Creative Encounters

Feasibility study for a touring exhibition to promote creative learning in science

December 2007

wellcome trust

Feasibility study for a touring exhibition to promote creative learning in science

Commissioned by the Wellcome Trust

Vivienne Reiss

& Bridget McKenzie (Flow Associates)

December 2007

Contents

1. Introduction

1.1 The brief

The main feasibility study objective was as follows:

> *To present recommendations to the Trust on the potential for a touring exhibition project to commence within the academic year 2007-2008. These recommendations will enable the Trust to create a tender for external contractors to design and deliver an exhibition (or an exhibition in multiple parts).*

The primary focus of an exhibition would be:

> *To disseminate, through a contemporary visual arts-based exhibition, the particular practice of creative learning in biomedical or biological science that is exemplified by projects funded by the Pulse Awards.*

The study involved:

- Evaluating the Trust's objectives for such an exhibition and making recommendations on the feasibility of meeting these objectives (and advising on ways to focus these).
- To review and summarise relevant initiatives in UK education and cultural programming which might:
    - Inform the project (learning what works or doesn't); or
    - impact on the project (for example, potential partners or initiatives to piggy-back).
- To outline a series of practical options for such an exhibition.

The following key issues were addressed throughout the study:

- Adding value and enhancing the impact of Wellcome Trust initiatives focusing on young people's engagement – the emphasis will be on Pulse and the Arts Awards
- Developing capacity and supporting the development of a community of practice in creative learning about biomedical science
- Exploring cross disciplinary/curricular boundaries, spanning formal and informal education sectors
- Devising innovative curatorial approaches, presenting process and exploring notions of quality and diversity
- Engaging with the different possibilities and constraints in different sites for exhibitions - science learning centres, schools (school galleries), galleries/museums with a community focus and libraries

- Generating opportunities for professional development, both subject-specific and interdisciplinary, for artists, scientists and educators/cultural sector workers
- Strategies for site-specific audience engagement – young people, teachers, artists, scientists (professionals from different disciplines) and the wider public.

1.2 Methodology

A set of enquiry themes were developed in order to clarify the aims of the research and to structure the study and proposed interviews. **See appendix 1 for enquiry themes.**

The desk research and literature review involved:

- analysis of relevant Wellcome Trust funded education and public engagements projects,
- investigating related external initiatives and resources,
- exploration of the broader educational and professional context.

A series of interviews were conducted with a representative sample of the potential stakeholder and user groups. The research was conducted through a combination of face-face and telephone interviews. The interviewees include individuals working in science, arts and education sectors and included the following organisations:

- Wellcome Trust,
- Science Learning Centres,
- Creative Partnerships,
- NESTA,
- Clore Duffield Foundation,
- Association for Science Education,
- National Association for Education in Art and Design.

We also spoke to science communicators, arts educators, artists and teachers. **See appendix 2 for list of interviewees.**

In addition to the interviews we met with Barry Gibb and Daniel Glaser to discuss the research and links with the Creative Encounters Programme and attended two seminars of the Creative Encounters team.

This report provides an account of the findings and then outlines our final recommendations.

2. Summary of recommendations

The following text outlines the findings from the feasibility study and provides a number of recommendations regarding the potential for a touring exhibition:

2.1 Overarching aim

- To encourage creative approaches to young people's engagement with biomedical science through a contemporary visual arts-based touring exhibition and dissemination tools.

2.2 Objectives

- Develop capacity and support an evolving community of practice - cross disciplinary and spanning formal and informal education sectors.
- Generate opportunities for professional development, both subject-specific and interdisciplinary, for professionals working with children and young people.
- Engage audiences in dialogue, creative enquiry and activity.
- Add value and enhance the impact of Wellcome Trust initiatives focusing on young people's engagement.

2.3 Audience

- Primary audience group: professionals working with children and young people aged 9-14 years.
- Formal education: science, art and citizenship curricula areas extending links to geography and technology at KS2/3.
- Informal learning: interdisciplinary activities with children, young people and family groups.

2.4 Advocacy

- A highly designed touring exhibition with a launch event at Wellcome Trust would provide a key promotion tool for the Creative Encounters programme and wider Wellcome initiatives.

2.5 Curatorial approach

- 'Creative enquiry' as a process for learning and research is central to the approach, combining aesthetic, scientific and pedagogical elements.
- Take the lead from the Wellcome Collection curatorial approach, presenting objects and images from science and everyday life, as well as cultural artefacts and artworks.
- Use questions rather than facts to convey science as method. Use metaphorical images and artefacts to stimulate questions.

2.6 Content

- Establish a theme that is open enough to relate to a selected number of Pulse, Sci-art projects and Creative Encounters digital enhancement initiatives and bring in reproductions from Wellcome Library and collections.

- Use questions as a starting point e.g. What Can We Become? This leads to subquestions about how humans develop, learn, invent and adapt intellectually and biologically. The above projects or examples can be pinned onto these hooks.
- Signpost and showcase the range of Wellcome initiatives and resources in support materials.

2.7 Young people

- Include children and young people's voices in the exhibition and associated resources, and develop strategies to engage them directly as audiences.

2.8 Professional development

- Curate and design the exhibition and related resources and activities to support work by Science Learning Centre networks, the Association for Science Education and all other CPD providers (including schools themselves).
- Develop awareness of contemporary science practice, contextual and cultural understanding around science and creative approaches to teaching and learning.
- The approach to creative enquiry modeled by the exhibition could facilitate multidisciplinary working.

2.9 Venues

- Target a range of venues, with different types of presentation formats, providing a depth and breadth of engagement, reaching new and diverse audiences.
- Support educators based at these venues to devise relevant audience development programmes.

2.10 Format

- Design and produce a contained touring exhibition providing a unique learning environment, a space for experimentation and activity.
- Produce a box version of the images, texts, objects and DVD that are in the exhibition, which is used in CPD and loaned to schools for temporary displays.
- Enable teachers to download the digital materials from the website.

2.11 Partnerships

- Collaborate with other organisations sharing similar aims, adding value to existing work and creating a more strategic approach.
- Science Learning Centres and Creative Partnerships have been identified as key organisations working in this area.

3 Contextual research

3.1 Wellcome context

3.1.1 Overview

Over the last five years the Wellcome Trust has initiated a series of projects under the umbrella of Pulse to support the development of creative approaches to young people's engagement with science. The initiatives have principally been about targeting work with professionals working with children and/or young people whilst also considering incorporating the voices of some of the young people involved in the work. These projects have involved crossing disciplinary and/or curricular boundaries and they have spanned formal and informal education sectors. More recently Creative Encounters has been established to continue to take forward the practice and to maximise dissemination of the work to date.

Wellcome Trust Education Objectives include the following:

- to stimulate interest and excitement in biomedical science amongst young people;
- to create future citizens who are well equipped to understand and take individual and societal decisions about the impact of biomedical science on their lives;
- to enable academic scientists to enter into dialogue with young people.

3.1.2 Pulse and public engagement awards

Pulse was a young people's programme, funding engagement work through the arts as an effective approach to science learning both in formal and informal contexts. The Pulse microsite (www.wellcome.ac.uk/en/pulse/home.html) has examples of projects previously funded. There are also in-house inventories of selected projects and the materials Wellcome holds relating to Pulse and Sciart grants. Some of this data has been made into a comprehensive list of projects, which is accessible through the Science Learning Centres portal.

It is worth noting that Pulse comes from the Theatre in Education tradition and the visual and literary arts were included in the funding guidelines more recently. In the first year no large grants and only 2 small grants were awarded to visual, literary and digital arts projects. However over the 3 years of funding approx 40% of awards were made to visual and performance art – this includes photography, painting, installation, moving image, sound, media arts, and live art (performing arts such as theatre and dance are separate). There has been less emphasis on more traditional art forms such as painting or sculpture. The majority of visual work has involved film and media art.

In terms of the scientific field explored, 30% of awards were made to projects around genetics, 15% classified in terms of general medicine, followed by 8% with subject matter relating to neuroscience and disease. Approximately 75% of the projects are working with young people in formal education, the remaining are situated in arts or youth settings engaging young people in more informal learning contexts. There are relatively few initiatives involving primary aged children. This study has made use of this data and there has been a separate analysis of projects, which may be suitable for repurposing for the exhibition. **See appendix 3.**

Many Pulse awards cross the performing, visual and media arts and have not only resulted in presentations or exhibitions but exist in distributable form e.g. DVDs. There is also a range of secondary materials including documentation, interpretation and associated resources. For example, there are comprehensive websites based around projects produced by Stan’s Café and All Change Arts. CDs documenting the process are available

from organisations such as the Central School of Speech and Drama. Also, there are comprehensive teachers' packs and resources co-ordinated by Resource Base and First Light and proposals for INSET provision developed by Duncan of Jordanstone College of Art and Design. Added to this, the Wellcome Trust have funded a number of initiatives through their People and Society awards with the primary aim of delivering professional development initiatives or learning resources. **See appendix 4**

Implications for this project

The Pulse and public engagement awards provide a key context to begin thinking about the exhibition. The intention is to build on these projects, developing the practice, in particular the themes and issues the projects address. In addition we are keen to learn from the approach in terms of creative strategies for engaging young people in biomedical science. We have looked at the possibility of repurposing material as well as the opportunity to signpost not just individual projects but also the wealth of comprehensive related materials and resources.

The data provides an opportunity to look at real strengths in projects supported through Wellcome's awards. The dominance of film and new media projects supported by the Pulse awards seems to suggest that any exhibition should either include work in this form or consider the creative use of technology as a means of engaging audiences, which might be in parallel to the exhibition. It also enables an analysis in terms of gaps in provision, for instance, as noted above there are far fewer initiatives aimed at younger children. Also, in terms of approach the majority of projects are strong on art and creative engagement, whereas the science content was sometimes a secondary consideration. These may be areas that the exhibition should address, whilst still drawing on the strengths of the legacy work.

3.1.3 Creative Encounters

The Creative Encounters programme looks at creative approaches to bringing science to young people and provides ideas and stimulus for new, interdisciplinary projects in formal and informal learning. It builds on work from Pulse and public engagement initiatives, ensuring that this practice can be disseminated. The programme includes five 'digital enhancement' projects, a micro-site within the Wellcome website highlighting five case studies, the forthcoming book Creative Encounters and the touring exhibition proposed in this report.

The digital enhancement strand has supported a number of projects to extend the work initially supported through Wellcome public engagement awards. Grants have been made to the following:

- All Change Arts,
- Campbell Works,
- Actiondog Productions,
- Resource Base,
- Paddy Hartley working with The Gillies Archive.

The five case studies showcased online include the following projects:

- Every Breath, which explores animal rights through drama,
- Colour Coded, an exploration of skin colour,
- Café Scientifique, informal meeting spaces to explore the latest ideas of science and technology,
- Mind Mine, which reveals the vastly complex human brain and
- Project Façade, an initiative telling the stories of patients who have had their faces reconstructed.

Implications for this project

This report proposes that the touring exhibition becomes the physical showcase and signposting for Creative Encounters and Wellcome funded initiatives. It can enable the full range of resources to be targeted at specific educational users and it can model their application to creative learning in different contexts.

3.1.4 Wellcome's education resources

The Big Picture series provides teachers and post-16 students with up-to-date information on research findings in biomedicine, and the social and ethical implications of this research. Recent themes have included evolution, thinking, sex and gender, nanoscience, obesity, dying for change (infectious diseases in the developing world), ageing and epidemics.

