement tools are deployed that are suitable for the target audience

The potential funder will also want to be certain that you:

- **are strongly motivated and have the necessary skills and knowledge to carry out the work** [or if you don't you know someone who does], so:

- be sure to indicate how you will enlist professional expertise for things like; website design, event management, exhibit construction, press and publicity
- include the cost of your own training needs where appropriate
- sound confident but realistic, avoid use of words like “hope” or “might”

- **will keep to schedule**; so

- include a time line in the description of the project plan
- volunteer to report on progress frequently
- make reference to any previous achievements that would lead you to be categorised as a completer/finisher.

- **are aware of other peoples’ work in the same area**; so:

- provide evidence of pre-research and knowledge of the field
- be aware you might miss something, avoid claiming absolute originality it more often antagonises than impresses
- make reference to consulting people who have run similar projects, including them on Advisory Panels if appropriate

Finally your potential funder will want to be assured that your project partners are positively committed to the project; so include:

- letters or statements of support that clearly communicate that they know in some detail what they are committing to delivering

- specific roles for the partners within the project plan

- named contacts within each partner organisation

- the extent of their financial and in-kind contributions to the project

- a clear rationale for why they should be involved

2.6.1.1 The Proposal Review Process

Funding bodies differ in slight respects in the way in which they will handle your application once it has been submitted, but the process usually has the following steps.

1. Deadline for applications is announced
2. Applications received within this deadline are sent out to a number of external referees.
3. The referees give their views.
4. The Awarding Panel meets.
5. The decisions are announced.

Taking each of these steps in turn

1. Deadlines

In this electronic age many funding bodies now accept electronic submissions, and some even insist on them. However, in almost every case it is still a printed copy that is read by the referee; so:

- If you have the choice of how to submit your application it is well worth considering sending in paper copies as well as an electronic one, because that way you control the "look" of the application and are not subject to the vagaries of printers, photocopiers and the mood and competence of their operators.

[*this advice is based on my experience relating to an EU application that was circulated to the referees having been stapled together backwards]*

- electronic submission processes usually involve pre-registration, so be prepared in advance, they are also of course subject to all the manifestations of Murphy's Law [Anything that can go wrong, will go wrong]; so have a Plan B.

2. Referees

Funding bodies have their own panels of specialist referees, but many will ask you to nominate your own as well.

Things that might be worth knowing about this part of the process are:

- science communication is a highly inter-disciplinary subject and referees can vary widely in their expertise, so don't assume your referees will be science communication specialists

- Referees are usually, but not always asked to make their comments on a standard form. It can be useful to know what criteria they are asked to apply. Here is the form used currently by the Wellcome Trust and the referees report form used by the EPSRC. You will notice they are very different in style.

- the views of the referee[s] you nominate will be set alongside the opinions of the other two or three who have been consulted. Your referees' comments need to be knowledgeable and critical. Don't choose someone simply because you know they will be supportive.

- some funders give you the opportunity to respond to the comments made by referees and your responses also go to the awarding panel. If you are given this opportunity be diplomatic and respond specifically but briefly to the points raised, acknowledging praise as well as criticism, and avoiding sounding defensive or intolerant of the views of a particular referee [although it can be very tempting].

2.6.1.2 Awarding Panels

Some points to consider based on my own experience of membership of awarding panels are:

- policy varies about whether you can discover the membership of a particular awarding panel; do if you can, it's useful in ensuring your application is likely to hit the right buttons.

- each panel has its own dynamic, but most see themselves as being strongly guided by the views of the expert referees and will only go against their collective view in exceptional circumstances.

- officers from the funding body attend panels, usually as observers, they often have data about the outcomes of previous work of yours that they have funded; so be sure you have submitted strong final reports and other documents.

- panels usually have at least a rough idea of how much money they have to award in that funding round and generally wish to ensure that a significant number of projects are funded. They, therefore, tend to look more critically at applications that cross particular cash thresholds. So there can be an advantage in staying just below for example the five or

six figure barrier if this is possible given your plan [and you don't make it too glaringly obvious; avoid £9999 and its equivalents].

- panels do sometimes have it within their power to partially fund work, particularly when it has inter-dependent stages or when they feel that not all costs are justified. However, this is an unusual occurrence, most funders don't negotiate.

2.6.2 Sponsorship from the Private Sector

The equivalent of the application process is unlikely to involve form-filling, referees or award panels. Instead, the key event is likely to be an interview or series of interviews with people at different levels within the potential sponsor.

It is important to research how best to reach individuals at the right level in the company at the first attempt. Aiming too high tends to mean your approach never makes it past the PA's waste paper basket, too low and there is a danger that you label yourself as a small timer who might come in useful on one of their open days.

Strategies for finding a target individual at the right level include:

- trawling through your own personal contacts to be sure you don't already know someone whose aunt just happens to be a Vice–President of some global company

- visiting target Companies' web sites to discover whether they have supported similar activity and who they have named as the person responsible

- calling company switchboards and asking to be connected to someone with the communications/external affairs brief

- contacting organisations who are likely to know which companies already support science communication initiatives and might have a named contact

Once you have actually managed to get in front of someone, they will want answers to most of the questions that public bodies seek to get with their application forms, but at a lower level of detail. However they, more so than a public body, are placing a high priority on:

- whether you are the sort of person they would feel comfortable having associated with them and their brand [so leave your more outrageous garb at home]

- assuring themselves that the outcomes of your project will reflect well on them

- identifying how their sponsorship is going to be acknowledged, likely to be any or all of:

    - opportunities to mix with VIPs and occupy an agreed number of the best seats in the house

    - having their logo emblazoned on anything that doesn't move [and sometimes through the medium of t-shirts on things that do]

    - a two minute slot during which one of their top executives awards a prize, thanks a speaker or talks about the company

Reasons for sponsoring events vary with the scale of the sponsoring organisation.

Multi-nationals are likely to be motivated by:

- doing their bit to ensure that the UK has sufficient numbers of technically and scientifically competent potential employees

- softening their image by association with something creative and playful

- creating opportunities for them to take messages directly to the public [so be careful, always retain editorial control]

Local businesses, may also have these motives, but often their main interest is being seen to make constructive contributions to the community that surrounds them, since this means they will be likely, for example, to attract large numbers of high quality applicants when they advertise for employees. A consequence of this difference in focus is that it is often possible to get funded by local businesses who have no obvious connection to science and technology whatever.

Tailor your pitch/presentation so that it covers whatever parts of this ground you think likely to be most important to the potential sponsor. They will expect you to have a sum of money in mind and be able to justify it in broad terms. Any harder bargaining and scrutiny is likely to happen once you have an agreement in principle. Don't be greedy: most sponsorship arrangements start small and then build.

2.7 Evaluation

[Cautionary Tales: Pub Genius; Science on the Buses, Chemistry and Physics on the Buses, Sci- Bus]

Most funding bodies seek to give their grant holders advice about how to evaluate the impact of their project [see for example So Did it Work? [COPUS] and the more detailed Evaluation: Practical Guidelines [RCUK].

These guides are concise and there is no point in attempting to paraphrase them here. What follows are key points based on practical experience, rather than a detailed guide.

An important starting point is to make clear that achieving specific targets, like for example reaching a specified number of people, is not the same as evaluating the impact of an intervention. It would be quite possible to imagine a circumstance where an event attracted a large crowd but only a very small number of those attending experienced what was intended by its organisers.

Evaluation, as distinct from meeting numerical targets, can have three distinct functions.

1. To pre-test materials and approaches during the devising process and before final versions are produced, this usually involves working with a small representative sample of the target audience, either individually or as a group [formative evaluation, or if you want to sound erudite “research led practice”].

The key question that pre-testing can help answer is: Will these materials have the impact on the audience specified in the objectives of the work?

The most common issue about pre-testing is its thoroughness; it can be very tempting to limit your test audience to your friends in the pub. Also it is something which is often omitted from project plans; a pity given its usefulness and also its value as an indicator of the care that has been taken in drafting a proposal.

2. To discover whether the objectives of a project have been achieved [summative evaluation].

Several issues can arise:

Could the achievement of all the original objectives be measured?

Has the right mix of qualitative and quantitative evaluation tools been chosen and properly used?

Has an independent evaluator been used or are the team assessing their own performance?
An issue that is more likely arise with large scale rather than smaller initiatives.

Did the project have an unanticipated impact, for example, on a non-target audience or a particular partner?
A finding of this kind can be a very useful starting point for new work and a useful aspect to highlight when reporting back to the funder.

Was the impact on the audience transient or longer lasting?

Most evaluation is focused on assessing the immediate impact on the audience, by for example getting them to fill in exit questionnaires, it may also be possible if carefully pre-planned to discover whether audience members know or think things after the event which they did not before it, by using pre and post event questionnaires or interviews. However, it is much more difficult to establish whether a specific experience changed either the longer term behaviour or performance of members of an audience. Principally because there are too many other uncontrolled variables operating that might influence these outcomes for an individual, like for example whether their learning or thinking was or was not subsequently re-enforced by subsequent experiences.

3. To assess how well the project was planned and executed [process evaluation]

Issues that such an evaluation might examine include:

Did the team have all the expertises needed to deliver the project?

Were there particular parts of the project that proved more time consuming or demanding than anticipated?

Were the costings for each stage realistic?

Were any changes made to the original project plan , and if so why?

Did all the partners make the type and quality of contribution anticipated?

Answers to questions of this kind can be very useful to a project team when they are planning their next project, and also to other practitioners who are planning projects with similar structures and partners.

Use of Evaluation Data

Evaluation data properly collected and analysed is of great potential value for those seeking to establish a reputation as effective science communication practioners, even if the project did not fully achieve all its objectives.

Reasons for disseminating and sharing evaluation of a project include:

- sharing your experience is likely to make you friends within the science communication community
- encouraging feedback from others who have had similar experiences can often help you design improved projects in the future
- openness will increase the extent to which funders see you as trustworthy and competent.

It's worth taking time to point out that only a minority of evaluations of science communication projects reach the public domain.

Amazingly, its not just individual practitioners who are reticent in this respect but also the bodies that fund the work. It's almost as if no-one ever wants to discover that something could be improved. The funder because it makes them look like they are wasting tax payers or benefactors money and the practitioner because it would prejudice their chances of getting funding in the future.

So, it could be argued, it's in everybody's interest that everything is assumed to have been a stunning success.