Two Citizenship units produced by the Wellcome Trust and The Association for Science Education illustrate themes for teaching science and citizenship. The units cover current and controversial science-related issues and address how individuals make choices and how collective behaviour affects the environment.

3.1.5 Wellcome's library and images

The Wellcome Library holds collections of books, manuscripts, archives, films and pictures on the history of medicine from the earliest times to the present day. The library regularly contributes items to exhibitions in museums, libraries and galleries. There is currently an exhibition on tour at the Barbican Art Gallery.

The Schools section provides resources to support teachers and students to make best use of the extensive collections on the history of medicine and related subjects. There are a series of worksheets drawing on resources from the Wellcome Library collections linking to the GCSE 'Medicine Through Time' syllabus, which include teachers' notes and links to relevant websites.

Wellcome images are available for teachers, researchers and the public through a Creative Commons License. They are structured under 6 themes: Wellcome, War, Witchcraft, Wonderful, Wellness, World and include medical images, manuscripts, and illustrations on the history of medicine, modern biomedical science and clinical medicine and cover representations around complex biomedical concepts to life.

3.1.6 Summary of implications for this project

The exhibition provides an opportunity to signpost and showcase a range of Wellcome resources, including the work supported through the awards, its own funded initiatives and the wealth of resources held in the library and image bank. The opportunities for professional development and curriculum enrichment from such a wealth of extraordinary materials, building on the established sciart practice, is enormous.

3.2 Educational context

3.2.1 The science education context

As part of this study we commissioned research from our associate David Barlex, a curriculum consultant for the Nuffield Foundation and lecturer at Brunel University. His expertise covers both Science and Design and Technology education. His contribution ensured that our understanding of UK science education and professional issues was up to date and relevant.

His full report can be found in **appendix 5** and it deals with:

- Professional development provision in England, Wales, Northern Ireland and Scotland
- Curriculum requirements in England, Wales, Northern Ireland and Scotland
- The emerging STEM agenda

The information provided in his report is a summary of that which he conveyed to us throughout the research process. It also supplies full contact details of all organisations cited.

3.2.2 Curriculum reform

The most crucial factor in the educational context is the curriculum reforms across the UK countries. The reforms have the most direct and radical effects on Key Stage 3 and on Science, in particular a new emphasis on scientific literacy. The reforms across all the countries emphasise:

Skills

Broadening the range of core skills and identifying opportunities for skills development across the curriculum.

Wider curriculum dimensions

A number of themes have been identified which enable cross-curricular connections.

- Global dimension and sustainable development
- Enterprise
- Technology and the media
- Creativity and critical thinking
- Community participation

Cultural understanding

Geography and Science, for example, now have strong components that ensure a diverse and ethical perspective, to understand the cultural contexts for the formation of knowledge.

Creativity and innovation

The tone of the new curriculum statements is overtly looking to the future, considering our urgent needs to design new solutions for living.

Wellbeing

The reforms are part of the overarching Children's Plan and the policy of Every Child Matters, which concerns the development and care of children and young people in holistic ways.

Widening opportunities

The plans overtly refer to broadening opportunities for learning experiences, including extending the roles of schools to connect better with the wider community, learning outside the classroom, making partnerships with creative and cultural organisations and bringing in experts other than teachers.

3.2.3 Professional development

Since the Workforce Modelling Agreement, there have been greater opportunities for teachers to undertake Continuing Professional Development. The curriculum reforms, and the overall changes required by the Children's Plan, will require particular strands of associated CPD. The touring exhibition and resources described in this feasibility study has a great deal of potential to support these development needs, in particular to support the Science Learning Centre Networks, the Association for Science Education and all other CPD providers (including schools themselves) to develop awareness of contemporary science practice, contextual and cultural understanding around science and creative approaches to teaching and learning.

3.2.4 Creative enquiry

Our contextual research included reading a range of reports and resources that promote emerging innovative practice in education, which could be termed 'creative enquiry'. This is, broadly, a model for learning that applies connotative or aesthetic practice (the arts, culture and creativity) to denotative or knowledge-based subjects (sciences, humanities etc).

Kerry Chappell articulates the commonalities between art and science, and what matters when they interact in learning settings: *"passion for the enquiry, the ability to ask the 'right' kinds of questions and to challenge, the powerful importance of the imagination, metaphorical thinking, being able to see the 'beauty', the ability to remain open to possibility at the appropriate time, and risk-taking."* (Creative Encounters, Wellcome seminar, May 2006)

The Association for Science Education resources and initiatives were informative. Their view on the range of initiatives is thus – *"Things are already happening to promote creative learning in science, but it needs time to embed. In terms of taking forward there's a range of things that are possible but we don't want to cause more confusion. The STEM programme, run by John Holman, aims to make the whole scene less confusing in terms of initiatives. Wellcome should work broadly within that structure."*

We also learned from the following:

- The *Leonardo Effect* - A project based primarily in primary schools in which learners investigate 'flight' using an innovative, synchronised/integrated approach in which they will research, observe, record, experiment, develop ideas, imagine and create. The approach goes beyond the conventional concept of cross-curricular teaching, by utilising the commonalities of both subjects, to enrich learning and equip children to approach science confidently and more creatively. A report of the project is written by the Technology Education Research Unit at Goldsmiths University of London for St Mary's University College, Belfast supported by NESTA.
- The *Teacher Artist Partnership (TAP) Programme* - A professional development programme for artists and teachers across London, it is a consortium of arts and education organisations managed by CapeUK. The programme has been designed to bring teachers and artists together within a reflective professional framework, to investigate the possibilities and practicalities of working in partnership within the school curriculum, exploring approaches to teaching and learning through the experience and practice of the performing arts.
- *Science UPD8 - A* project from ASE and Sheffield Hallam University addressing the lack of up to date science. It is a web initiative that provides curriculum-relevant stories for teachers KS3 and 4. Members are sent a text message to their mobile phone, or an email, and activities can be downloaded from the website.
- The *Creative Springboard 'I Wonder' - A* resource produced by Creative Partnerships and designed to encourage secondary science teachers to deliver creative science lessons to Key Stage 3. The aim of the resource is to create a positive change in teachers' attitudes, approaches and skill sets in relation to the teaching of science. Key findings from an evaluation of the resource include the following:
    - The poster was the most popular element of the 'I Wonder' resource. Teachers liked the style of questioning, which was deemed as 'not scientific', and spoke to students on their level.
    - Teachers had incorporated a few of the smaller creative lesson ideas into their teaching
    - Teachers suggested they needed more help to develop their skills and confidence to teach in the style presented by the resource. They proposed Creative Partnerships workshops which would be ideal for teachers to bounce ideas off each other and keep up motivation levels.

4 Findings from interviews

4.1 Curatorial approach

4.1.1 Possible approaches

By 'curatorial approach' we mean the general sense of purpose, and the values and aesthetics that inform the project. The possible approaches to curating this exhibition include:

- **The 'aesthetic' approach**

  To create an exhibition of art or an immersive artistic installation, which connects only tangentially with scientific and educational content.

- **The 'science messages' approach**

  To create an exhibition that conveys scientific knowledge and issues, using art and contemporary design to increase its effectiveness.

- **The 'pedagogical' approach**

  To create an exhibition that focuses on teaching and learning activities, showcasing and promoting particular kinds of creative learning practice.

- **The 'integrated' approach**

  Aims to combine all three in balance.

We understood that, in some way to be explored, the approach would need to be integrated, ensuring that the artistic, scientific and pedagogical elements were all of the highest quality, contemporary and relevant. Several interviewees commented on the way in which art can provide the connection. Caroline Coates suggested that cultural artefacts are a means of provoking debate around science, social and ethical issues. She talked about "*shining the light on science through visual metaphor.*" Elio Caccavale commented: *"You need to kick off creative learning with a spark, a strange contemporary thing or artwork."*

There were also some practical questions about what would make an engaging exhibition for the visitor:

- Should the content be sourced from past Pulse and possibly Sciart projects, allowing these to lead and shine?
- Or should it be led by a fresh strong design, which might incorporate a small amount of visual content from these past projects?
- Should the exhibition be an open-ended and active experience, in which the visitor takes part in creative workshops and contributes more content to it?
- Or should it be a spectacular, passive experience to stimulate further creative activity in other settings?

4.1.2 Artistic integrity

The interviewees with the strongest views on the curatorial approach were those, especially Wellcome staff, who had been most closely connected with Wellcome programmes and who wished to see their contemporary artistic integrity preserved. For example, Marie-Lise Sheppard and Meroë Candy highlighted Sciart artwork (such as The Sonic Body and Silent Sound) that "*goes beyond the Science Centre style of exhibition*

interactivity – it's not just you interacting, the exhibition interacts with you". Daniel Glaser describes the Pulse Awards as being about: *"Finding a working practice that can include scientific jargon and discourse but still produce a high quality artistic product"*.

James Peto, asked about the touring exhibition, thought it best to make 'something special', to commission new art or to design the exhibition as art, reducing the 'documentation' of past projects (which will be available in the website and book). He suggested the creation of *"3D items, multiples or modest art objects that speak of the collaborative spirit between artists and scientists, young people and adults."* Because of his view that the exhibition should not just present past projects, he felt that the design brief should be developed carefully by paying a number of design companies to propose ideas that could be absorbed into the overall scheme.

Following on from this several interviewees talked about the exhibition as an art installation and felt that it was important that the exhibition took its cue from the contemporary art world; the concept and structure informed by contemporary art approaches. Sally Bacon talked about the idea of involving artists/curators in the production as with Artworks when Richard Wentworth had worked with the team to curate and produce the exhibition.

4.1.3 Design for activity

"The most useful exhibitions are ones that stimulate activity" Anna Ledgard

Overall, most of the interviewees believed that this exhibition should not be a passive visual experience but a laboratory, with displays that would grow with the visitor's (or rather, the participant's) contributions. They wanted to see a combination of:

- resonant art objects (with cues to stimulate multiple questions)
- the posing of particular scientific and ethical questions (with activities that enable participants to make personal and creative responses to them).

As a good example, Elio Caccavale cited part of the Energy Gallery in London's Science Museum devised by Dunne and Raby. They created hypothetical objects, for example an object that transfers blood into energy, intending that they would stimulate dialogue between adults and children. He feels that an exhibition has to be designed to elicit particular actions or reactions, which won't be achieved if a random range of Sciart and Pulse outcomes is displayed. That said, it is 'strange and interesting' art, and not didactic communication, that works best to involve people and stimulate further questions.

4.1.4 Strip down to questions and metaphors

Anna Ledgard felt that it was possible to elicit such content and create a resonant exhibition from some of the Pulse projects such as Boychild. She said, "*Metaphor is key. To get beyond an exhibition that simply documents projects, you need to strip down to the key question (e.g. the science question) and the key metaphor or image that exposes the nature of that enquiry.*"

Katherine Mathieson from NESTA agreed that the strongest Pulse projects start with an open question, and that these might engage participants and lead to experiment and action. She suggests asking questions on two levels:

- at the level of ethics e.g. 'should we heal people?' and
- at the level of scientific practice and communication e.g. 'can you research or teach something you disbelieve in?'

4.1.5 The visitor makes the exhibition

Katherine supported the idea of an exhibition with several incomplete stories, or starting points that visitors are encouraged to complete, an idea liked by others too.

Jeremy Airey from the National Science Learning Centre would also like to see the exhibition throw out an open question and show how you can enquire about it in different ways. He suggested "*chopping off the end of some of the Pulse projects and leaving it open to visitors to finish the enquiry themselves*."

There were a number of comments relating to an evolving exhibiton, one which could be developed by audiences in different venues. Elio Caccavale was interested in an approach whereby you can "*dematerialise an exhibition and reconstruct it again"*, for example using diaries/cameras and asking visitors to record ideas. He would like to see a show that grows as people do workshops, adding artworks to it. Similarly James Peto proposed that the exhibition grow with workshops. He also added that it would have to be designed to grow (e.g. like a tree, that bears flowers or fruit).

Rehana Mughal from Creative Partnerships sees less potential with static exhibitions (which show a range of disparate items) and more with interactive installations such as the creative lab 'Eye and I'. In this, Helen Storey collaborated with a neuroscientist, and created a room within a room. Actors were placed outside the walls of the inner room, and were asked to express emotions through their eyes. Children were led in and could see the living eyes through small holes. Following such a curatorial approach for the touring exhibition would involve a fresh commission for an installation, accompanied by a set of materials and CPD events that draw attention to past Pulse and Sciart models.

4.2 Content

4.2.1 Possible approaches

There are four possible approaches to sourcing content for the touring exhibition:

- **The 'opportunistic' approach**

  To focus on the Pulse projects which have been subject to the 'digital enhancement' process and those that have produced good quality aesthetic outcomes that will work well in a display.

- **The 'thematic' approach**

  To focus on projects from across Sciart and Pulse that relate to a specific science topic e.g. genetics, and topics connected to this.

- **A combination of the above approaches**

  Find a broad theme that is open enough to relate to the best and easiest artistic outcomes that are available.

- **The 'fresh commission' approach**

  To commission a new art-science collaboration to create an installation (or several) that offer a single dramatic experience, and support this with Pulse models and related materials.

4.2.2 "The question is king"

The interviewees tended to discuss content in the same vein as the curatorial approach because they were not usually considering the practicalities of budgeting and managing a design process. Their replies reinforced the consensus that 'questions at the heart of science' should drive the content. John Steers from NSEAD thinks that the overarching themes in the new curriculum offer huge opportunities for multidisciplinary working, so

again, this suggests exploring the cultural and ethical dimensions of science. Jeremy Airey is keen to blur barriers between what teachers see as science and what might not be science (e.g. ethics and aesthetics).

4.2.3 Show real contexts and play out scenarios

However, there was also a strong awareness that you need to go beyond simply posing questions. You also need to demonstrate how science is done in professional and applied contexts.

Marjorie Smith is dealing with topics such as stem cells and biobanking. She thinks such focused topics are a way in for young people to deal with scientific methodology or bigger ethical issues. She says the first step is to explore why people have different views on these current topics and then young people can begin to understand the complexities and formulate their own views. An exhibition would need to focus in on particular science topics, and play them out through scenarios with different viewpoints.

Anna Ledgard described how in the Boychild project, they continually asked *'where's the science?'* As they took such a holistic approach to masculinity they needed to involve sixteen scientists from different disciplines. The high points were when young people met scientists in their contexts of work - they were hungry for concrete facts about scientific processes. She suggested that the questions to drive the exhibition should be sourced by asking every scientist that has been involved for the key questions that occupy them, perhaps supplementing this with a key visual image or metaphor.

4.2.4 Engaging young people

Although the primary aim of this programme is to reach teachers and other education professionals, in order to transform science learning, these audiences would wish an exhibition to be engaging for young people too. It should model and enable creative learning by teachers and young people together, rather than tell teachers how they can do it.

Although interviews with young people were outside of the remit of this study we discussed ways of including young people both in the production and as audiences with the interviewees, and we have looked at examples of other initiatives where children's and young people's voice essential to the project. A further study could involve some of the young people active in projects supported by Wellcome. Marie Lise Sheppard and Meroë Candy identified the following: Central School of Speech and Drama *Sci:dentity*, Resource Base *Colour Coded*, All Change *Playing God* and a number of projects run by Oxford House.

Anna Ledgard proposed that young people from previous projects could be involved in the design and delivery of the exhibition as well as in initial consultation. Becky Swain from Creative Partnerships echoed this by suggesting that a good way to make it engaging for young people is to involve them in the process of creation. Whilst this could lengthen the design process and make it more expensive, it is a key suggestion that we have taken on board. Suzanne Lee liked the idea of including testimonies by young people, or 'sound bites'. The web site for *Playing God* opens with audio clips of young people's voices. She suggested *"pulling out quotes as provocation"*.

Young people were integral to the development of the Citizen Science initiative (see appendix 4). Consultation events with young people were established to inform the overall project. Junior Cafés (ref 2) are student-owned. The students run the café, choose the topic and invite the speaker. A conversation exploring contemporary issues from science and technology takes place between the young people, scientist and educators.

Elio Caccavale suggested that a way of embracing different audiences, including young people and adults is to layer the content, or make it progressive, for example by starting with the idea of 'creative enquiry', then showing how adult artists/scientists have collaborated, then how young people have collaborated with art-science (Pulse awards), which lead on to active participation by visitors - 'over to you'.

Anna Ledgard was keen to see young people who had been involved in Pulse projects (e.g. Boychild) being invited to present to public or groups in workshops, or to develop a creative workshop within the exhibition. These young people were really involved in the project and became very ready to ask questions. This would provide active opportunities for students to do work outside the classroom, adding to their National Record of Achievement and so on. Anna also pointed out that young people want a personal connection or output from an experience, such as a personal DNA readout or something to take home that they have created.

Fiddian Warman from SODA suggested we should create 'gaming scenarios' and aim to make the exhibition physical. Young people enjoy experiences that enable you to ‘build something and race it’. For example, Actiondog’s Corporeal Cacophony could be experienced in a special listening pod or you could put dancing pads on the floor to use while watching All Change’s dance piece. Whilst these ideas could be difficult to set up it is useful to remember that playing games and using the body are crucial for active engagement.

4.2.5 Facilitation

Given that the interviewees preferred a space that stimulates activity and dialogue, a question arose about how this would be facilitated. Would it need staffing with animators? Or would it be possible to design it so that visitors cannot avoid behaving as if they are in a workshop, and so that adults/educators find it easy to prompt and guide such activity? We feel sure that the latter approach is the most cost-effective. However, it would be important to design these activities to require minimum maintenance by the venue staff.

4.3 Venues

4.3.1 Possible approaches

The possible approaches to sourcing venues include:

- **The mass public approach**

  To identify places or touring devices (e.g. central museums or tents) that attract large numbers of public.

- **The targeted approach**

  To identify places where the target audience spend much of their time in educational or informal learning activity.

- **The creative spaces approach**

  To identify and intervene in unique creative spaces to engage audiences in experimentation and in the production of artwork.

- **The consortia or multi sited approach**

  To set up partnerships between organisations building on local cultural infrastructure, creating hubs of practice at a local level and embedding the practice.

The research has identified different kinds of venues for the exhibition with the potential of engaging diverse audiences. Interviewees proposed science, arts and education venues and some had suggestions for establishing new creative spaces. In the past the Pulse Awards have also been presented in informal spaces such as libraries, youth clubs, health centres and hospitals. Additionally conferences, clubs or festivals with a focus on sciart or creative learning provide other types of venues to host or promote a touring exhibition.

Given the curatorial approach and proposed ideas regarding content, the exhibition ideally needs to be shown in places that are sympathetic with creative and innovative approaches. Several interviewees thought that the venue should be a vibrant, social space where ideas around science and creativity can be exchanged,

discussed; making an environment for activity and production. Elio Caccavale commented that "*Ideally the exhibition needs to create a visually stimulating space for dialogue then it has to be in places where people are excited to go and make plenty of time, and feel happy to settle into dialogue and activity*." Katherine Mathieson suggests that "*people have to feel they are getting a whole experience e.g. glamour of the Dana Centre."* On the other hand as Katherine also points out, there are benefits in taking an exhibition and or related material to the audience in their existing venue, even though this may require different creative solutions regarding structure and format.

4.3.2 Science venues

Science Learning Centres (SLCs) are obvious venues for the touring exhibition and there is growing interest in creative learning initiatives. Catherine Aldridge cites a number of initiatives such as Big Screen Science, a First Light Movies project (Appendix 4), working with SLCs in the South West and North West and Junior Cafe Scientifique (Ref 1), situated in North and South West England. She commented that the SLC in the North East has also been working with poets and artists in residence. The Helen Storey Foundation is developing a new initiative, Wonderland (Ref 2), with The Centre for Science Education (CSE) and the Yorkshire and the Humber SLC based at Sheffield Hallam in spring 2008. Catherine describes SLCs as very different venues with individual approaches and so any tour across the network would have to consider these differences. Creative Partnerships national office has been working closely with the SLC in Yorkshire (Julie Jordan) and the West Midlands (Tina Whittaker). Catherine talked about new developments with Creative Partnerships to establish a creative science network.

There are no Science Learning Centres in Scotland, Wales and N Ireland. Marjorie Smith addresses this issue specifically and suggests alternative venues such as the RSPB or local colleges when they have science days. Reference was made to some previous work Steve Mesure carried out for Wellcome, which mapped out creative science networks.

Science centres and museums are also potential venues for the touring exhibition. Ecsite-uk is a network of 80 venues in the UK. These venues are diverse and some currently tour exhibitions already, such as At-Bristol. Wellcome has recently funded 'Inside DNA: A genomic revolution', a new touring exhibition led by Ecsite-UK and produced by At-Bristol (Ref 3).

A consortia approach was mentioned by a number of people. Catherine Aldridge thought that some SLCs may not have the space to accommodate an exhibition but they could work with a host science centre to partner initiatives or events. This could be extended to other potential partners, for example, arts centres.

4.3.3 Arts and cultural venues

There are a considerable number of publicly funded art galleries in the UK. They operate independently and crucially they differ in curatorial ethos, which means varying degrees of interest in any proposed touring exhibition. Several interviewees talked about art galleries being 'all curated up' - they tend to have exhibitions planned 2 years in advance. Also they may not be the most appropriate venue as their primary target audience is not young people. However those art galleries that have active community programmes may well be worth targeting. James Peto suggested The Lighthouse in Glasgow, Sheffield Millennium Galleries, The Public in Wolverhampton and Cornwall's Truro Museum. Artworks, the exhibition of school art produced by the Clore Duffield Foundation, toured to the following organisations: Walker Art Centre, Poole Study Gallery and the Ashmolean Museum.

Each region has a local cultural infrastructure, referencing Yorkshire Jeremy Airey proposed a range of cultural venues: The Thackray Medical Museum in Leeds, the National Media Museum in Bradford and the Colour Museum in Bradford.

A number of interviewees suggested arts centres as more likely venues. These organisations tend to be more community focused than art galleries and many arts centres, such as Poole Arts Centre, employ education officers or outreach co-ordinators whose job it is to make links with schools or youth centres. There is a substantial network of arts centres that currently take touring exhibitions. Suzanne Lee commented that she would like to see the exhibition in a venue like the Royal Festival Hall.

Other suggestions included the idea of a number of art interventions at the same time in different venues in one region, for example a network of single screens in various venues or a simple kiosk or screen.