The situation becomes even more curious if you add the fact that application forms for science communication grants invariably contain a section requiring the applicants to provide an evaluation strategy, and there is much sabre rattling about the importance of disseminating the outcomes of projects

3. Cautionary Tales

3.1 **Biochemistry of Boozing / Biology for Bank Raiders**

[Tips and Techniques: Getting Started]

My first attempts at communicating science took the form of talks. Powerpoint had yet to be invented, so audio-visual aids were generally more idiosyncratic, varying from slides, which were, in my case nearly always either the wrong way up or back to front, or transparencies for an overhead projector whose bulb could blow at any moment. It may be simply nostalgia but looking back I have the impression that this made for a higher degree of individualism with much clearer distinctions between the corporate talking head with a custom designed suite of slides to the rather more biodegradable hand written overheads favoured by eminent Oxford dons. I was completely convinced that all person kind would be as fascinated by neuroscience as myself and that if they were not it could only be because they had not encountered the right neuro-evangelist. My mission began in undergraduate classes but soon branched out to schools, and later into adult education. The visits to schools were strongly encouraged by my University because people were not exactly queuing to study science in Canterbury, which had quickly acquired a reputation as a breeding ground for bolshie social scientists and had chosen on its foundation in 1962 to take a giant leap back in time and be collegiate, and then realized too late that cloisters, quadrangles and the like made less than ideal settings for laboratories.

The preferred target for these combinations of lecture and sales pitch were local sixth formers, a strategy which overlooked the fact that in this era no self respecting University applicant gave a moments' thought to studying locally. I enjoyed performing and hit a fairly rich seam when I devised a talk entitled *The Biochemistry of Boozing* which was seen as naughtier than the average talk by adolescents and an illustrated dire warning by their teachers, possibly because it contained a picture of a cirrhotic liver. I also had a peroration about the brain designed for adult audiences and it was in giving these courses that I first discovered what I came to realize was adult education afterglow. I felt good about myself because I had finally taken my message to what, at the time, I took to be the person on the Clapham omnibus. I even found that this pedagogic equivalent of post-coital relaxation could be experienced by others when I persuaded the braver amongst my colleagues to talk about their research at the local prison. An institution which was fortunate enough to employ a very go-ahead education officer who wanted to offer more than the usual mix of literacy, numeracy and basket weaving. The result was a programme of talks whose shorthand [and unpublished] title was *Biology for Bank Raiders.* It included, amongst many other wonders, my first and last attempt to dissect a rat brain with a blunt teaspoon and a contribution from a colleague greatly enlivened by the

fact that someone had told him that the emergency button in the teaching room operated like a dead man's handle, and should therefore be kept depressed at all times.

3.2 **Musical Science**

[Tips and Techniques: Getting Started; Making Initiatives Contagious; Getting and Refining Ideas]

My first funded science communication project was called *Evolutionary Notes* and its starting point was an invitation from the Director of Music at the University of Kent, Sue Wanless, to perform the narrations at her annual kids' concert. We did the standards, *Peter and the Wolf* and *Carnival of the Animals*, and then we had little option but to do them all over again, given that few suitable pieces have ever been written. *Peter and the Wolf* has a set narration which is closely matched to the music, a potential problem for a musical dunce like myself, unlike *Carnival of the Animals* where you can make up your own script and deliver it between each of the musical sections. Doing this, gave me the idea [see Getting Ideas] that there might be room for more pieces in this repertoire and that it could be adapted to communicate science to young audiences. So in partnership with Sue I applied successfully for a Committee on the Public Understanding of Science [COPUS] grant and ended up working with a talented young composer, Joanna Ive, with a penchant for black leather trousers and straight talking. Soon she and Sue were deep in negotiation about the musical forces that could be mustered within the University's orchestra and I, much encouraged, went off to write the narration for what we had decided would be called *Evolutionary Notes*. The final version included a weather forecast for an average day 2 billion years ago which went like this:

"Red hot rock can be expected over 25 percent of the earth's surface tomorrow and actually for the next 1 billion years. Clouds, mainly, of cyanide and ammonia will block out the sun. Air quality will be appalling, particularly if you like oxygen"

and an account of the rise and complete extinction of the dinosaurs, which provided the orchestra with a great excuse to pull out every stop before ending with Homo Sapiens and the present day with the line:

"After all, we are in charge - as the dinosaurs used to say"

Jo came up with a great score and we were soon into rehearsal. A rather scary experience since I could not read music so had to come up with rough and ready ways of following the score. Possible if there were obvious points where one part of the orchestra stopped and the other started, but much more difficult if the transitions were subtler. It could be very frightening standing at a lectern and not

knowing which page you were meant to be on, although Jo did try to help by sitting in the stalls and making hand signals. The actual performances went well, but after backs had been slapped and fees paid I became uncomfortably aware that it was likely that *Evolutionary Notes* had received its one and only performance. It was my first encounter with a project that was not contagious [see: Making Intiatives Contagious] and it all stemmed from my untested, and it turned out erroneous, assumption that the piece would be played by secondary school orchestras for their local primary schools.
Nothing daunted, I extracted some funding from Unilever to create a musically simplified version for a school orchestra, added a choir [because most schools have one] and renamed the piece *Dance of the Dinosaurs* since the D word is a sure fire crowd puller. My first problem was that Jo was not very interested in dumbing down her score and the second that Unilever nominated a school local to its R & D centre which turned out to have a less than dynamic music department.

The piece was receiving star billing at the R&D centre's open day so as ever we were working against the clock. After only one run through at the school it was time for the dress rehearsal. Ben and I arrived late having misjudged our travel time and entered a bedlamesque scene where it was hard to know whether the orchestra was playing the piece or still tuning up. Jo was muttering that every composer reserved the right to refuse to allow their piece to be played, and when I finally got to the podium realised that I would have been lost even if I had been able to read the score. Things became even more surreal when most of the string section left to take a French exam, but somehow we survived and by the end of the afternoon we had at least performed the whole piece once. Back at our hotel it had to be time for a stiff drink, a fitful night's sleep, a breakfast held in a similar atmosphere to that prevailing during the condemned's last meal, and back to the scene of the previous day's crime to literally face the music. Two performances later we had at least got by, even been politely applauded and I had vowed that the next time I worked with an orchestra I would choose one that played the notes in a predictable order.

3.3 **Selling Science**

[Tips and Techniques: Getting Noticed in Crowded Places,; Making Intiatives Contagious; Getting Funding]

My first escapade that took science into public spaces [see Use of Public Spaces] was called Selling Science which involved getting schools and colleges to create displays that explained the science behind something sold by a shop in their local High Street. The funding came from Kent Business Education Partnerships and I had access to all their Kent branches. How could I fail? Well reasonably easily it turned out since I started with the fatal assumption that every local outfit would be managed by an equivalent of Richard Branson, and that therefore all that was necessary was to call a meeting, explain the concept, and then watch as all Kent caught fire. The reality was rather different with most of the county refusing even to smoulder whilst a few reasonable sized bonfires got lit by the keener and better organised regions. Fortunately, and not entirely by chance, one such hot spot, Maidstone, was visited by the Minister of Science who subsequently blurted out at a science communication conference that experiencing Selling Science in Maidstone High Street had been his big moment of National Science Week. Such an endorsement is, of course, gold dust, and formed the starting point for a correspondence that I initiated which culminated in an audience with two rather nervous civil servants who clearly had no idea what I was on about, but greatly feared failing to support something that had been described in such glowing terms by their political master. I left with a contribution of £20,000.

3.4 **Pub Genius**

The British love quizzes, and I had noticed that this passion was being exploited by pubs that organised regular or irregular quiz nights. My own experience of these events was that they fell far short of being atmospheric, usually involving a bored sounding publican reading out a list of questions in which sport and TV programmes featured heavily. It seemed like there might be a welcome for a livelier format. The funding once again came from COPUS and it was all scheduled for National Science Week during which a thousand flowers bloomed, or actually more like large numbers of weeds through which the odd flower fought to be noticed. Universities have always been the major providers of events seeing it as an excellent context for their attempts to recruit science students, but tended to hold events for schools on their own campuses. Ours was going to be different, we had made an alliance with a brewery which gave us access to three of their pubs, a crate of beer to hand out to contestants during the quiz and a grand prize, which was a guided, tankard in prospect, tour of their premises. Our final event format was a quiz about all about the science to be found in a pub, interspersed with table top demos like the Lifting Lemon for teams to try between rounds [of the quiz, that is] [see Physics to Go for 20 such demos] We were lucky to have undergraduates on the Science Society and Media degree to help with the devising and it wasn't hard to persuade them to spend the evening in the pub helping us run the event. Our premiere was a little shaky in that I suspected the pub had been nominated by the brewer because both its regulars were getting on a bit. However, our pre-event media mini-blitz, an interview on local radio, ensured we had a respectable number of punters. It went down well, particularly the table top demos which apart from self-elevating lemons also involved AlkaSeltzer rockets and a lager lamp. These were particularly popular partly because we gave a bottle of beer to anyone who could give anything even vaguely resembling a sensible explanation of the science behind the trick, but also because the students handing out the ingredients for each trick were mixing with the audience, so it wasn't just me asking questions.

We actually got TV coverage of the second event the hook being the perceived quirkyness of the juxtaposition of science and a pub. We were overconfident by the night of the final event and rolled up to find that the pub claimed they hadn't been told we were coming. Nothing daunted we ran the event anyway, the only snag being that there was no PA system which meant I had to run around shouting a great deal. Our evaluation techniques were somewhat primitive at the time but Ben did manage to get some great quotes from participants. Armed with these we made it into the Daily Telegraph as the inventors of "Boozology" and an event that has travelled the world.

3.5 **Check Out Science at Tesco**

[Tips and Techniques: Targeting Audiences, Getting Noticed in Crowded Places]

Flushed with our success with Boozology the next SET week found us at the local Tesco running an in-store science quiz involving ten simple science based multiple choice questions. My preliminary reconnoitre of the venue revealed that it would be hard to get harassed shoppers to accept five pound notes from a stranger who accosted them at the entrance to the store far less a mini-exam paper. It was at this point that I was rescued by Zbig Sobriesierski, with whom I shared an office. He was a graduate of the Techniquest Masters programme that placed considerable emphasis on training their students as presenters and he volunteered to draw a crowd in the entrance foyer, thus stopping people long enough to thrust a quiz sheet in their hand. Even with this assistance, we accumulated a not very stunning 70 completed quiz sheets, even though we had offered a £200 cash prize. We were learning but had yet to realise how crucial it was to pre-test formats before committing to their use. It would have paid big dividends just to have spent a few hours observing how people behave in a supermarket and devising a task and a prize that matched it. Was it really likely that someone would juggle a shopping list and a quiz sheet? Might it have been more effective to offer instant prizes to anyone handing in a completed questionnaire? We never found out.

3.6 **Science in the Fast Lane**

[Tips and Techniques; Targeting Audiences; Getting Noticed in Crowded Places]

Motorway service areas are generic venues where people spend considerable amounts of time, either waiting for Aunt Maude to re-appear from the Ladies or trying to recover from the mind numbing effect of motorway driving. Science in the Fast Lane was our third event designed for a specific public venue, and it was easy to get COPUS funding because we could point to our previous venue based work, but what kind of event would succeed? Our starting point was that kids get bored in cars and that anything that could keep them occupied would be snapped up by their parents. So some kind of bag of goodies seemed like a good idea. We also knew that a percent of adults would complete a quiz if there was some kind of prize.