4.3.4 Education venues

Schools could provide venues for a touring exhibition although some interviewees cautioned that they are not ideal as they are not 'neutral' enough. Anna Ledgard suggested that "*They have other messages that conflict with interdisciplinary creative learning.*" However there are a growing number of exhibition spaces in schools supported through government initiatives such as Building schools for the Future and the Spaces for Sports and Arts programme. Anna mentioned the possibility of working with newly built schools such as Swanley School in Tower Hamlets and showing an exhibition in their atrium space. John Steers mentioned Chenderit School in Middleton Cheney near Banbury and Church Down School in Gloucester, which have gallery spaces. We also visited Welling School in Bexley, where students use the school gallery to organise their own contemporary art exhibitions. It is worth noting that school galleries work in relation to individual school policies as separate enterprises. There is currently no existing network through which to tour an exhibition. Both John and Jeremy thought that the Specialist Schools and Academies Trust might provide a network which could support the dissemination of the exhibition, targeting schools with a science or arts specialism, as well as school galleries.

sciZmic, is part of Ecsite-uk, the UK network of science centres and museums. sciZmic links science clubs, schools and youth groups with science resources - organisations, exhibitions and on-line activities. They may be a good vehicle to reach young people in informal learning contexts. Catherine Aldridge cited initiatives like Junior Cafe Scientifique (Ref 1) which takes place in cafeterias, common rooms or libraries, not classrooms, and at lunchtime or after school, so that audience and speaker meet on a less formal basis. These are cafes in schools across the North of England.

A number of interviewees proposed PGCE centres as venues, many of which have galleries (e.g. Institute of Education in London), which would provide the opportunity to engage arts and science students in Initial Teacher Training. However, there were several people who cautioned against student teachers being the primary focus for this exhibition.

4.3.5 Creative spaces

Some interviewees were of the view that the exhibition may need to be sited in non-traditional venues, possibly in new creative spaces. The examples given involved an artist or curator finding 'resonant places' to create temporary art spaces or creative labs. Proposed venues included hospitals, health centres, colleges or even shopping centres. In Bristol, the artist Kamina Walton took on the concept of a Creative Lab (based on a model developed by the Helen Storey Foundation) and exhibited work in an empty hospital ward making a creative space for young people to produce their own art.

There were several suggestions for self-contained spaces in the form of a pod or tent. The Big M inflatable gallery (see section 5 The Circus) is a good example of a portable temporary space that can be sited in a variety of public spaces and programmed to respond to a range of host organisations and their audiences. There are also other examples of mobile initiatives such as Lab in a Lorry (Ref 4) and projects coordinated by organisations such as London International Festival of Theatre.

4.3.6 Infrastructure and animation

The idea of a consortium of organisations coming together to host and develop projects in relation to the exhibition, building on local cultural infrastructure, was mentioned a number of times. Where this has worked well in the past the exhibition has been a catalyst for long-term partnerships between organisations. The Primitive Streaks creative lab in University of Derby was set up by an active local authority officer who worked with Creative Partnerships to promote the exhibition to schools in the East Midlands. (see section 5 Creative Lab).

A number of interviewees suggested that the exhibition should tap into existing networks, which could facilitate hosting the exhibition as well as setting up related initiatives or events. Regional and national networks are facilitated by some of the following: Arts Council England, Museums, Libraries and Archives Council, Science Learning Centres, Ecsite-uk, Creative Partnerships and local authorities. The Touring Exhibitions Group is a membership organisation that supports public organisations touring cultural exhibitions.

It is worth noting that the Clore Duffield Foundation made funding available for audience development and education workshops at each venue as an incentive to take the Artworks touring exhibition. This had an impact on the visitor numbers to the exhibition and assisted in securing touring venues.

The idea of working with several large organisations like the Centre for Life in Newcastle or At-Bristol to provide a venue for a larger scale exhibition from which aspects could be toured to other venues was proposed. Anna Ledgard suggested an exhibition with tentacles e.g. an exhibition in one central venue but with small elements in venues (including schools) nearby.

If a populist approach to biomedical science was taken, one in which young people were the target audience, there would be opportunities for associated merchandising. In the same way as environmental issues have been used by the fashion industry with statements (e.g. 'I am not a plastic bag'), there could be opportunities to promote science as a creative and thought-provoking subject by distributing notebooks, pencil cases or T-shirts with art works and ideas on them.

4.4 Professional Development

4.4.1 Possible options

A primary aim of the exhibition is to disseminate innovative creative learning practice to educators in order to transform practice. School staff and educationalists would be the primary targets, but it would also be important to reach science communicators and creative practitioners working with young people in and beyond schools. This means that the exhibition programme must be designed with professional development as a key outcome.

The possible approaches to designing the exhibition include:

- **Making the exhibition engaging for the wider public, in particular young people, but delivering CPD through associated resources and events**

or

- **Forming the exhibition narrative as a training course, overtly aimed at teachers.**

We began our research with the assumption that the exhibition should be engaging for all visitors, and not only speak to teachers. It could act as a stimulus for them to do training events with other teachers or an action research project, but also they could learn through the experiences of young people with the exhibition. We found this view to be reinforced by the interviewees. For example, Jeremy Airey said that *"Science teachers most want active learning and events for young people - the more interactive the more you'll persuade them. If*

the exhibition focuses on teachers and their CPD rather than young people, then they will need to know that it offers transferable skills or learning that they can generalise and apply broadly in their teaching and share with others."

The possible approaches to running professional development include:

- **The partnership approach**

  To organise the programme with CPD and ITT partners who will use the exhibition as a stimulus for their own pre-existing or specially devised resources, events and courses.

- **The Wellcome-controlled approach**

  To staff a Wellcome Creative Encounters team to travel to where the exhibition is and to deliver activities to a particular format.

The partnership approach would be more cost-effective and likely to reach more educators, through familiar and local CPD providers.

4.4.2 What CPD do teachers need?

4.4.2.1 Contemporary science

The new Science curriculum and the STEM agenda require a great increase in teacher's knowledge of current applied science. Science teachers need support in new topics relating to contemporary science: Genetics, Epidemiology (disease & population), and the scientific method are of particular relevance to this project.

4.4.2.2 Citizenship and 'wider curriculum dimensions'

Although science teachers are the key audience for professional development, teachers of Citizenship, PSHE, Geography and History all need to develop their understanding of global and contemporary issues, for example on topics to do with sex and health education and adaptation to environmental change.

Note that Katherine Mathieson warned that "issues might appear to some teachers to be very left-field".

4.4.2.3 Art-science resource gaps for KS2

Primary teachers could be a very willing audience for the programme as they have more capacity to work across the curriculum. Marjorie Smith said that much attention is placed on KS3. Marjorie thinks there is more potential of an impact at primary age re creative learning in biomedical science because of the potential to work in an interdisciplinary way, there is less flexibility in secondary education. Also there are few resources aimed at this audience. Science and Plants for Schools (plants, environment and human reproduction) activities were aimed at primary schools.

4.4.2.4 Awareness of research about science teaching and learning

Derek Bell, ASE, was keen to see the Wellcome Trust supporting teachers to engage with the research that is available about teaching and learning in science. *"Researchers do research, some filters down but it doesn't always get through. How do you get teachers…perhaps driving the agenda, coming up with topics, perhaps with young people? What is needed is something that does that interfacing. How can the Wellcome develop a facility to do this?"*

4.4.2.5 Active learning in science

The SCORE grouping of science bodies has been charged by DCSF with promoting practical work in science. This definition is not limited to lab experiments but incorporates learning outside the classroom, learning in the workplace, active citizenship projects and creative partnerships. The Wellcome Trust, and this exhibition,

can play a role in this initiative. Teachers need guidance to expand the range of active learning opportunities they can offer young people.

4.4.2.6 Models of creative enquiry

The National Science Learning Centre, Creative Partnerships and NESTA interviewees were all keen to see 'creative enquiry' promoted to teachers. Jeremy Airey explained how such models must be made explicit to them, in practical terms: *"They will want concrete examples of how to make creative enquiry work. Science teachers see 'enquiry' in a certain light, as testing or fact-finding. We try to get teachers to think broader than this. It's valid and helpful to show them 'what does enquiry mean to a creative person?'"*

4.4.3 How to design and manage the professional development programme

4.4.3.1 Working in partnership

Meroe Candy pointed out that arts educators are already converted to creative learning, so the CPD programme should target science educators and work in partnership with science providers (especially the Science Learning Centres) to do this.

4.4.3.2 Sustaining and disseminating creative approaches

Derek Bell and Katherine Mathieson both expressed concerns about how to transfer inventive cross-curricular work to ongoing classroom practice.

"The biggest difficulty is what happens beyond it - how do you keep reinvigorating it? Where are the structures that support it? What does it mean in practice? How do you harness the interest and energy?" (Derek Bell)

Katherine raised a question about the best setting for professional development: *"Is it best to come out of the classroom and be immersed in a 'lab' or best to develop in the classroom?"* She suggested that what makes the difference is support to apply creative learning in the classroom.

They, and others, hoped that the exhibition would not simply be a good-looking product referring to past practice, but would be carefully designed, properly resourced and planned with local partners for maximum long-term effect.

Becky Swain from Creative Partnerships asserted that any teaching toolkits need facilitating by people who understand the open-endedness of the creative process (such as Steve Mesure). There must be structures in place (perhaps online) for ongoing dialogue to support reflection and risk. Teachers need to be drawn away from accepting that 'off the shelf' activities and lesson plans are what they need.

4.4.3.3 The Pulse projects that could support CPD (see appendix 4)

- Science and Plants for Schools: Activities to enable primary teachers to raise scientific issues with their pupils, linked to the primary curriculum. These activities are trialed, via teacher training institutions, in 25 schools in the UK (People Award).
- Citizen Science: Engaging young people and teachers in biomedical science and its impact on society. Approaches include video conferencing, chat rooms, drama and filming. Practical workshops for teachers on new discussion and debating skills (Society Award).
- First Light Big Screen Science: Info-labs brought together teachers, scientists and filmmakers to explore science/arts, specifically exploring KS4 'Ideas and Evidence in Science'. Encourages cross-curricular links. Free resource pack for teachers.

- Duncan of Jordanstone College of Art and Design: Developed a modular template for INSET provision (primary curriculum).

4.4.3.4 Professional exchange as a good model

Anna Ledgard runs the Teacher Artist Partnership (TAP) scheme, she hopes this will provide a model for providers such as Wellcome and Creative Partnerships. The teacher and artist are in an equal relationship, aiming to enquire through dialogue, just as the artists and scientists are equal in Wellcome projects. Involving teachers in a relationship of enquiry with an artist and/or scientist would be a good model to promote through this exhibition and programme. Rehana Mughal also cites 'Teacher Exchange' as an effective approach to CPD, and suggests that it can happen within schools. For example, the art and science teachers swapped places at Thomas Tallis School in Greenwich.

Katherine Mathieson raised a question about teachers and informal mediators (e.g. artists) being on different levels in relation to the most creative approaches to education. This can be overcome if you put peers together over a period of time, as in the TAP scheme. This could include putting the most creative teachers together with the least creative teachers.

4.4.3.5 Reaching other educators and communicators

Katherine Mathieson said that it would be a very big job tackling the informal sectors in terms of youth work, although she did suggest looking to work with ENYAN and Children's services in Local Authorities.

She talked about how post graduate courses in science communication don't include contemporary arts, and conversely, training for artists in community or education does not include science. Perhaps these courses could benefit from coming together around this exhibition. She urged us to look out for the Centres of Excellence for Science Communication to be run by certain HEIs.

4.4.3.6 Use networked technology

Rehana Mughal discussed the low turn-out by science teachers to creative learning events. She proposes that they may be more easily reached through online forums, web streaming, videoconferencing and downloads to support CPD programme. The Science Learning Centre website managers also suggested that videoconferencing could be a good way to reach teachers.

4.5 Audience programmes

This theme was a part of our interview questions because we wanted to ensure that the exhibition would **not** be discussed as a passive experience, simply as a remote marketing tool unaccompanied by any events or activities. However, it soon became difficult to separate social activity from the concept of the exhibition, as it came to be conceived as designed for activity.

If professional development is to be such a key outcome then any extra events or courses should be aimed at teachers and other mediators. We could assume that these teachers and mediators would be able to guide their own groups of young people in active and social learning with the exhibition materials, if it is designed to allow this.

Elio Caccavale did engage with the question about how best to engage all audiences on an equal footing. He is keen on the idea of workshops between different groups or individuals focused on a problem, bringing their different approaches to it. He organises workshops between design students, medical students and science communicators to inform design to communicate bioethical ideas. He suggested that this could apply to science and art/design teachers working together to animate the exhibition, bringing in young people to the mix, to work together on problems and creative products.

This idea combined with Becky Swain's suggestion that young people should be involved in the creation of the exhibition, which led to one of our recommendations for a DIY exhibition toolkit.

4.6 Format

4.6.1 Possible options

The options for the format are described in greater detail in section 5. Here below is a brief summary of the case studies cited by our interviewees and their views. Note that our interviewees primarily responded about the purpose of the exhibition rather than on the logistics and format.

The possible options for the format, as conceived at the start of the research, include:

- A traditional single touring exhibition installed in venues
- A travelling stage-set for a performance and workshop event
- A small distributed display in multiple simultaneous venues
- A resource box that can be used to create temporary displays
- A self-contained touring exhibition, incorporating its own venue (e.g. bus, outdoor tent)
- Site-specific art installations
- A consortia of organisations developing a creative lab

4.6.2 Interviewees' views

Suzanne Lee of All Change Arts thinks that it should be an art exhibition. We should avoid the use of information boards, except as a taster or link to the art. She thinks new media work is important to include and that relevant interactive systems have moved on to make this logistically possible, even in temporary spaces.

Elio Caccavale suggested a display that could be designed for forum activity, using digital screens to bring particular projects or films to the fore to suit the theme of the workshop. The theme might differ according to the touring location.

Rehana Mughal proposed the idea of a box with objects (or raw material to produce objects) and suggested that teachers and pupils could select from the box online (using an online shopping basket). This box could tour schools and other venues, with each venue choosing the right materials for them.

Mike Jones and Caroline Smith from the Film and Video Umbrella provided some practical views on the options for display:

- The 'resonant spaces' site-specific option: They warned that negotiating and sourcing locations would eat up the budget.
- 'The Big M' outdoor tent option: It looks exciting outside, but it allows little flexibility for spatial design, content and activity inside.
- A modular exhibition to adapt to internal spaces: This would be the easiest option, with a warning about a digital-heavy exhibition, questioning how much people find screens engaging and pointing out the expense of the equipment and dealing with functional failures in different venues.

4.6.3 Case studies

4.6.3.1 Pulse examples

Pulse has funded a high percentage of performing arts projects but the following are some examples of visual arts (2D and installation):

- Campbell Works' 'Mind Mine',
- Aberdeen City Council/White Space 'Crime Scene',
- Phoenix Arts Association/Sensitive Propose modular exhibition 'Panacea',
- The Wellcome Trust has also funded an interactive travelling exhibition about genetics.

4.6.3.2 Artworks Awards

Sally Bacon reflected on the Clore Duffield Foundation's Artworks Awards exhibitions. This experience was instructive because the tour venues had very limited space for 3D objects, concerns about showing original artwork and digital equipment due to a lack of security attendance. This may have been because it was an educational exhibition, about children's work, so not given the space and resources of a 'proper' exhibition.

Sally Bacon cited other good examples as:

- Reggio Emilia exhibitions for innovative design about child-centred learning
- Hackney Building Exploratory Trust as a good interactive exhibition for children
- La Villette in Paris as an exciting science-centre model.

4.6.3.3 ICA short films to music

The ICA's temporary film gallery in Trafalgar Square was a large round structure, with steps leading up to a floor on which the audience was seated. A central gantrey projected several films onto a white screen around the full circumference. It attracted big crowds but the experience was 'drop-in', brief and passive.

4.6.3.4 British Library Learning

The British Library Learning team organised touring exhibitions as part of their regional engagement programme. Several different projects trialled different practical approaches. For example, 'Inside Story' (illustrated) was a three-part structure constructed from visual material produced through a creative enquiry process by three primary schools exploring the Ramayana, the Golden Haggadah and the Shahnama. At the centre of the three sections was a forum, for groups to sit in discussions. The exhibition was toured to libraries, museums and arts centres across Yorkshire, and used for performances and workshops.
http://www.bl.uk/learning/cult/inside/story.html

Another British Library Learning project resulted in resource boxes for schools to explore the Lindisfarne Gospels. Forty boxes were distributed to resource centres and libraries across the North East and could be borrowed by schools from there. The contents included pattern games, cultural artefacts, artists' books and a facsimile of the Lindisfarne Gospels. The accompanying pack encouraged schools to make their own exhibitions with the contents.

4.6.3.5 Cape Farewell

Cape Farewell's current touring exhibition is a good example because it is aimed at a schools audience, documents past projects and promotes a 'creative enquiry' model of learning about science. The designer, Sam Collins, has created a slim boat-shaped structure with scaffolding poles and sail canvas. Digital screens show video & stills. The canvas panels are printed with information about the young researchers, the artists and scientists, as well as maps and scientific information. On the young researchers' return from their Arctic voyage, the exhibition will accompany them on a tour to schools and science centres where they will deliver performances and workshops.

4.7 Partners

4.7.1 Possible options

The possible approaches to leveraging partners and working with others could operate on different levels:

- ***Policy and strategic development***
  Making links with other national organisations interested in supporting work in related fields. This may extend to involving 'champions'.
- ***The production and delivery***

  Working in partnership, adding value to organisations in the business of promoting creative engagement with biomedical science.

4.7.2 Wider context - initiatives

There are a number of science/ arts related initiatives and events, which provide a broader context in which to think about the exhibition in terms of content and dissemination. As many interviewees have pointed out, changes in education offer a key context in this respect (see curriculum section).

There are enormous opportunities for collaboration with those organisations sharing the aim of developing creative approaches to young people's engagement with science. Partnerships with these organisations may involve discussions around the production as well as the delivery of the exhibition.

The following initiatives over the next few years are worth considering in terms of content and also in relation to the hosting and promotion of a touring exhibition.

Wellcome is currently responding to Darwin 2009 through special projects led by Dan Glaser. The exhibition could make connections with this large scale Festival and related events. The Festival is in Cambridge 5-10th July and is aimed at a broad audience including young people (16+).

The theme for The International Year of Planet Earth in 2008 is 'Earth science for Society'. It aims to help build safer and healthier societies around the globe. The Year's activities will span the three years 2007-2009. The sub themes include: Earth and Life (origins of diversity) and Earth and Health (building a safer environment). This initiative might be a way of considering interaction of biomedicine and earth sciences – living on the earth or medicine from the earth, for example.

The United Nations is to review drug policies around the world in 2008 and relating to this the British Association for Advancement of Science has an ongoing project on Drugfutures and the RSA is leading a Commission on Illegal Drugs, Communities and Public Policy.

There is also a range of ongoing conferences, events and festivals with varying degrees of focus on science, art or pedagogy linked to some of the organisations listed in this report.

4.7.3 Funders and policy

At a national level Creative Partnerships (CP) and NESTA are also engaged in supporting projects around creative learning in biomedical science. A number of practitioners interviewed had received funding from Wellcome and these two organisations, occasionally for the same project. CP is currently being restructured but officers expressed interest in collaborating with initiatives in the future at national and regional level. It may be that Wellcome facilitate the exhibition and CP could add value through a professional development programme or related workshops. Research suggests that further conversations with CP and NESTA should take place to inform the exhibition and associated programmes. Other Trusts and Foundations mentioned by interviewees included Esmee Fairbairn who funded the original PAL labs. The Helen Storey Foundation has received money from the Crafts Council, Design Council and ACE.

The 'I Wonder' creative science teaching resource produced by Creative Partnerships was endorsed by the then Department for Trade and Industry, the Association for Science Education (ASE) and Qualifications and Curriculum Authority (QCA) and was entirely funded by the then Department for Education and Skills (DfES).

The Association for Science Education is part of SCORE - a grouping of science bodies asked by the DCSF for a strategy to promote practical work in science. This exhibition offers a chance to join up with this by supporting an emphasis on creative investigation and young people seeing science in real contexts.

4.7.4 Commercial support

Several interviewees suggested the possibility of working with a technology company. There are many instances where artists have worked with industry especially in the area of new technology as there is mutual benefit in artists testing and working with the technology in new and innovative ways. This may involve experimenting with equipment or trialing a new form of interaction. Staff at the Film and Video Umbrella suggested Hewlett Packard, Panasonic and Sony. The kind of company will depend on the nature of the exhibition and the form it takes.

4.7.5 Production and delivery

One of the key networks which should be considered in relation to both production and delivery are the national and regional Science Learning Centres. The regional centres were supported by the then DfES. New funding agreements and management via the National Science Learning Centre increase the possibilities for co-ordinated projects. They are already beginning to work on strategic initiatives. Catherine Aldridge was keen to point out the possibility of SLC being an active partner in relation to the touring exhibition.

Sally Bacon proposed a link with the new children's museum for Kings Cross - Eureka London - the opening of which is proposed for 2011. The children's museum could provide a venue for permanent exhibits exploring biomedical science, which could be a springboard for touring exhibition/s. Locating a Wellcome display here could help with cross-marketing, encouraging visitors to walk down the Euston Road towards the Wellcome Collections. The plans suggest that the museum will move on from the science centre approach and look at innovative models for creative learning including artefacts or artworks by children. The Chief Executive of Eureka (Leigh-Anne Stradeski) is currently the contact leading on initial plans.

4.7.6 Champions

4.7.6.1 Creative and science education

Both ASE and NSEAD expressed interest in being involved in the initiative and are looking to work in more interdisciplinary and cross curricular ways. NSEAD would be keen to discuss associated professional development programmes. Other supportive individuals and organisations could include:

- Sue Grayson-Ford, director, the Campaign for Drawing

- Anna Cutler, head of education and interpretation, Tate Modern
- Jane Sillis, director, engage
- Roland Jackson, director, British Association for the Advancement of Science.

4.7.6.2 Art and science 'names'

The Artworks exhibition benefited enormously from champions from the art world including artists such as Antony Gormley and Richard Wentworth who made limited edition prints for the Award winners. One year this extended to a colouring book with work from 30 well known artists. The touring exhibition could benefit similarly through endorsements from high profile artists and scientists.

4.7.6.3 Champions who cross these areas

The following names are a starting point for individuals who support creative learning and who are also known in the fields of art or science communication: Marc Quinn, Tacita Dean, Helen Storey, Kathy Sykes, Mark Lythgoe or Quentin Cooper. A statement, question or image by these champions could be featured or built into the exhibition.

5 Options Analysis for Creative Encounters exhibition

Note: All examples given are projects that we have overseen or been involved with, so that we can reflect on the lessons.