The quiz followed the same logic as Check Out Science pointing up the science around you as you drive, but what about the goody bags? We didn't have the money to generate our own content but suspected that there were many science organisations that have basements packed with give-aways that they have never found a way of effectively distributing. A few calls and we were disappearing under boxes of pens, paper puzzles and leaflets, of greater and lesser obtuseness.

We had rather overlooked the fact that these would now have to be distributed into 500 bags, but managed to use cakes to entice colleagues into joining an epic lunch-time bag stuffing event.

We had wondered whether the service areas would welcome us given we would take up space and distract their customers but need not have worried, each one was keen to somehow stand out in the minds of motorists and guessed that that what we planned would be at the very least memorable.

Our first event was at Giordano on the M5, using what we had learnt from our supermarket experience we set up a stall in a position as close as possible to the front entrance and I performed a mix of demos designed to draw and hold a crowd. The secret of attracting punters turned out to be kids, because, unlike adults, they were not embarrassed to ask questions or suspicious that we were some underhand way of getting them to part with money.

We did brisk business and ran out of bags, a good sign, particularly when the canteen ladies began appearing to ask if we had spares for their grand children. It was the first time we had used an independent evaluator for such an event, and we captured data about how the audience perceived our antics, and also realised that demos could be integrated into any event that depended on attracting a crowd in a public space.

3.7 **Science on the Buses – Cardiff**

[Tips and Techniques; Targeting Audiences; Choosing the right medium for communicating your message; Making Initiatives Contagious; Costing Projects; Evaluation]

Our first poster project was *Science on the Buses* [1996]. It happened because on arriving in Bristol I resolved to travel to work in an eco-friendly way, this grand scheme did not last long because the Bristol bus services seemed to be organised by the local anarchists. However, in the short time that I did take up to one and a half hours to travel the 4 miles to work, it was forcefully brought to my attention that the insides of buses are amongst the most boring environments on the planet.

I think it must have been these experiences that had me awake at 0300 one October morning thinking “Why not put science posters in buses”. By the end of the next day I had jotted down the bones of the idea and the day after a glossy leaflet dropped on my desk announcing the Techniquest Pan-Technicon Millennium Award scheme, the brainchild it turned out of an old friend and collaborator, Melanie Quin. She had extracted a six figure sum from the Millennium Commission to be distributed amongst poor and needy science communicators and their like in Wales. I was not in Wales, but I certainly felt the need to show my new employers that I could attract cash and attention. So *Science on the Buses* became the one thing that would set all of Wales [well at least parts of Cardiff] abuzz with interest in science, and specifically with questions like “Could there be life on Mars?”

The response to my bid was a phone call from Melanie saying that the panel had liked the idea behind my application, but would need to know what one of my posters might look like before they could be separated from their money. Could I come across to Techniquest with an example? Certainly I said, when would be convenient? What about the day after tomorrow, she says? Oh fine, say I, put the phone down and realise I needed a designer, but that they probably didn’t run 24hr emergency call out services. So I stuck a pin in the appropriate yellow page and hit Presentation Services which turned out to be a small business owned by Colin Greenslade. He didn’t sound too keen to get entangled in a scheme which was quite as extra-planetary as mine, and on hearing that it was going to happen in Cardiff was quick to suggest that I really needed a Welsh designer, gave me a number and put the phone down.

The Welsh proved illusive, possibly having been forewarned of the likelihood of being approached by a bloke with a posh accent and a half baked idea. So I get back on the phone to Colin, this time focusing his mind on the enormous riches that might be his if he invested now. Somewhat to my surprise he agreed to meet me immediately and that is where my education began.

He wanted to know who I was aiming my posters at and was not satisfied when I replied bus passengers. He explained that posters only work if aimed at specific audiences. That was news to me, but fortunately during my constipated travels on the Bristol bus clogwork it had struck me that the other passengers did seem to be either a lot younger or a lot older than me.
So we decide to target young adults and are joined by Paul Skuse, one of Colin's design team. Then things get really interesting, soon we are in the world of club colours, night club ads and the font preferences of DJs. It's great but I dread the inevitable moment when they ask about the deadline. It comes; I gulp, and say tomorrow lunchtime and they don't blink. I wonder if it's shock, but it turns out it isn't. I had forgotten I was not within the hallowed walls of academe; these people worked in real time.
Next day, a little anxiously, I reappear, maybe they changed their minds or a rush job had arrived for which they were actually going to be paid. But no, my draft is there neatly mounted on card with a black paper covering flap. It's fantastic, eye catching and intriguing. Time to drive to Cardiff, but before I go they teach me how to get the maximum impact when presenting a design. It's simple and counter-intuitive - delay showing it to the client. Put the folder on the table beside you talk, explain, negotiate and only at the point where they can't bear it any longer, and with a little flourish, finally reveal your masterpiece.

The Techniquest meeting turns out to be with Melanie and the Techniquest treasurer, an earnest but kind gent. I wondered secretly if he was the kind of client who was susceptible to the rabbit from hat approach to presenting artwork. I decided to stick with the plan and sure enough it wasn't long until their eyes were wandering to the large file by my elbow. At what I judge to be the propitious moment I reveal the poster in all its disco glory and they are, to my relief, very impressed. Possibly because they had half expected me to turn up with something looking like a bad entry to a kids poster competition. I am so relieved at their response that when the Treasurer asks if I might need a little more money for the project I protest trenchantly that I have asked for just the right amount. Not a mistake I was ever likely to make again

My musings on the posters on the London and Paris undergrounds persuaded me not to ask the bus travellers of Cardiff questions as originally planned but instead to compose pieces of text that had a quirky, intriguing quality and ended with some kind of punch line. Topics were Martians, Cloning Immortality and Prions

So for Martians

Might live under the red planet's surface
May have already reached the earth on meteorites
Are likely to have relatives in many other parts of the Universe
Are probably bacteria

A four poster set was duly devised and Colin actually got paid this time. I chose biological topics both because that had been my scientific specialisation and also because surveys gauging public interest in science and technology always find the biological and more specifically medical topics attract high levels of public attention.

The text of the posters was tested on a group of undergraduates and generally approved. Copies of the posters were printed and circulated to selected science communication colleagues who almost unanimously thought them to be innovative and appealing. Unfortunately, subsequent evaluation revealed that this was not the opinion of bus passengers who tended to like the colours but not the text which most found wordy and unhelpfully ambiguous.

It was disappointing but it did at least provide some clear “do’s” and “don’t’s” for inclusion in the planning of future work.

3.8 **Chemistry and Physics on the Buses**

[Tips and Techniques: Getting and Refining Ideas; Getting Funding; Evaluation]

A carefully personalised letter targeted at potential funders of posters netted a commission from the Royal Society of Chemistry for a four poster set to display on buses during the 1998 BA Annual Festival. It was exciting to be working from a brief just like a proper ad agency but also limiting in that we now had a client, rather than being the esteemed recipients of an Award. And we had a bright idea, to explain to bus passengers that tiny differences in the structures of chemicals like steroids could lead to huge differences in physiological effects. In no time Colin's team had worked up the idea which featured molecular models of Testosterone and Oestrogen, headed His and Hers and had a strap line that read "A little Chemistry makes a big difference" and off went Ben to the RSC. He did not receive a very warm reception, it turned out that they had recently adopted a policy of never knowingly using chemical structures in their materials, because they might frighten the punters. However, they did like the strap line, so requested we find a way of using it that did not cause fear and loathing amongst the young. It was at about this point that someone noticed [I say someone because Ben insists it was him and I insist it was me, such are creative partnerships..] that there was a techno-dance band out there called The Chemical Brothers who would be well known to young adults.

It seemed like too good an opportunity to miss, and so the Chemical Brothers poster set was born, featuring chemicals that could be described in words alone, like carbon. These posters illustrated the fact that small changes in chemical structure made the difference between close relatives "brothers" like graphite and diamond.
Gone were the prose poems but the graphics and colours remained clubby, would these work better? Well the answer was a resounding; a bit. Our audience had moved from pretty bamboozled to vaguely interested.

Enter the Institute of Physics, who had, as you do, decided to celebrate their 125th birthday, and that bus posters were in order. So it's off to London for a briefing meeting, which ended with agreement that we will have a brilliant idea with them as soon as we have one, which turns out to be a couple of weeks. At the time I would have viewed this pause as wasted time, however I now know that the literature about creativity makes much of the need for "incubation" as part of the process needed to develop an idea.

We had decided to illustrate single words beginning with "F" which had something to with the way Physics was applied in the modern world. As is often the case the first three were no problem [Fast (a racing car), Fad (yo-yos were on the up), Far out (satellite technology)], and the last was agony forcing us to settle

for Fooled [how footballs swerve]. The strap line was “Thanks to Physics”, and each word was to be miss-spelt with a Ph instead of an F.

As ever the design team now featuring Jon Mills came up with some great looking drafts and we went back in London to present them to the IoP. They liked the idea and had the great news that they wanted to not only use the interiors of buses but also to adorn the entire back of a London double decker. Ben came up with Phull Phrontal as the caption illustrated to show how physics is used in medical imaging. A little to our surprise they liked that also.

The final forms of the posters leave no doubt that they have something to do with Physics, featuring the word 3 times on a poster that only carries 9 words in total We have come a long way from intriguing prose poems, and at last, evaluation shows that our message, that physics is central to everyday life has actually got across to about 50% of our target audience, young adults.

However, we did have one problem. It was planned that Phull Phrontal should also have an outing on the back of a double-decker in Salford, which had been selected as a fun spot to hold that year’s Annual IoP Conference. But the owner of the local bus company objected, claiming that pictures of naked men and women on the backs of his buses would distract the impressionable drivers of North West England. He suggested a level of editing of the graphic which would have destroyed its meaning, but did at the very last gasp relent, partly because we pointed out that his buses were already emblazoned with risqué lingerie adverts, and also that accident rates had not increased on the London bus routes along which Phull Phrontal had been travelling. I was relieved at the time but have often wondered since whether it wouldn’t have been better to be the devisers of first science communication campaign ever to be censored.

3.9 **Science on the Buses – The UK Campaign**

[Tips and Techniques; Getting Funding; Evaluation]

By 1998 we had three poster sets but no-where to display them. It was time to go for bigger money and coincidentally the OST was offering grants for the national rollout of projects that had been tested locally. Armed with our local evaluation results for the posters, we sat down to write our first ever business plan. It was heavy going, particularly the bit where they asked you to estimate how much revenue the project would attract from other sources. As a novice, I had not yet encountered the black art of appearing to have matched funding but after much internal wrangling about finances the bid was submitted, the silence form the OST was extended and deafening, but ended with the news that we had the funding for a six city national campaign and for the first time for a campaign coordinator. We had gone from 25 buses in Cardiff to a nationwide campaign in 2 years.

Now all we had to do was run campaigns in Bristol, London, Birmingham, Manchester, Edinburgh and Belfast. Not a simple task, but we were lucky to entice Linda Wookey away from Techniquest, to do the job. We decide not to run all the campaigns simultaneously, opting to run events in pairs of cities at a time.

So, we had three existing poster sets to run nationwide and beyond the logistics of getting the right numbers printed and buying the appropriate ad space one big challenge was to get the media interested in the campaign. We already knew from the pilot phase that local broadcast and print media found the idea of putting science on buses quirky enough to give it coverage but that it was crucial to have a poster festooned bus to provide the right film and photo opportunity. We had also discovered that graphics based projects have a huge advantage over other media because the poster will be reprinted by the press and remain as a permanent concrete output from the project. This contrasts with say a demonstration lecture or drama, for which people are always asking for the video, which you either couldn't afford to make, or which you decided not to make publicly available because one camera attempts at recording events tend to make them appear much more amateurish than they actually were.

Our first launch is in Bristol. We hire the Mayor's parlour, the University invites some of its bigger wigs and we invite anyone who we think we need to impress. It goes well except for one salutary experience. The reporter from the local BBC TV news team decides that his angle has to be that I am a deranged scholar with an evangelical streak who wants to ram science down the throats of complete strangers. We have a choice, go with it and get on the telly, or pull up our skirts/kilts. I would, with hindsight, like to say we did the latter, but faced with a news hungry camera crew I opted to play the role that fitted the reporter's

prejudices. Not the last time that I have found the media were uncomfortable with the idea that science could be communicated by anyone except a white coated bloke who doesn't appear to get out much [and when he does is a hazard to traffic]

Our campaign was structured so that each pair of cities got posters in two three month bursts, with evaluation taking place after each burst. This model allowed us get data on the target and non-target audience's responses to each poster set separately. A quality of data that had not been gathered previously and which is not often disseminated, principally because it is usually collected by ad agencies and is seen as highly business sensitive. Ben and his team were eventually to carry out 751 face-to-face interviews with bus passengers and in doing so discovered firstly that the target audience were heavily represented on buses and that 75% of bus passengers used them every day. This meant that they would be exposed to the posters on many occasions.

They also quickly discovered that interpretation of posters could be, to put it mildly, individualistic, with for example one elderly lady insisting that our carefully rendered racing car was clearly a fast moving cabbage.

However, some findings were highly significant, the most striking being that the intended message of the posters, that Biology/Physics/Chemistry played a central role in everyday life, was much more likely to be communicated to the target audience than, for example, pensioners. Not because the latter were less astute, but simply because their attention was not attracted and held by the poster for a long enough period for them to interpret it.

Meanwhile back in Edinburgh, it was the day of our launch and we were relieved that the reporter for BBC Scotland took a much straighter line than his Bristol colleague. Interviewing the Chief Exec of the BA as well as myself, and coming up with the punch line "Buses for learning as well as for travelling**"**

All was rolling but we had one final hurdle to clear. A condition of our funding from the OST was that every aspect of the project should be independently evaluated. Years in academe selecting external examiners had taught me that that there is an art to finding what had now been labelled "critical friends". You needed to find people whose judgement you trust but are neither so close to the delivery team to cast doubt on their impartiality nor so distant from it that there is a danger of them riding off on their own personal hobby horse. We were fortunate to find the ideal person in Gillian Pearson, then Director of Education for the Oxford Trust.

Her report was generally positive concluding that thanks to Linda the project had been managed professionally and efficiently, sticking to schedule and budget, and that the team had attracted high levels of usually accurate media coverage. To my chagrin, she found that there were considerable levels of confusion

between Science on the Buses and Science on the Underground, but looking back I accept that this was probably inevitable given the Chinese whispers element of how the word travels in professional networks. One area where there was considerable discussion was the number of people who were likely to have seen the posters during the campaign. It was, however, accepted that at a minimum the posters had been seen by 2 million people.

3.10 **Confessions of a Euro-expert**

[Tips and Techniques: Getting Funding]

Becoming-an-expert was a push-over; I sent in my CV and was soon contacted by a very polite Eurocrat who could scarce conceal his surprise that anyone should want to sign up for work at the euro desk face. Two months later. I joined a team which had clearly been selected using some arcane algorithm that ensured the correct gender and country balance. We were all assigned a desk on the fourth floor of what appeared to be a building scheduled for demolition. Each of us was given about 12 proposals to read. All were in English and the first thing I noticed was that a number of the evaluators had a large dictionary at their elbow. I began to read through my pile; the standard was very variable with well-thought out projects with multi-partners interspersed with submissions which appeared to have been created by cutting and pasting buzz words and phrases from randomly selected euro-policy papers. This approach presumably being the equivalent of throwing darts in handfuls hoping at some point to hit the bulls-eye. Each expert had to fill in a four page form commenting on the proposals' aims and objectives, fit with the funding criteria, management structure etc. and assigning that section a mark out of 5. I laboured long and hard over these, writing mini-essays in each box. By the middle of the second day in our concrete tomb most of the experts had read and commented on their stack. It was then the fun really began in the so-called consensus meetings, where I met the other two experts who had been assigned the same proposal and in the presence of a eurocrat we had to agree on a grade. Then someone had to volunteer to write a report summarising why the decision to fund had or had not been made. Some of these meetings took only minutes because all the experts were close to agreement but some could drag on for what appeared to be eternity. I soon realised that there were certain experts with whom I usually agreed and others with whom I never did. It wasn't just personalities, it was also expertise. It became clear that, for example, the Czech Republic had yet to discover science communication but that the algorithm insisted that they be included in the evaluation team, so they were represented by a very clever young women who ran a language school. Iceland, presumably because it too lacked a science communicator amongst its population were represented by a management consultant. It was my first experience of the reality of the EU, underlining both the immense challenge of reconciling different historical and cultural perspectives and the problem of finding experts in a field so inter-disciplinary as to make virtually every professional in Europe a potential expert. It was also clear that the constraint of working in English was a very heavy burden on several of the experts who limited their comments on the written documentation to writing either excellent or good under every heading. After five days of trying to agree the unagreeable I left Brussels with a heavy heart. My proposal was up for evaluation by a different, but no doubt no less motley team the following week

3.11 **Science on the Buses- the EU campaign**

Tips and Techniques: Triggering Dialogue and Engagement; Making Initiatives Contagious; Evaluation]

So, at least in our minds we had done Britain, it was time to tackle Europe. The approach was two pronged, one prong being that I put myself forward for selection as an evaluator of Science and Society projects for the European Commission [see Confessions of a Euro-expert]. The second being that we submitted a proposal for a mega-grant to run a Europe-wide version of Science on the Buses during European Science Week, a squib of extraordinary dampness that fizzled every November. The proposal was a different matter. I had never come close to encountering such a gothically elaborate and impenetrable process and was soon to understand why people made excellent livings just acting as guides in this strange underworld. However, we did have one very strong card; we were suggesting something that could be presented as tried and tested. Every grant schemes dream, an almost sure fire winner, but there was a snag to get euro-funding you need euro-partners, not a possibility in the short time before the application deadline, although we did send out a few "lonely heart" messages. My only chance was to go to a partner we had already worked with, the European Molecular Biology Organisation, they could at least be presented as an organisation with a trans-european brief and membership. Fortunately they were eager to get involved and so at the last gasp the application, which weighed in at an impressive 400 grams, was dispatched to Brussels.

The dice must have landed kindly or maybe the fireman from Estonia who was flying in to evaluate our bid cancelled at the last minute, because we just got funded, on the basis of a last gasp tie break meeting using additional experts. The problem had not been the project but the extreme flimsyness of the euro-partnership, which even the fireman would have spotted. We proceeded to the kind of contract negotiation which makes you wish you had never been awarded the money. And finally to a 400,000 euro cheque. So far so good. However it was about then that we began to look at what I had committed us to delivering, a little matter of a bus poster campaign that would run simultaneously in the capital cities of all fifteen member states during European Science Week 2002. A quick survey of the language skills of the Unit's core staff, namely Ben, Mad and I, revealed all would be well if a mix of pigeon English and menu level French was all that was needed. Sadly we had to agree that this was unlikely and what we needed was an incredibly well organised, brilliant linguist preferably by yesterday. Fortunately, the Faculty had employed an ace administrator, Jochen Pichler who just happened to be fluent in Italian and German and had working French and Spanish but was not finding much cause to deploy these abilities whilst taking the minutes of endless meetings during which everyone stubbornly stuck to English. We were quick to make him an offer he could easily have

refused but he was clearly intrigued by how such a motley crew were going to tackle such a daunting task.

A week or two later he was installed in the Unit and talking foreign languages down our telephone, something in which we took a curious pride.
These early conversations revealed that we had indeed bitten off more than was going to be easy to chew. Advertising on buses was controlled by several companies; in some countries, like France, the minimum order would have consumed our entire budget, in others, they simply didn't have ads inside their buses.

Aside from the logistics which were clearly going to be similar to those involved in landing a European Commissioner on the moon, there was also the little issue of what the campaign was going to be about. I had played safe in the application telling the Estonian fireman and his other colleagues that we would deliver the same " Science is central to everyday life" message to young adults across the EU as we had visited upon the unsuspecting residents of six cities in the UK. However, science communication was now in what in the UK is probably best described as the dialogue or die era, the dawn of which had been heralded by Science and Society, a report produced by the House of Lords Select Committee on Science and Technology [see Landmarks: Science and Society]. Within weeks of its publication, no self respecting UK-based science communicator could be seen dead telling anybody anything, suddenly it was all supposed to be about listening.
On the face of it, posters are hard to listen to, but we were not to be daunted, and decided our campaign had to be focussed on issues not factoids. With some trepidation we contacted euro-mission control and asked if this rather radical rethink would be OK with them. Not a lot happened, indeed we had to remind them that we had asked the question, and then they responded with the euro-speak version of "Yeah, whatever"
It was beginning to dawn on us that now that the experts had passed judgement and dispersed for ever back to their fire stations, language laboratories and businesses there was no-one out there who cared what we did at all. It was tempting to test this hypothesis by sending another message along the lines of; "Having great time in Seychelles please send next cheque care of the Beach Bar, Hotel Exotica" but we desisted. Instead, we began the process of discovering whether it was safe to assume that our trans-european target audience shared the same preferences in terms of graphic and textual styles. It was time for Ben to hit the road convening focus groups in five countries, and bearing sample graphics created by Jon. We had high hopes that there would turn out to be headline grabbing differences in national preferences but ended up discovering that the euro-young, of whatever nation, had similar likes and dislikes. That is except for the Germans who fascinatingly conformed to the comic book caricature of a nation who liked detail but disliked ambiguity.