5.1 Traditional touring

What is this?	Substantial touring exhibition with cases, panels, objects and artworks including photos and digital screens.
Example	Science of Spying. 'The Science of…' is the touring wing of the Science Museum. Very interactive and learner-centred. Very few precious objects, lowering insurance & transport costs. Some parts have to be redesigned for each venue. The budgets are big because they charge for entrance – Wellcome's would need to be free and more cheaply produced.  www.sciencemuseum.org.uk/visitmuseum/galleries/science_of_spying.aspx (Learning resources produced by Flow Associates)
Venues	Purpose built display spaces e.g. art galleries, museums, and science centres. Science Learning Centres and foyer spaces such as those in libraries and schools would not be appropriate for such public exhibitions
How toured	Single large module. A manager would be required to book dates into the venues' schedules and negotiate & support its installation in e.g. 12 venues over 2 years.
Audience programme	Habitual audience would wander through and look/ interact with exhibits. May depend on mediation to get active engagement. Mix of public and group visitors.
Strengths	• Good regional reach with the full experience for everyone. • Familiar approach. Procedures will exist for this kind of show.
Weaknesses	• Can be very expensive to create and tour a substantial display, especially with digital equipment. • The bigger the exhibition the more negotiation with venues. • Range of possible venues is limited. • Education programmes, except packs/resources, can be difficult to organise with short-term displays.

5.2 The show

What is this?	A small temporary installation like a tradeshow or stage set. This could be put up in 1-2 hours and reinstalled at events. It might accompany a presentation.
Example	The Artworks Awards included a touring exhibition. Although the display did stand for days or weeks in some venues, it was easy and quick to install. It consisted of freestanding triangular forms, showing good reproductions of the winner's work. www.art-works.org.uk/awards/index.shtml (Lead consultant for Artworks: Bridget McKenzie)  *A winning artwork from 'Footsteps Forward' project (no photos of the exhibition available)*
Venues	Science, arts and education events, conferences and fairs. For example, the annual Creative Partnerships conference. If the presentation and display are strong enough it could be a stand alone display which could tour to SLCs, schools, youth clubs, health centres, libraries etc.
How toured	Research events and make bookings. Central administration would be required as well as a small team to install the display and deliver presentations.
Audience programme	Depends on the event. The team may just be there with the display or they may interact with the audience through a presentation or workshop, or a performance with the display in the background. A pack or resource kit would need to be given out so that the audience can take the learning approach forwards.
Strengths	• Allows for a responsive approach – getting to where the target audiences are, and where such people are likely to be receptive.
Weaknesses	• The display may look too much like a trade show or marketing tool. It could be hard to foreground the artwork, which is the point of Creative Encounters. • Temporary installations may be easy to install, but the short timescales can be labour intensive. People are always needed.

5.3 The spider

What is this?	Single (or twin) exhibition that is static or only moving once, like a spider in a web. Combine this with small satellites in regional centres e.g. digital screen & panel. See the 'In a box' option for the possible 'spider's legs'.
Example	The 'Wasted: The Trouble with Rubbish' exhibition at both Newcastle's Centre for Life and Manchester Museum of Science and Industry. Developed jointly between the two museums. The funders, SITA Trust, took an active role to convey messages about waste & recycling. These are small but rich displays the museums would not have been able to fund themselves. They are permanent displays, which can be integrated into the museums' learning programmes. SITA was able to use the approaches developed via the exhibition for other initiatives. www.sitatrust.org.uk/news/News1223 (Learning resources produced by Flow Associates) 
Venues	A central and popular venue e.g. one in London, one in the North West or Scotland. Example venues are the proposed children's museum in Kings Cross (opens 2009) and the Centre for Life in Newcastle. The 'spider's legs' could be schools, libraries or arts centres.
How toured	Develop a partnership with 1-2 venues to house the exhibition for a substantial period. For the 'spider's legs', encourage and support partners to use the 'in a box kit' to create their own display in a public venue.
Audience programme	Central venues would be chosen for the quality of their mediation based on active exploration. There would be a substantial programme of young people's workshops and professional seminars and training. Distributed venues can angle displays and activities to their own audiences.
Strengths	• Flexible approach: Enables the creation of a good quality high profile display, alongside small displays reaching into many venues. • Certain venues may welcome the opportunity, may wish to match-fund it and take on the management of exhibition and organisation of the related programme.
Weaknesses	• Central venue(s) would need substantial negotiation for long-lasting displays that host a large number of events. • This could result in a loss of curatorial control and Wellcome may become more of a funder in this model.

5.4 In a box

What is this?	A selection of reproducible items recreated from the Pulse projects, Wellcome Collections or newly commissioned. Items might include digital art reproductions, DVDs, bold questions or statements as posters or projections, or objects that encapsulate the key ideas of public engagement projects. The box and contents all compellingly designed
Example	It is not easy to give a single example, as this is a novel idea. It is inspired by *Café Press* enabling you to order online printed items to suit your needs, and to upload your own artwork for printing onto a range of objects. The items are dispatched to you. www.cafepress.com *Flowmarket:* This company designs useful objects that provoke thought. See the Collection '07. www.theflowmarket.com A programme of 'Object Dialogue Boxes' helped make British Library heritage collections more accessible. Artists were commissioned to create boxes of contemporary and facsimile artefacts, such as artist books. The objects were designed to provoke questioning. Some were more factual. • www.lindisfarnegospels.org • www.objectdialoguebox.com 
Venues	Wellcome would not have to negotiate so much with venues. Educators or group leaders in schools, libraries, museums, science organisations, health centres and so on would create their own displays. However, the materials could be used for 'model' displays supported by Wellcome, in public venues as the legs of the 'Spider' proposal.
How toured	It wouldn't tour. It would need to be well organised so that the materials were easy to obtain. They could be ordered online, along with activity guidance, so that you could create a display and/or Creative Encounters workshop in any venue. Perhaps users would need to pay for postage & packing, or even for their own copies of the materials. If they cannot afford to buy them, loan copies could be based at the training venues.
Audience programme	Each organisation would be responsible for delivering their own activities. The process of organising the display and workshops could be participatory i.e. young people can make decisions. The materials could also be used as a key resource in a training programme for educators & champions of creative learning in science. These Creative Encounters 'champions' could go on to organise a display or workshop projects using the box materials.
Strengths	• Enables maximum reach. Anybody who is motivated can order materials from

	the internet. • It works well as a training & CPD programme. • It enables young people's participation. • Innovative, especially if well designed.
Weaknesses	• Unless combined with the 'spider' or traditional exhibition approach, there is no main showcase to raise the profile of the project. • Could be seen as not greatly different from a learning pack. • No guarantee on quality of display or engagement unless facilitators were employed.

5.5 The circus

What is this?	A multimedia touring event space, in the form of a pod or tent.
Example	Isis Arts' The Big M. See link. A highly stylised inflatable structure. This can be installed in any outdoor or large indoor space. It incorporates 3 large digital screens. The visitor/educators touch the screen to choose which digital artworks they want to see. www.isisarts.org.uk/index2.html  Vivienne Reiss has worked with Isis Arts to deliver events in The Big M (events in Trafalgar Square and secondary school playground)
Venues	It is a self-contained space and can be programmed to respond to a range of host organisations and their audiences. For example, outside a science museum during National Science Week, near an education fair or in a public park close to an arts centre.
How toured	Contact regional arts consortia, local authorities, the regional MLA's, and look for relevant event opportunities. A mix of planned and opportunistic bookings. Central administration would be required.
Audience programme	It is likely that a space such as this would not stay for very long in one place, so the programme would most suit an intensive period of short workshops and parties responding to the art works. These could be repeated and built upon in each venue. Would have to fund and jointly plan education activities with hosts.
Strengths	• Novelty factor is high – this kind of event space could attract large audiences and appeal to a range of ages/ communities. • Presentation of 'local' projects could be programmed into the event space. • Could be affordable e.g. Big M itself may be available for very little money as its final programme has ended.
Weaknesses	• Technical team needed to support the tour which would increase costs. • The space may not be very flexible to include a range of objects. Screen based work may be best suited to these sorts of spaces.

5.6 Site-specific art

What is this?	Artist commissions / curated exhibitions installed in resonant places.
Example	Kamina Walton's art installation in a disused ward in Bristol Hospital, related to her work with children from Bristol Hospital Education Service. It highlighted the artist's practice which focuses on physical and mental health, but also made a 'creative space' for children to experiment in. www.kaminawalton.co.uk/creative.html (Vivienne Reiss has commissioned off-site projects and has worked with Kamina Walton on similar programmes).
Venues	Venues might include hospitals or health centres, or museums that do not normally show contemporary art. They may not be 'generic' spaces but very particular e.g. empty or disused rooms in education or public buildings. They would need hunting down perhaps by the artists involved.
How toured	This would not be a tour but parallel displays. It may involve commissioning 6-8 artists across the UK who may have been Pulse award winners. They may source a venue and create a display reinventing aspects of their project but also adapting to the space. Each display, although it focuses on one artist or topic, should include resources and references to the website and other projects.
Audience programme	The artist and/or agency commissioned may also be given funds to run workshops or seminars for groups of educators and/or young people. They would need central training, guidelines and support.
Strengths	• The displays would be aesthetic and be in no danger of looking like marketing. • If the artist/agency can be trusted, then the administrative work for the Wellcome is reduced. • It follows the 'hands-off' model of the Pulse Awards, and reflects the approach of the Creative Encounters website project.
Weaknesses	• Each exhibition may look too much like one artist's work and may not showcase the broad possibilities for creative learning enough. • The spaces may not all be suited to engaging large numbers of young people and public. • It reduces Wellcome's control over the programme.

5.7 Creative Lab

What is this?	A consortia of organisations developing a creative lab based on an inspirational collection of cultural artefacts or significant objects.
Example	The Helen Storey Foundation tours Primitive Streak a 27 piece textile/fashion collection which elucidates the first 1000 hours of human life. It was a recipient of a Sciart Award. It has been used in exhibition for many projects with young people and has been touring for 10 years. The HSF have set up 2 Creative Labs using Primitive Streak as a catalyst for educational engagement and teacher CPD. www.helenstoreyfoundation.org
Venues	Temporary venue e.g. school or university space about to be renovated. As in the site-specific art model these spaces would have to be found.
How toured	Work with National Science Learning Centre, Creative Partnerships, local authorities (arts and education officers) to set up consortia of organisations to develop the lab in situ e.g. universities, SLCs or arts organisations.
Audience programme	Animation through local networks. Requires local infrastructure – facilitators and resources for interpretation to a range of audiences.
Strengths	• Engagement factor is high – this kind of initiative could attract large audiences and appeal to a range of ages/ communities. • Develop local and national infrastructure creating links between cultural institutions and ensure legacy. Embeds creative learning in the culture of these organisations.
Weaknesses	• Full time manager would be required.

6. Recommendations

6.1 Overview

The following text outlines the findings from the feasibility study and provides a number of recommendations regarding the potential for a touring exhibition. The proposal for the touring exhibition has been informed by interviews with representatives from stakeholder and user groups across the arts, science and education sectors (see appendix 2) and the parallel literature review and associated desk research. In addition to this, presentations from individuals from the Creative Encounters group and the views of Wellcome officers have been considered and have shaped the following recommendations:

Overarching Aim

- To encourage creative approaches to young people's engagement with biomedical science through a contemporary visual arts-based touring exhibition and dissemination tools

Objectives

- Develop capacity and support an evolving community of practice - cross disciplinary and spanning formal and informal education sectors
- Generate opportunities for professional development, both subject-specific and interdisciplinary, for professionals working with children and young people
- Engage audiences in dialogue, creative enquiry and activity
- Add value and enhance the impact of Wellcome Trust initiatives focusing on young people's engagement.

6.2 Audience

6.2.1 Possible options

The possible options for audience include:

- Focus on educators and specialists, with no public or youth engagement
- Focus on young people, reaching teachers by stealth
- Focus on public engagement, with schools included in programmes
- A combination of the three.