Having established that one style would fit all [except the Germans] and that the most engaging aspects of the test graphics had been the colour palette and the focus on people, Ben had also asked the groups what they saw as the major science and technology based issues facing society. That was the starting point for our selecting medicine, agriculture, transport and e-communication as the issues to feature in the final campaign.

And so back to the devising team and one of those long afternoons labouring in the creativity mines. At some point it was agreed that the campaign had to be about the audiences opinions and their influence on their choices. We would pose a question like “More lives or better lives?”, which was open ended enough to stimulate discussion but also closed enough to provide a response in a particular context. We knew from the UK work that the most powerful way of engaging the audience would be using strong graphics and colours, and from the pre-research that pictures of people attracted attention.
The afternoon ended with a Janus concept which involved posters showing a human face looking in two directions, one towards images relating to negative consequences of scientific advance and the other towards positive ones. The drafts were striking but we needed something to compare them with, we decided to test single ambiguous pictures against our “twins”. It was a good thing we did because the focus groups, to which Ben returned, tended to dislike being led into perceiving good and bad aspects of science and technology applications preferring the single ambiguous picture, and quickly getting into discussion of its meaning and implications. It was at this point we needed to get our partner involved so we also sent them the drafts. They were less than enthusiastic, partially because they would have been happier if we had been explaining how useful science was to everybody and partly because they felt that the posters had little to do with science. After a blizzard of fraught e-mails, telephone calls and a face-to-face meeting at which it becomes clear that they are particularly upset by the square tomatoes we had used to illustrate the More Food or Better Food poster. Now, square toms have a venerable history in the world of science communication in the UK because some press officer became distressed that Her Majesty’s press corps wasn’t taking a blind bit of notice of the amazing things that genetic modification might do for the person in the supermarket. Their solution was to dream up the cuboid tom concept , as a way of illustrating how much more convenient it would be if vegetables could be persuaded to be sandwich shaped. Thus unwittingly bringing about the Kracken like awakening of the Daily Mail to the concept of Frankenstein food.

We had used them for these symbolic reasons, and because they are a rare example of a modification so obvious that it works pictorially. However, we conceded that their inclusion might be seen as inflammatory, particularly to the euro-version of Daily Mail readers. So Toms were out and the Lonely Lettuce was in.

The other bone of contention was that the posters in their draft form did not mention either science or technology, a good point which led to the inclusion of a second question on the poster “Does science have the answer?”

We parted on good terms. The new versions of the posters were re-tested by the roving Ben, they promoted discussion unprompted, we were nearly there with the concept except we had yet to answer the question “Why would discussions of the kind triggered in the focus groups happen in a bus?” Would a Goth start an animated discussion about the future of transport with the punk across the aisle? Would friends sharing an account of their drunken exploits of the previous weekend suddenly spot a poster and launch into deep consideration of the risks and benefits associated with genetically modifying lettuces. We thought not, or at least not often, so we had to build in another way of getting the magic dialogue going. One obvious option was a website, at that time becoming an almost compulsory ingredient of any science communication campaign, particularly ones that sought to get into the blissful state of two way communication with the great British public. However, a quick survey of all these enticing opportunities to give your views revealed that many attracted no participants at all, even when featured on the sites of prestigious organisations like the Royal Society. But we said we’d have a web site, indeed the Estonian fireman would have been amongst the first to spot its absence from our plan, so we created one, bought the enticing domain name choosenow.net and featured it on the posters. However, we still weren’t convinced it was likely to attract hordes of opinionated bus passengers. Would that Goth forgo the pleasure of a dialogue opportunity with the punk and instead jot down the URL on the back of a fag packet, it seemed unlikely. However, we reasoned what if said young things spied an SMS number wouldn’t their fingers itch to use it?
It seemed worth a try and we could arrange for any messages to be posted on the website, thus covering at least partially for any lack of a blizzard of two way communication.

Now it was just a simple matter of getting a total of 8018 posters printed in twelve different languages, having first checked that the translations all conveyed the same message. Good thing we did really: it turned out that rather than asking the bus travellers of Lisbon about their views on the future of transport technology [More Journeys or better Journeys?] we were about to pose a fascinating but less relevant question, namely “More Holidays or better Holidays”.

So it’s off to Brussels for the launch of European Science Week 2002. The whole team took part a look-alike double decker London Bus had been hired. The venue was central and close to the Museums but there was a snag. The spot was not one frequented by many Brussel-ites, and those that did come by were being frogmarched towards museums by their teacher. Fortunately we had anticipated that we might need to pull our own crowd and had brought the ingredients of our physics tricks which we used to divert the crocodiles of children in our general direction. Tactically sound but not much related to the purpose of

our campaign, in fact, it was dangerously close to a relapse into the “wow isn’t science great” model so vilified by our colleagues. Meanwhile back on buses across the EU people were encountering our posters and in some cases texting in their views. Most seemed to get the point except for a bloke in Athens who clearly thought we were a rather oblique way of advertising an escort service.

Messages varied from a straight one word answer to the question “more” or “better” to concise crisp expressions of opinion like in response to *More food or better food?* …

> “Personally I believe that better controlled food would be the first step into the right direction”
>
> “YES to local and appropriate farming technology. NO to global companies controlling our food and trade”.

….and in response to *More lives or better lives ?...* rather touching personal statements were offered such as..

> “Supposing my mother had chosen to abort me and my brother due to the fact we had Cystic Fibrosis. I think the world would have lost out especially my girlfriend. Perhaps science will rid the world of CF before birth and that would be great”

The future of agriculture and medical advances posters attracted the most text responses, 49 and 112 respectively, hardly a deluge. As we had suspected there were minimal active visits to the web site.

One further disappointing aspect of the campaign was the difficulty of getting press coverage for it. One problem was probably that journalists do not anticipate their readers to swoon with excitement when they read of projects funded by the European Commission. Another was that it was extremely difficult to create the kinds of relationships with journalists you need to get them to print or broadcast your story.

However, it was still the case that we had shown that it was possible to use posters to get reactions from bus passengers to science and technology hot topics, so, we wondered might this be a new way of getting the public to contribute to local planning processes?

An opportunity immediately arose to find out when we were awarded a Partnerships in Public Awareness Award by the EPSRC. This scheme aimed to get the findings of EPSRC funded scientists out into the public domain. Ours was Jim Longhurst an air quality specialist who ran the Air Quality Management Resource Centre in the next office.

The interesting thing about air quality is that at some point it was decreed from on high that every local authority needed to have an Air Quality Action Plan and that furthermore they needed to consult the public whilst coming up with this desk bending document. By the greatest of good fortune Bristol was in the middle of such a consultation and so a bus campaign was born. The posters were not to be inside buses because that's where virtuous souls resided who had already decided that the purgatory of travelling on public transport would ensure them an afterlife in a pollution free Valhalla. No, it was the environmentally unfriendly motorists and the pedestrians inhaling the afore-mentioneds' exhaust fumes that we wanted to reach. And so we did, using a poster carrying both an SMS number and an invitation to express your views at the Bristolsays.com website. It would once again be disingenuous to suggest that the SMSs flooded in, we got 25 over two months or that the Council ran out of questionnaires, eleven were requested, but given the normal difficulty Bristol City council had in portraying itself as being in touch with the person in the street it was in everybody's interest to present it as a bit of a triumph [see my previous remarks about evaluation].

A disappointing aspect of the campaign was that we had anticipated persuading the local media to get involved and they did indeed publish a short piece and a photo in the local paper, but that and an interview on local radio was as much as we achieved. It could have been that local media don't like to see themselves as being on the side of the Council, preferring stories about local gerrymandering or the sexual adventures of the Lady Mayoress. Or it might just have been that people giving their opinions to strangers a priority similar to discovering if their mother-in-law has had a nice day.

3.12 **Meet the Gene Machine**

[Tips and Techniques: Triggering Dialogue and Engagement; Choosing the right medium for communicating the message; Getting and Refining Ideas]

Meet the Gene Machine began life as a response to a call for ideas from Helena Sojkova, the British Council's science specialist in Prague. It was 2003 and the BC had produced a not very interactive travelling exhibition to mark the 50th anniversary of the publication of the structure of DNA. Helena was after something more likely to engage 16-19 year olds and we got the job. Our idea was to use a comic mini-drama to kick start debate about the implications of advances in genetic screening for individuals and society. We were not the first to use drama to trigger discussion. The approach had been pioneered by Y Touring under the direction of Nigel Townsend [see www.geneticfutures.com]. However, their projects had been very much built on the theatrical model involving playwrights, professional actors, sets and lighting rigs. We wanted to try to simplify delivery of the event, thus possibly making it more contagious.

We decided to use a format that was universally identifiable, a TV game show, and set the action thirty years in the future. Two characters were involved, one being the show's oily host [Peter], and the other a member of a team that had invented "The Gene Machine" [Katka] – an exciting new device that could read a person's genetic code in seconds and flag up the presence of gene variants with known implications. Ben and I wrote the basic script quickly and it was dispatched to Prague for translation. A passable Gene Machine was produced by a few cosmetic additions to an old pH meter and it was time to roll. We had only one day to rehearse our two Czech presenters, both of who were students with some experience in amateur productions. Looking back it was taking an extraordinary risk to assume that they could pull it off the next day in front of an audience of potentially terminally bored teenagers, particularly since we had not given any serious consideration to how they would be able to facilitate the discussion triggered by the drama.

Fortunately, we had been found two very bright people and they triumphed, catching and holding the audience's attention and then being able to get them to discuss the issues raised. And the audience seemed to be enjoying itself, which could not be said for the members of the Czech Academy of Sciences whose premises we had borrowed. They were close to apoplectic, claiming that it was irresponsible to raise the issues with young people who would be much better served by watching a video that explained the science behind molecular biology. We did not agree but couldn't prevent them showing such a video at the end of every subsequent performance of Gene Machine.

3.13 **Hot Topics**

[Tips and Techniques: Triggering Dialogue and Engagement; Getting Funding]

I had never encountered a Science Centre until I took the job in Bristol and saw signposts directing me to the Exploratory. It was only when we had some visitors with young children that I paid my first visit and I remember being somewhat taken aback when asked to pay for admission. Partly no doubt because of my Scots ancestry, but principally I think because in my mind I was doing everyone a favour by getting kids interested in science. My first impressions were of a dark space filled with a marvelously eclectic mix of objects, from giant mirrors to bicycle powered computers and a large hot air balloon. I felt that I was entering the double garage of an engaging neighbourhood character who loved entertaining people through science. Heath Robinson's world presented in three dimensions. The kids loved it, rushing from plore to plore [yes the exhibits really were called plores] hitting buttons and occasionally each other. It made my attempts to communicate science seem rather staid and conservative and I immediately became possessed of an ambition to somehow devise a plore for such a place.

I was quickly to have my chance because a group in Bristol, which included the founder of the Exploratory, Richard Gregory, was one of those that had won a large prize in the great Millennium Commission capital projects lottery. The project was to create a New Exploratory in a custom built space on the Harbourside. It was the perfect chance to realize my latest ambition and I immediately began to plan my pitch to whoever was eventually going be in charge. I had noticed that the majority of the exhibits at the old Exploratory illustrated the wonders of 19th century physics and engineering, while chemistry tended to be kept as a subject for demonstration lectures in the best H Davey tradition and biology was principally about the senses, particularly sight and hearing.

Contemporary science was almost entirely absent and that was the niche I decided to target.

One of the first interactive Science Centres, the Exploratorium in San Francisco, founded and directed by Frank Oppenheimer, the brother of the father of the first atomic bomb had been based on the idea that the public lacked opportunities to experiment and that a science centre was a place that permitted free-flowing experience of the joy of inventing things. Consequently, Oppenheimer's nickname for the Exploratory was "The Shop" as in workshop and, early photos of it resemble a scaled down scrap heap.

I was quickly to discover that this was not everyone's conception of how a modern science centre should be designed. The Bristol team turned out to contain two factions, one group had founded and run the Exploratory and were very much disciples of Oppenheimer and the other had been the business brains behind the bid for Millennium funding who saw science centers as the visitor attraction for the 21st century, surviving by competing on equal terms with stately homes and theme parks. I found myself caught in the crossfire between these two factions when it became clear that working to create an exhibit for what was now, temporarily it turned out, called Science World was seen as a grave betrayal of trust by the group that had founded the Exploratory. All of whom were going on record as believing that whatever did eventually open its doors on the Harbourside would be a monument to the folly of putting high design values ahead of substance.

However, all was not conflict and gloom, Science World had appointed Kathy Sykes as their first member of staff and she was busy hunting down good ideas. I worked to ensure that everywhere she looked she bumped into mine, and particularly the Newsroom, a multi-media means of bringing the science behind breaking news to the public. She liked the idea and it went on some kind of list of possible content. It was at this point that the first Director of Explore was appointed, an ex BBC man whose vision was of the science centre as an electronically mediated Pandora's box, an immersive, interactive e-environment that would respond to the needs of every individual visitor, or something like that anyway. Such electro-arm waving further enraged the double garage mob, but also posed a problem in terms of the meaning of hands-on in such an environment. Had everything been reduced to touching screens and moving mice? Tricky questions of this kind are usually circumvented by new terminologies, and right on cue, everybody was suddenly talking about minds-on.

I have to admit to never really understanding whether this was a sideways kick at hands-on, since it had been criticized by some as not promoting deep learning or a claim that electronically mediated learning was more intriguing and flexible.

It wasn't long before Ben and I were pitching the hands-on, and of course, minds-on Newsroom to the electro-gent who seemed impressed, and offered us the princely sum of £2000 to do some testing of the idea at the Exploratory. We had grand plans, imagining that the pilot would lead to a fully electronic version within the Exploratory that on refinement could be moved into Science World. As I recall our three target stories for the test covered; the fact that the Israeli winner of the Eurovision song contest had undergone a sex change operation; a welsh bloke who claimed to have invented a perpetual motion machine, and an article about the shelf life of sun creams. We didn't have the money to do anything more than produce large blow-ups of the stories and invite visitors to ask the questions that occurred to them on either post-it notes or large pieces of card. Not exactly hi-tec but enough to demonstrate that visitors were intrigued by the idea. We hot foot it back to Science World mission control just as the electro-bloke is clearing his

desk. We are back uncomfortably close to square one. Next I know we are invited to a meeting with what turns out to be the consultants who have persuaded the management that they can deliver what is left of the electro-vision. They ask politely what this Newsroom thingy is exactly and I press my play button one more time. No-one interrupts but I had an uncomfortable feeling that they would rather be elsewhere. Kathy adds her enthusiastic and supportive contribution and we get down to the nitty-gritty, they want the Newsroom to be an activity for kids, a sort of write your own newspaper against the clock exercise. Now it's my turn to look puzzled, whatever happened to enabling people to explore the science behind news? Looking back it was I who had misunderstood, science centers are, to all intents and purposes designed for and used by children bussed in from school during the week and children accompanied by their middle class families at weekends and holiday times. I had failed to distinguish between the rhetoric of science for all and the reality of "Science that's great for children, who may or may not be accompanied by middle class adults".
So we now had a new Newsroom concept and had to start testing all over again this time in schools. The first one selected by the Science World team was a struggling comprehensive in South Bristol. The class of 14-15 year old guinea pigs were tolerant of our intrusion rather than intrigued by our presence. We worked very hard to make the session a success, but the test software was pretty dire and the task too poorly defined. So I scored it roughly a draw, some of the kids engaged with the story writing task, but several boys passed the time trying to hack into the programme, whilst the girls stayed in huddles that when approached, suddenly switched from animated and gossipy to fixed expressions and formality. The next week it was a primary school and a room full of enthusiasts all competing for our attention. Most of their questions were related to how to run the super clunky software and so when I was beckoned over by a small boy, I was ready to explain which button was meant to do what. I was puzzled when he said nothing, simply looking me up and down from my white hair and beard to my red shoes. After a few seconds of detailed scrutiny he asked "Are you Father Christmas?" It seemed wrong to break the spell, so I said I was but it was only a part time job, and I was forced to spend the rest of the year grafting at UWE. Apart from this delightful diversion, the session went better than that with older children, but only as a result of frantic facilitation by Ben and myself.

We were still, at least on paper, on track for there being a Newsroom in Explore, as Science World had now become [it was confusing]. There was even a draft floor plan which marked where the Newsroom would be and an artist's impression of it in operation. It looked like the home strait: it was now only 15 months until Explore opened, we had weathered two changes of management, a close encounter with consultants, endless meetings, carried out two rounds of audience testing, but still no green light. We wondered why until we learnt of management change number three and a few days later that the Newsroom was no more. I wish I could say I was surprised but the idea always had the Achilles

heal that it would need staff to run it and staff were one thing that was going to be in short supply after Explore opened. This was because the funding from the Millennium Commission was only covering the capital cost of creating their projects. In the running phase the new centres were all going to have to fend for themselves. This requirement had been known at the time that the applications were made and had led to the submission of some fairly outrageously optimistic business plans. As all these projects opened their doors the air was full of the sound of chickens coming home to roost and dire predictions of embarrassing early closures.

The Newsroom was dead but it turned out to have some posthumous admirers, possibly because it would be embarrassing for Explore to contain no electronic gizmos that connected visitors to contemporary science, having featured the Newsroom so often in its own presentations. So we were back in meetings, planning what came to be called Hot Topics stations. Strangely, these stations which would enable people to express and explore their opinions about topics like genetics, cloning and robots were in many ways closer to the philosophy of the original Newsroom and could be customized for different genders and ages of user, just as the electro-bloke had dreamed.

We were working with Mousepower now, a trendy software developer based in part of a stately home. I felt like a proper media person, discussing shooting schedules, voiceovers and megabytes, but the link to current news had gone and that had been the core idea. Also we had created no linkage between the people expressing their views and the people who needed to hear them, like policy makers and politicians. This reduced the incentive for visitor participation as well as the perceived value of science centres to those with influence and cash. Time was now too short to make such arrangements. Adrenalin was high but our spirits were not. Work that could have been spread over two years now had to be completed in weeks. Consequently the opening of Explore was both bitter and sweet. We had done it, our plore was in place, but it wasn't what it could have been and as I sipped my glass of white wine I wondered how many other people there were in the room who felt as I did.
At the time of writing Explore has, along will all but one of the Millennium Science Centres, established a key role in science communication in the UK and although it doesn't have a Newsroom, we have worked successfully in partnership with them on several projects, including the Masters in Science Communication. There was light at the end of the tunnel.

3.14 **Cheltenham Science Festival**

[Tips and Techniques: Getting Started; Triggering Dialogue and Engagement; Getting Funding]

My adventures in festival-land began in 2001 with a phone call from Jeremy Tyndall, then Head of Festivals at Cheltenham. He already ran Music, Literature and Jazz Festivals and wanted to add a Science festival to the portfolio. My first question on sitting down with him was why Cheltenham ran Festivals at all. "Because we haven't got a river and nobody had the sense to call anything a cathedral" was his lightening riposte. It turned out he had been given £2000 by Tony Higgins, the irrepressible head of the Universities and Colleges Admissions Service which was based in the town, to commission a Feasibility Study from someone as obviously dispassionate as myself. I was quick to accept and recruit Simon Gage, the Director of the Edinburgh International Science Festival as the external expert and Ben as the evaluator. We visited venues, held consultative meetings, made up balance sheets and finally to no one's great surprise solemnly reported that, in our objective view, having taken most things into consideration, Cheltenham would be mad not to move at speed to add a science festival arrow to its quiver. I was then invited to attend my first but by no means my last meeting of the Board of Cheltenham Arts Festivals Ltd, which was, to be tactful, interesting. Firstly, you clearly couldn't be eligible for membership until you had retired from running some mega-corporation or quango. Second, none of the Board had any idea at all about what a Science Festival might involve, except that it was bound to feature white coated blokes muttering acronyms into their beards, watched attentively by an audience whose members looked and sounded much the same as themselves. My initial attempts to shift this perception seemed to be going well, every one remained awake, several began to smile. I gained in confidence and began to wax lyrical about the festival encompassing not just science but also the visual and performing arts. Some eyes hooded a little and I realised, a little late, that I might be stepping on some pretty sensitive toes given that all three existing Festivals would not be keen to see their hard earned sponsorship diverted to support science. I just avoided ending up in the ditch by rapidly moving on to say that a science festival would be picking entirely different pockets from those in which the other festivals dipped, which seemed to calm things down somewhat. I left the meeting with a conditional go-ahead and a member of the Board, David Setchell, as my minder and first Chair of the yet to be convened Science Festival Advisory Panel. He was an accountant who had recently retired as Chief Executive of Gulf Oil [Europe], so I suspected this might be a ploy to smother the infant festival in balance sheets, but this turned out to be unfounded as he quickly became a strong and voluble supporter of the Festival, bending ears and arms in our support. I even thought I detected him mildly bending the rules of accounting in our favour on one occasion. The first meeting of the Advisory Panel, whose membership mapped well onto my personal group of suspects was arranged in the back room of a pub off Portland Place that had become my unofficial London

office. It worked OK, once we had negotiated the axing of the musak and had a couple of drinks, although I did get the feeling that our Chair was a little unused to weighty if light hearted deliberating in a space that others thought of as being the way to the toilets. Key decisions made at this meeting were that the Festival should:

- be short and include both week days and a weekend
- have a programme that targeted specific sub-groups within the audience
- avoid having a fringe, so as not to compromise the brand
- feature events that enabled the public to have close encounters with scientists
- programme the science popularisation celebrities
- include social and artistic perspectives on science

Back to the Board with a plan and an idea of the programme structure, and the news that a local Charitable trust had come up with £10,000 to fund a six month appointment for a Festival Coordinator. An amber light was forthcoming, proceed with caution. We had left the scoping stage and it was time to appoint a Festival Director. It was, I think, assumed that I would apply, but I had reservations about my ability to deliver a great Festival alone and had some time earlier asked Kathy Sykes whether she might consider co-directing the Festival with me. My choice informed by an excellent experience of working with her on the at-Bristol project and the fact that working with an attractive thirty something year old, female physicist would balance my contribution as a fifty three year old ex-biochemist and Father Christmas look-alike.