Recommendation: A combination of the three, with a strong programme of professional development underpinning the public and youth engagement, with educational change as a key objective. It is proposed that the primary target audience for the exhibition is professionals working with children and young people aged 9-14 years.

6.2.2 Rationale

The research indicates that there are a substantial range of resources aimed at professionals working with secondary-aged young people. Wellcome's own in-house initiatives are aimed at KS4 and post 16 students. Pulse has mainly supported work with young people (rather than children) and the Creative Encounters programme is also aimed at professionals working with this age group. There are a handful of resources supported by Wellcome such as those produced by SAPS Biotechnology Scotland Project and currently

Resource Base's *Colour Coded*, a repurposing of work made with young people, aimed at professionals working with primary aged children.

Given the dearth of materials aimed at younger age groups, it is proposed that the main target audience for the exhibition is professionals working with children and young people aged 9-14 years. Wellcome would then be instrumental in stimulating and creating excitement and interest around science to a wider constituent group. The exhibition could fill a gap between the hands-on interactive exhibits designed by 'exploratories' and science museums for younger children and the fairly sophisticated science communication programmes offered by various science bodies to young people aged 14 up to young adults. It would also build the foundations for creative engagement with biomedical science at an earlier age.

Some strategic changes in the education context will ensure that a cross-phase programme can be effective. Increasingly, primary and secondary schools are working together in local 'collaboratives', exploring good practice together in school management and pedagogy topics. Schools are also attempting to collaborate to ease the transition of pupils between Key Stage 2 and Key Stage 3.

The pressures on teachers to deliver the exam syllabi at Key Stages 4 and 5 will prevent their full engagement in a programme about creative learning in science for this phase. There is a little more freedom to work across subjects at both Key Stage 2 and 3. Teachers at KS3 find it more difficult than at KS2, because they have to readjust timetables and communicate with other subject departments. Therefore it could be fruitful to extend reach to primary teachers.

The audience priorities would be:

1) Secondary teachers

- The primary group would be science teachers, especially those teaching/co-ordinating KS3
- Citizenship and PSHE (especially health education),
- Geography
- Art & Design, Design & Technology and ICT.

2) Primary teachers

- The primary group would be science coordinators
- Creative Partnerships coordinators
- Heads and deputies
- Coordinators of the subjects mentioned above.

3) Practitioners working with schools

- Science communicators who may wish to develop creative strategies,
- Arts educators who may wish to develop sciart work
- Providers of CPD and ITT (e.g. in HEIs or LAs)
- Education staff in arts centres and science exploratories

4) Professionals working with children and young people out of school in:

- Art and science centres
- Youth clubs

- Field centres and holiday schemes
- Youth workers in LAs and charities
- Gifted & Talented schemes
- Learning Outside the Classroom initiatives

5) Young people

- Key Stage 3 school pupils
- Key Stage 2 school pupils
- Young people in structured activity out of school, where there are possibilities to connect arts and science

6) General public

- People who may visit the main touring exhibition and those created via the 'exhibition in the box'
- Parents and the wider community around schools
- Visitors to arts centres and science centres

6.3 Curatorial overview

6.3.1 Possible options

There are several ways to look at the curatorial approach:

- ***The 'aesthetic' approach***

  To create an exhibition of art or an immersive artistic installation, which connects only tangentially with scientific and educational content

- ***The 'science messages' approach***

  To create an exhibition that conveys scientific knowledge and issues, using art and contemporary design to increase its effectiveness

- ***The 'pedagogical' approach***

  To create an exhibition that focuses on teaching and learning activities, showcasing and promoting particular kinds of creative learning practice

Recommendation: The ideal scenario would be to combine all three in the balance. 'Creative enquiry' as a process for learning and research is central to the approach, combining aesthetic, scientific and pedagogical elements.

6.3.2 Rationale

The Wellcome Collection provides a curatorial lead. Its exhibition programme portrays the 'development of our understanding of wellbeing and human identity'. Exhibits include an eclectic range of objects and images from science and everyday life, as well as cultural artefacts and artworks. As the Wellcome website indicates: 'Where else could you find an ancient mummy, Napoleon's toothbrush, Darwin's walking stick, a DNA-sequencing robot and a Marc Quinn sculpture all under one roof?' The exhibition we propose borrows from this approach, which also underpins a philosophy of creative enquiry. Creative enquiry is about rigorous planning to enable learning which combines the rigour and evidence-seeking of the sciences with the aesthetic, lateral and metaphorical attributes of the arts.

6.3.3 Young people

We discussed ways of including young people both in the production and as audiences with the interviewees, and we have looked at examples of other initiatives where children's and young people's voices were essential to the project. This could include initial consultation events with young people or a commissioning process involving young people from previous Pulse projects. The idea of multiple narratives and an evolving exhibition where young people become responsible for continuing or completing the exhibition would be another way of brining in young peoples voices. A further study could involve some of the young people active in projects supported by Wellcome.

6.4 Content

6.4.1 Possible options

There are a number of approaches to sourcing content for the touring exhibition:

- **The 'opportunistic' approach**

  To focus on the Pulse projects which have been subject to the 'digital enhancement' process and those that have produced good quality aesthetic outcomes that will work well in a display.

- **The 'thematic' approach**

  To focus on projects from across Sciarts and Pulse that relate to a specific science topic e.g. genetics, and topics connected to this.

- **A combination of the above approaches**

  Find a broad theme that is open enough to relate to the best and easiest artistic outcomes that are available. (This may also include reproduction of materials from the Wellcome library and collection.)

- **The 'fresh commission' approach**

  To commission a new art-science collaboration to create an installation (or several) that offer a single dramatic experience, and support this with Pulse models and related materials.

Recommendation: Find a theme that is open enough to relate to a selected number of Pulse and Sciart projects and Creative Encounters digital enhancement initiatives and bring in images from Wellcome library and collections.

6.4.2 Rationale

We suggest that the exhibits consist of:

- Questions (illustrated by science research)
- Metaphorical objects and artworks that stimulate thoughts about some of those questions
- Materials that encourage visitors to ask their own questions and to make and share their own metaphorical objects or images about any of the questions posed
- Supplementary materials guiding educators to reflect on the experience and create their own 'question-image' displays in schools and other settings.

Which questions?

We suggest framing the exhibition around one big question: **What can we become?**

This question has implications at two levels.

- All of us: How do humans adapt and evolve, to survive and thrive?
- The target audience: How can we be transformed through creative learning and pursuing scientific enquiry?

The content of the exhibition could be organised according to sub-questions that fall out of this big question, such as:

- The facts of science:
    - How and why do our genetic codes vary between us?
    - What makes us change over time?
- The applications of science:
    - What impacts do medicine, diet, physical activity and reproductive control have on human adaptation and evolution?
    - How can we use science and new technologies to change and evolve?
- The methods of science:
    - How do scientists work?
    - How creative is this process?
    - How can we learn through creative enquiry?
- The ethics of science:
    - Is it right for us to take control of our destiny and go 'against nature'?
    - Is human health the highest goal or does it threaten biodiversity and our wellbeing in the long term?
    - What does being human mean?

The visual content may not illustrate all these questions. Some of the questions should be unexplored so that visitors can add their own images and thoughts.

As professional development resources and events will be a major element of the exhibition, animating it and extending its reach, it will be important to underpin it with a clear articulation of a rigorous learning methodology. This should be designed to accelerate teachers' ability to deliver the curriculum reforms required of them and to extend their own practice in making connections between subjects. In appendix 5, please find a possible learning model, devised by Bridget McKenzie/Flow Associates for creative science programmes with the Science Museum.

6.5 Format

6.5.1 Possible options

The possible options for the format include:

- A traditional single touring exhibition installed in venues
- A stage-set or performance-style display
- A small central display with satellites in multiple simultaneous venues
- A resource box that can be used to create temporary displays

- A self-contained touring exhibition, incorporating its own venue (e.g. bus, tent)
- Site-specific art installations
- A consortia of organisations developing a creative lab

Recommendation: 'One size fits all' is not appropriate. The exhibition could combine several options, in particular combining 'Traditional Touring', 'The Spider' and 'In a Box'.

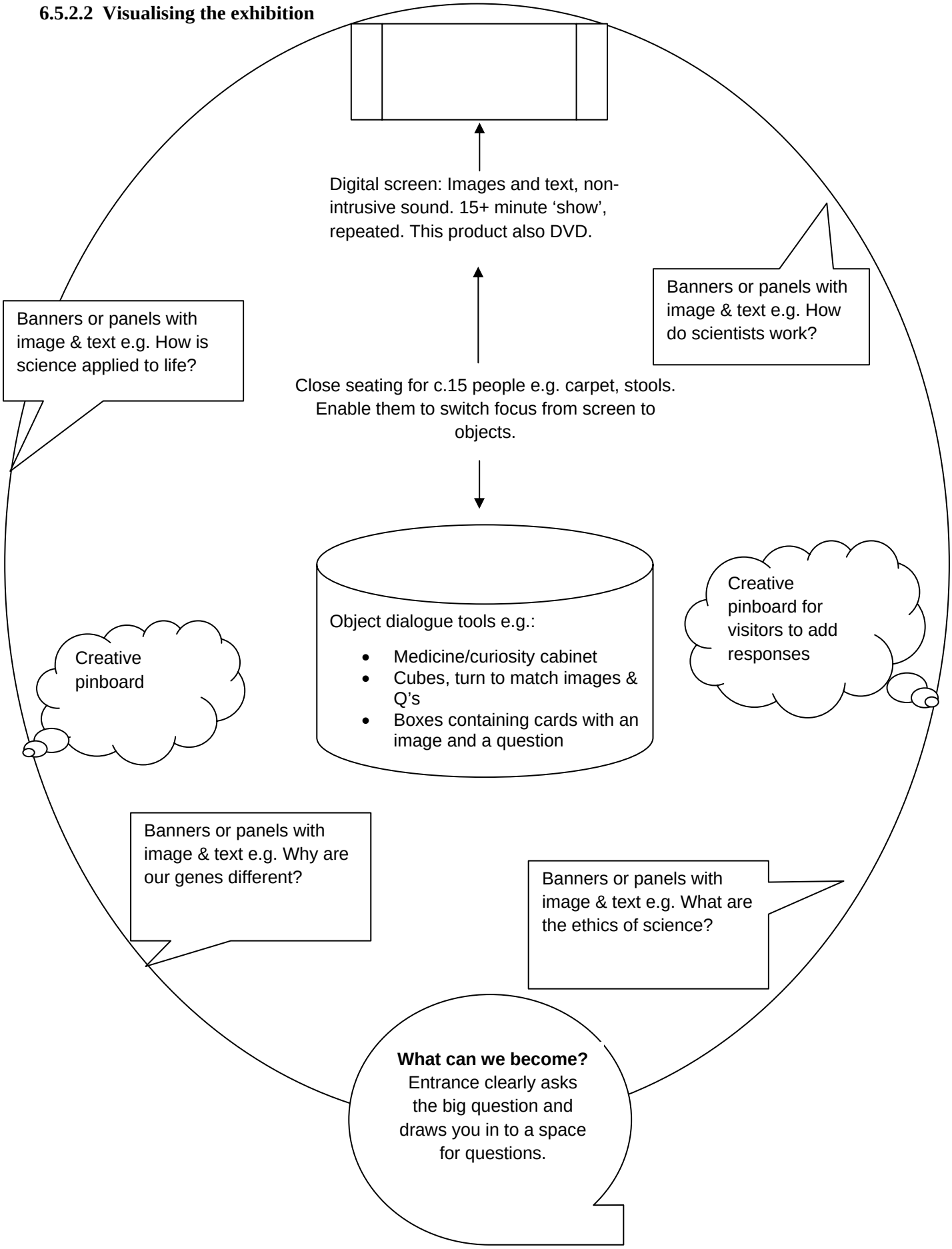
6.5.2 Rationale

Here follows a more detailed proposal for a single touring exhibition, with associated resources that enable multiple small exhibitions to be created by partners and educators.