We were not the only applicants and were therefore summoned to a rather surreal interview with Jeremy and David. They asked us for our festival vision and as rehearsed in the car moments earlier we told them our Festival was going to be:

- mesmerising and attractive
- sharp and edgy
- compressed, both in time and space
- multi-faceted

Like a diamond, in fact, something that did not have to be large to catch attention and could be re-cut on an annual basis. They bought it and the serious business

of getting an organiser began. An interesting aspect of this search was that by mutual consent it started with the assumption that the ideal candidate would be a dynamic young scientist who wanted to make a career in communication. Possibly because that was the way that Kathy and I had developed our careers and also because the existing Cheltenham team contained no scientists and were concerned that they lacked the expertise to mount a science festival. No-one fitting this description could be found, and time was pressing so we made the mistake of appointing the one person who was available. Fortunately a month later this person terminated their own appointment by the simple expedient of going AWOL. With the clock ticking ever more loudly, it was decided to make an internal appointment, namely Clare Reddington, an arts graduate.

It was a great move. Clare was amazingly dynamic, a seasoned fund-raiser, hungry to establish her credentials in the Festival world and, as an arts graduate able to tell Kathy and I when the boffin in us was showing. Now all we needed was the money. Long hours explaining, using mainly wild arm movements, that the Festival was going to be amazing and was not going to resemble an academic conference or a trade fair followed. The reception was generally warm but encounters too often ended with a vague expression of interest and a warm invitation to return after we had shown it could all work as we claimed. There were exceptions, most notably the Wellcome Trust, but as the London launch loomed we still had no title sponsor, although the programme was looking promising, featuring a mix of big names, hot topics and hands on experiences.

Fortunately, Pfizer, and more specifically Gill Samuels, was in the wings and in a piece of high drama that couldn't have been orchestrated turned up at the launch at the Royal Society with The Cheque. In the space of five minutes we went from being a beguiling bag of hot air to the coolest kids on the block. Money was still an issue, but with big players committed it became easier to find the rest of the cash. Pfizer were not seeking editorial control in return for their doubloons, although they would be watching intently to see whether we delivered an event with the buzz we had described. One thing they did know was that the theme which was going to be Pleasure. Sciences contribution to it was going to be explored from every conceivable angle, from drug induced euphoria, to mood altering food, and of course, sex, although smelling salts might have to be available to some members of the audience.

Back in Cheltenham, the Festival machine was at full revs, and we had the great advantage that the team had all the marketing, fund raising, and Press and PR and skills we needed, plus an education department that had good relations with local schools and colleges. I began to realise just how different it would have been if we had been founding a Festival from scratch. However, despite all these riches, I could not escape the feeling that the Cheltenham audience were not exactly in desperate need of opportunities to connect with science and technology. A feeling that was strongly re-enforced by a meeting with the marketing department of the Daily Telegraph who had, in the shape of their

Science Editor, Roger Highfield, expressed an interest in becoming the Festival's media sponsor. After my usual difficult climb over the so-what's-a-science-festival hurdle, it was straight into, why-should-we-be-interested-the-audience-will-all-be - Telegraph-readers-anyway.
I couldn't answer that one, except by saying that association with a first class science festival would further enhance the Telegraph's reputation as providing strong coverage of science and technology. Not a point, that seemed to impress hard-headed marketing personages of the kind who were on my case. It came therefore as something of a surprise when they did decide to become the media sponsor, although with hindsight it was probably because firstly it wasn't going to cost them a great deal, secondly they might have been concerned that we would go straight round the corner to the Times, and thirdly because Roger was a persuasive and influential bloke.

Back at the office, we were struggling to finalise a programme, and were encountering all the last minute hitches and apparent disappearances from planet of key contributors that characterise such endeavours. We also had to deal with honouring all the outrageous promises we had made to sponsors and ensuring that their contributions fitted into the programme, a task that required the negotiating techniques of a second hand car sales executive combined with an ambassador class diplomatic pose.

Our biggest innovation from Cheltenham's point of view was that we were going to convert the largest central space in the Town Hall into an interactive science exhibition rather than use it, as all the other Festivals did, as their largest performance or presentation space. We had decided to do this for two reasons. The first was that we needed to find a way of placing interactivity literally at the centre of the Festival-goers experience, since we anticipated that this would add greatly to the buzz of the event, and that such a space would attract children and their families thus potentially widening our audience. Secondly, and more pragmatically, we suspected that there would be very few science popularisers who could attract the audience of 1000 people needed to fill the Town Hall. We also agreed that access to the interactive space should be free, a brave step given that it would be expensive to create, a loss leader if ever there was one.

The schools programme was the first to be launched, and to our great relief, many of the events sold out that evening, before the programme had even been printed. We had opted for the model whereby the kids would be bussed to us, rather than the Edinburgh one where a separate programme of events was created in schools in the two months leading up to their festival. I liked their idea both because it probably made life simpler for the schools but also because it worked as a means of pre-publicising what would be in the Festival programme proper. However, despite Simon's finding that this model paid for itself, the logistics of publishing two programmes and running what amounted to a booking service seemed more than we could bite off in our first year.

The moment had come to go to press with the programme and hold our breaths, the Festivals had a large mailing list of past ticket buyers, but would they turn out for a science festival? Would Telegraph readers be arriving by the Jaguar load? Might a new audience of local people be attracted by the child centric nature of the layout and the programme? No-one really had the least idea, although we did have the advantage of knowing that some of our stars like Richard Dawkins and Simon Singh had pulled big crowds when featured at previous literature festivals.

The first resume of ticket sales was a landmark, it was already easy to spot our sure fire winners, and not all were the ones we had anticipated.

In some cases events had to be given the equivalent of emergency resuscitation because no-one appeared interested, a process which began with giving tickets away to anyone who asked and ended with three line whips requiring every able-bodied member of the team to drop everything and attend the actual event disguised as fascinated members of the paying public.

We had followed the policy of the other Festivals in using the local repertory theatre, the Everyman, as our 650 seater venue but found it hard to make it as atmospheric as the Town Hall. However, it was sold out by at least one of our TV scientists, so that seemed to make it worthwhile.

The immediate lead up to the Festival was unsettlingly quiet. Clare and the production team were frantically creating the spaces in which the Festival would happen but the Directors seemed a little superfluous, waiting in the wings, nervously adjusting their apparel. I travelled to Cheltenham the day before the Festival full of apprehension. First stop was the Town Hall. Could a Georgian Ballroom be transformed into a Discovery Zone, or would it just look like the set for the village panto? I need not have worried: the quirkiness of the space, if anything enhanced the impact of its new furnishings, including centre stage, a robot arena.

Next, it was a curry with those who had volunteered to act as “runners” during the Festival. Not a title which I was particularly enamoured because, for me, the term conjured up a dogsbody image which belies the fact that they were to become the face of the Festival. Probably, more central to the visitors experience than anyone else and a vital source of intelligence about what was working and what could work better.

The dawn of Day1 Festival 1 was bright, but were we going to pull a crowd? We had sold a respectable 13,000 tickets for the set piece events, but what about the free ones. Would it turn out that no-one cared about the potential conflicts between science and religion, or that their appetite for interactive science had been satiated by the great Science Centre infection? It had never really occurred to me that I was going to spend much of the five days introducing speakers and chairing events. My first assignment was in a less than stuffed to the rafters

Everyman, for an event featuring Sir John Sulston, the man who outsmarted Craig Ventner. I trooped on stage with them, carrying a list of things to say and do, and nervously read it out including stern words about switching off mobile phones. Over to the speaker, who had a good story to tell and then back to me. Time for questions and for my mobile phone to ring, which at least amused the audience. Meanwhile back at the Town Hall, the much talked of buzz had materialised, in fact at times it was more like a roar. The combination of a talk or show followed by time in the interactive zone was going down well with the bussed in primary school children, although some were being dragooned around the spaces in ways which did not precisely conform to the ethos of informal learning. By the end of Day 1 it was clear we had a reasonable formula, backs were being slapped. The Pfizer delegation seemed happy and had turned out to include Gill Samuels' bodyguard, an amiable bloke who began the day reading the newspaper in a corner of the VIP room, but ended it attending events, presumably when Gill's body didn't need guarding.

He was needed that evening for the late night orgasm event because Gill was a speaker. I asked him how he intended to operate if there was an incident and he explained that he could be on stage in ten seconds. I didn't know whether to be alarmed or relieved. The event itself was fine until we reached question time at which point myself, the audience and the speakers all found it was almost impossible to compose a sentence which was not also a double entendre. My favourite being an earnest enquiry about up and coming breakthroughs in the field of clitoris research.

Back at the Kandinsky Hotel, the Kandy to the in-crowd, the bar was full of people who were too excited to sleep. We seemed to have a success on our hands, but still four nerve racking days to go.

One recurring issue was events where the speakers went over their allotted times leaving next to no time for questions from the audience. In the planning phase we had identified this as a potential problem and decided that we needed was for events to be chaired by hard nosed tough talking journalists and anchor persons, well used to controlling the out-pourings of ministers of the crown and their like. Unfortunately the trip to Cheltenham and possibly the loss of the controlling hand of their news desk made our hard noses into pussy cats for whom virtually anything went. It was a good lesson and meant that for all subsequent Festivals we used Kathy and myself and a small reliable corps of people to chair events.

We also learned that no amount of briefing and baby sitting could make one immune from Murphy's Law. A great example being an eminent professor who could not be found as the time of his event approached or even after it was due to start. The queue outside the Everyman was definitely getting restless, fortunately only by Cheltenham standards. Scouts were out across town, the gents had been thoroughly searched, hair was being pulled out, when suddenly

our man appears, he was in the theatre all the time sat in an empty room with his mobile phone turned off. I wish I could say I could have hugged him, but it was actually a shorter sharper form of physical contact that I had to restrain as my adrenaline levels dipped below one gram per litre for the first time in 30 mins.

We were now at Day 4 and really motoring, people were queuing for tickets, events were selling out, and the weekend was upon us. The atmosphere changed, suddenly our morning audience wasn't being delivered by bus. Now, it was a family audience, parents dragged along by their kids or vice-versa rubbing shoulders with enthusiasts coming to learn the latest about their chosen subject. The compactness of the festival made it much easier to assess the nature of its audience, if I had ever hoped that the Festival was going to reach out to groups not normally drawn to science related events, I was disappointed. You had to look hard to spot a young adult, although the robots seemed to attract an audience that included males in their teens. And most people appeared prosperous and well heeled.

These casual observations were confirmed a year later when we commissioned a detailed evaluation The audience seemed in some ways similar to that attracted to science centres, school parties during the week, families at weekends, half terms and school holidays, particularly in bad weather. But there were differences, because the Festival could afford over its short duration to dedicate at least as much floor area to presentations and shows as to an interactive exhibition, something that would not be logistically or financially viable for a science centre. The Festival's, its audience included large numbers of retired people coming to learn about and discuss science, as well as people in employment looking for edutainment in the evenings.

One unique aspect of Science Festivals is that you get to do it all over again once a year, and came over time to understand what our audience's event preferences. The surest fire way to draw a crowd was to field a celebrity, and it had to be one fresh from recent TV exposure. The next was an event that featured anything to do with food or drink, particularly if tastings were part of the package. Anything about the brain tended to be popular and events that focused on brain function, be it normal or abnormal always packed them in. Kids' events could be instantly assessed for potential audience pulling power by asking if they involved any explosions and so on. However, this growing familiarity with the audience had its drawbacks; it became easier to put together a successful programme but the thrill of creating something new had waned. I felt a little like someone acting in a long running West End Show, it gets harder to be excited before performances, and that's the time to leave. And so I did, leaving the festival in very safe hands.

Appendix 1

The Bodmer Report

The Royal Society of London was quick to realize that Mrs Thatcher and her minions needed convincing that science was not a candidate for the fiscal axe. Its first move came in 1982 when it commissioned a report on *Science Education 11-18 in England and Wales* which concluded that:

"science, technology and medicine directly affect, to an unprecedented extent, the details of our daily lives and the *prosperity* of the nation"

However, such learned pontificating could be seen as no more than special interest pleading and so in 1984 Walter Bodmer was asked to chair an ad hoc committee that would find ways of getting the electorate excited about science and technology.

The recommendations arising from this exercise, published as the Bodmer Report in 1985 make interesting reading. Bodmer's committee insisted, rather unsurprisingly given its brief, that the understanding of science is crucial to absolutely every man, women and child in Britain. It placed particular emphasis on its power to promote "satisfaction and well being" for private individuals, its importance to individual voters and its great relevance to the endeavors of every kind of worker, be they a refuse collector or a captain of industry. So far so predictable, but one of the final recommendations deserves to be reproduced more fully, it reads as follows:

"Able scientists…tend to shun the higher administrative responsibilities of government, the Civil service and industry.…To ensure that those who do achieve such positions of influence without a primary scientific education, have at least some understanding of science, science education must be extended and in particular broadened at all levels"

Which decoded means I think: "Keep your grubby, untutored hands off science you prize winning Oxbridge classicists".

In addition to urging improvements in levels of science literacy amongst everyone, in particular the great and good, the report also presses the media to give more coverage to science and present its human side. It concludes with the following "Direct and Urgent Message" for scientists:

"Learn to communicate with the public, be willing to do so and consider it your duty to do so"

Appendix 2

The Committee on the Public Understanding of Science [COPUS]

COPUS was created in 1986. Its main role was to take forward the Recommendations of the Bodmer Report. The members were the Royal Society, The British Association and The Royal Institution, all of whom already had science communication within their remits to different extents. Its major activity was its Grant's scheme whose principal aim was to provide scientists with up to £3000 to use in devising ways of taking science to the public. It also made a small number of grants up to a value of £40,000 for larger scale projects. When the British Association launched their Science Engineering and Technology Week a percent of the grant fund was specifically allocated for events that would happen during that week.
Many of the people who were to become full-time science communicators received their first funding from COPUS and it did therefore play a significant role in developing that community in the UK. However, it did experience pressure both from within because of the differences in histories, cultures and missions of the members and from without in the shape of its key funder the OST. These pressures led finally to its demise in 2003.

Appendix 3

Surveys of Public Attitudes to Science and Technology

OST/Wellcome survey (conducted 1999; published 2000)
OST/MORI survey (conducted 2004; published 2005)

These jointly commissioned surveys of public attitudes to science were extremely influential, particularly since the publication of the first virtually coincided with that of the Science and Society Report published by the House of Lords Select Committee for Science and Technology, chaired by Lord Jenkin. .

This OST/Wellcome survey is worth reading in full, but to give you a flavour of its findings. It showed that the great majority of the representative of the UK population held positive opinions about science and technology and its impact on their lives; examples of responses included:

- I am amazed by science 75%

- Science and technology are making our lives healthier, easier and more comfortable 68%

However, it also revealed that significant numbers had concerns; examples of responses included:

- The more I know about science the more worried I am 32%
- Rules will not stop researchers doing what they want behind closed doors 70%
- Scientists seem to be trying new things without stopping to think about the risks 56%

The survey also identified six distinct groups within the UK in terms of attitudes to science and technology. These groups were

- Confident Believers [17%] who are :

believers in science and are interested in science because of the benefit it brings. They have faith in the regulatory system and in their capacity to influence government. They generally have high incomes, are well educated, middle-aged and more likely to live in the south of Britain

- Technophiles [20%] who are:

positive about science and how to access information but skeptical of politicians and the regulatory system. They also have high incomes and belong to higher social grades, are well educated, and young.

- Supporters [17%] who are:

amazed by science, engineering and technology and able to cope with rapid change. They believe that the government has control. They are more likely than other groups to be interested in engineering and the physical sciences. They are a younger group, a high proportion of whom are in education.

- Not sure [17%] who are:
  uninterested in science or topical issues, perhaps because the benefits of science are often no apparent in their daily lives. Consequently this group has few opinions about science. They have typically low incomes with a low level of education.

- Not for me [15%] who are:

  also uninterested in science or topical issues whilst appreciating the benefits of science for the future and its importance to young peopleThey aer mostly low-income women aged 65 and over and slightly younger male skilled manual workers

  Concerned [13%] who are:
  interested in topical issues and know science is an important part of life, especially for their children. However they are sceptical of those in authority. This final group contains a higher proportion of women than men.

These findings were subsequently been used extensively to make the case for funding of science communication activities aimed at changing attitudes to science.

In 2004 a second survey commissioned by the OST and conducted by MORI re-asked some of the questions posed in 1999.

The results were as follows:

“These days I see far too little about science and technology”

	too little	[%]	right amount[%]	too much [%]
Wellcome/OST 1999	24	55	14	
OST/MORI 2004	49	40	7	
Change(+/-)	+25	-15	-7	

“Scientists should listen more to what ordinary people think”.

		strongly agree[%]	agree [%]	neutral [%]	disagree [%]	strongly disagree [%]
OST/Wellcome 1999		19	50	14	10	2
OST/MORI	2004	31	43	15	8	1
Change(+/-)	+12	-7	+1	-2	-1	

“It is important to know about science in my daily life”

		strongly agree[%]	agree [%]	neutral [%]	disagree [%]	strongly disagree [%]
OST/Wellcome 1999		10	49	21	15	3
OST/MORI	2004	22	49	15	11	2
Change(+/-)	+12	-	-6	-4	-1	

“It is important that young people have a grasp of science and technology”

		strongly agree[%]	agree [%]	neutral [%]	disagree [%]	strongly disagree [%]
OST/Wellcome 1999		37	54	6	1	0
OST/MORI	2004	59	37	3	1	0
Change(+/-)	+22	-17	-3	-	-	

“The more I know about science the more worried I am”

		strongly agree[%]	agree [%]	neutral [%]	disagree [%]	strongly disagree [%]
OST/Wellcome 1999		6	26	18	38	9
OST/MORI	2004	7	28	25	31	9

Change(+/-)		+1	+2	+7	-7	-

"The speed of development in science and technology means that it cannot be properly controlled by Government"

		strongly agree[%]	agree [%]	neutral [%]	disagree [%]	strongly disagree [%]
OST/Wellcome	1999	8	33	20	25	4
OST/MORI	2004	8	40	23	21	3
Change(+/-)		-	+7	+3	-4	-1

It is dangerous to over-interpret survey data but it would be difficult to dispute that the public's awareness of the significance of science and technology in their everyday lives increased over the five year period, with increased numbers of them declaring that they see and hear too little about it and also an increase in the numbers declaring the importance of knowing about science's role in their daily lives. This could be used to argue that science communication had a big impact over the period, or that it had too little impact, leaving the public feeling under-informed.

What does seem to be clear is that scientists have failed to increase the extent that the public think they are consulted over the period. Despite this being a major objective of the bodies that represent them at the science and society interface. It is also clear that the public's concerns about possible negative impacts of science on society and the ability of the UK government to control the situation were unchanged.

Science and Society: *House of Lords*- Select Committee on Science and Technology
Feb 2000

In 1999, it was becoming apparent that despite the best efforts of COPUS the UK population had not concluded that to quote Jon Turney "To know science was to love it"
So another investigation of the state of the relationship between science and society was undertaken by the House of Lords Select Committee on Science and Technology chaired by Lord Jenkin which concluded that urgent counselling was needed. Quotes from the summary include:

" Society's relationship with science is in a critical phase"

and

"..public confidence in scientific advice to Government has been rocked by *BSE*; and many people are uneasy about the rapid advance of areas of biotechnology and IT – even though for everyday purposes they take science and technology for granted. This crisis of confidence is of great importance both to British society and to British science"

Beneath, these headlines the Committee concluded that:

- The key issue was trust, not understanding
- Governmental and institutional secrecy was a problem
- Problems had been wrongly framed as solely scientific
- The public and science had different ways of perceiving and assessing risk
- Science's "licence to practise" was at risk and needed to be actively defended

Their key recommendations were that

- Dialogue be no longer seen "optional add-on" to science communication activities
- Government agencies like the Human Embryo Authority and the Food Standards Agency needed to operate with maximum openness
- Lay people should be directly involved in setting research priorities

The Report led to a considerable shift in the criteria applied by the funders of science communication activity towards favouring projects that involved two way communication between science and its publics and the inclusion of non-scientific members of the great and good on high level Committees and Councils responsible for deciding priority areas for research.