6.5.2.1 The exhibition

The exhibition will be designed to work as a single self-contained structure, a portable temporary space in the form of a pod or tent, which can be installed easily in a variety of venues with internal spaces that are spacious enough. The exhibition will present a range of visually engaging and carefully selected images and objects to encapsulate the questions described above and to demonstrate the Wellcome approach to public engagement. Ideally, the space would include a digital screen, to enable a greater depth of content if required, and to enable richer audio-visual content. It will also include text/image panels as well as 'creative pinboards' to enable visitors to display their own questions and images.

6.5.2.2 Visualising the exhibition



Ideally, there will be space inside the structure for a group (e.g. 15 people) to sit and talk or work. This forum area may contain an ‘object dialogue kit’ (like a lab kit, a tool box, a game, or an unusual table setting). These items could be pouches or boxes containing objects and images, to stimulate thoughts.

- Packaging items, printed with statements to make you rethink health and consumption
- The artists ‘Hedsor’ create Object Dialogue Boxes for museum education, first commissioned and devised by British Library Learning, www.objectdialoguebox.com

The idea is to design a creative space, which will provide a unique learning environment. It should not take too long to absorb the content, as we would wish visitors to be quickly inspired to begin discussing and making their own responses. It may be necessary to book groups in to use the space, but a paid facilitator should not be essential (although some venues may wish to provide one).

We propose this as an exemplar exhibition, helping to raise the profile of the programme and widen its reach to audiences beyond teachers who may take part in professional development courses.

6.5.2.2 DIY exhibition in a box

In addition to the exhibition we propose an 'exhibition in a box’, a version of the above without the physical display structure. The contents will be based on the materials in the exhibition, to include a DVD of the digital presentation, mounted images and texts and the ‘object dialogue kit’. It could be possible to donate several of these boxes to partner organisations around the UK, such as Creative Partnerships offices, science museums and Science Learning Centres.

The professional development programme would be devised to make use of these resources: A teachers’ course could involve making a display using these materials that would last a day or more. The participants could then sign up to take the box into their settings for a week or month, to follow the same process either with their teaching colleagues or pupils.

6.5.2.3 The website

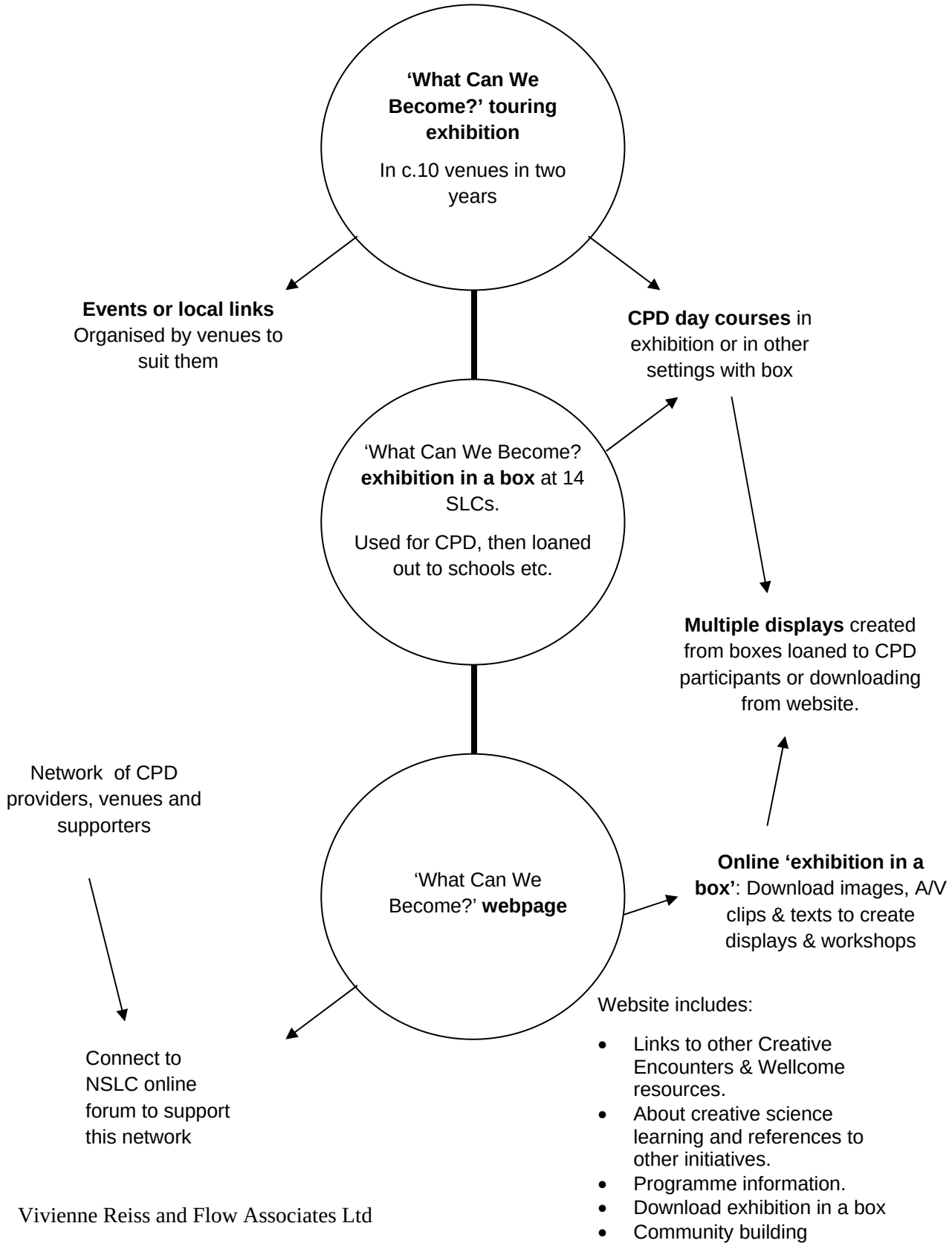
The exhibition and 'exhibition in a box' will be supported by online guidance and links to the Creative Encounters web projects, other Wellcome resources and any ‘creative enquiry’ resources that Wellcome endorses.

A particular proposal for the website is that Wellcome could begin to create a database, with User Generated Content to build it up, of works of art, artists or collections available and suitable for supporting creative learning in science around the UK.

The contents of the exhibition will be described and illustrated online. If users are unable to visit the exhibition, or obtain the ‘exhibition in a box’, they will be able to download visual images, designed texts and

moving image files so that they can create their own displays in their settings. We realise that it would be too difficult to create a complex ordering and distribution system of physical objects, so we suggest instead that Wellcome simply offer digital downloads with minimum fuss. We could provide links to online creative print services (such as 'Moo'), enabling users to send digital files to order the printing of postcards, posters, stickers and banners.

6.5.2.4 Proposed model for the format



6.6 Venues

6.6.1 Possible options

The possible approaches to sourcing venues include:

- **The mass public approach**

  To identify places or touring devices (e.g. central museums or tents) that attract large numbers of public.

- **The targeted approach**

  To identify places where the target audience spend much of their time in educational or informal learning activity.

- **The creative spaces approach**

  To identify and intervene in unique creative spaces to engage audiences in experimentation and activity.

- **The consortia or multi sited approach**

  To set up partnerships between organisations building on local cultural infrastructure creating hubs of practice at a local level and embedding the practice.

Recommendation: Work with a range of venues, with different types of presentation formats, and if possible encourage these venues to programme related initiatives simultaneously.

6.6.2 Rationale

We suggest that the Wellcome Trust launches the touring exhibition and associated resources in its own venue. James Peto suggested the Wellcome could offer the large top level event space although we would recommend a more public space.

The kinds of venues proposed to take the touring exhibition include the network of arts centres and some science centres. Arts Centres tend to be more community focused than art galleries and many employ education officers or outreach co-ordinators whose job it is to make links with schools and youth centres. There is a substantial network of arts centres that currently take touring exhibitions. Also, as it should be quick and easy to install, it could also travel to conferences and education fairs.

The 'exhibition in a box' could be hosted by each of the regional SLCs and appropriate venues outside England (14 in total, see below). The Wellcome Trust would need to provide these partners with funds to run at least one day course each, and the materials that would help them publicise and loan it to schools. Ideally these events or seminars would be programmed in relation to the exhibition at the art or science centres for maximise impact.

It would be essential to raise awareness of these resources and the creative learning model with the tour venues and hosting partners. This may involve meetings to agree contributions to the programme, and possibly a central training session or seminar. This could be distributed through video conferencing and it may be worth looking into local delivery agencies to support a centralised initiative. This would help to develop the local and national infrastructure creating links between arts, science and educational institutions. These relationships could result in a database on the website of all science and cultural venues that can enable creative learning in science, supporting any schools taking part in Creative Encounters projects. Taking part in this process will help embed creative learning in the culture of these organisations.

6.7 Audience engagement and professional development

6.7.1 Possible options

The possible approaches to running professional development include:

- **The partnership approach**

  To organise the programme with CPD and ITT partners who will use the exhibition as a stimulus for their own pre-existing or specially devised resources, events and courses.

- **The Wellcome-controlled approach**

  To staff a Wellcome Creative Encounters team to travel to where the exhibition is and to deliver activities to a particular format.

Recommendation: The partnership approach would be more cost-effective and likely to reach more educators, through familiar and local CPD providers.

6.7.2 Rationale

As described above, the exhibition is a resource to stimulate activity and professional development, rather than a passive experience. This strategy allows for a responsive approach – getting to where the target audiences are, and where such people are likely to be receptive.

It has the potential to reach three tiers of audiences:

- **General public**

  Displaying the exhibition in a public venue enables maximum reach to a broad audience group (schools, HE students, parents, scientists, artists, youth workers etc).

  Presentations of 'local' projects could be programmed into the exhibition space, increasing ownership by a wider range of people.

  The website will enable educators or group leaders in schools, libraries, museums, science organisations or health centres to access the materials.

- **Educators**

  The courses using the 'exhibition in a box' will be primarily targeted at KS2 and KS3 teachers, but also could be offered to other educators such as youth workers, artist educators and science communicators. These people will become champions for a creative enquiry approach, provided with tools to demonstrate it.

- **Young people**

  The participating educators will be encouraged to organise their own display projects with their students, encouraging young people to make decisions about the display aesthetics and how to communicate with the visitors they invite (e.g. other young people).

6.8 Partners

6.8.1 Possible options

The possible approaches to leveraging partners and working with others could operate on different levels:

- **Policy and strategic development**
  Making links with other national organisations interested in supporting work in related fields this may extend to involving 'champions'.
- **The production and delivery**

  Working in partnership enhancing and adding value to organisations in the business of promoting creative engagement with biomedical science

Recommendation: Establish a partnership with a lead organisation that can work at national and regional level to promote and deliver the exhibition and related resources and activities.

6.8.2 Rationale

We propose that Wellcome develop the exhibition and associated resources in collaboration with the National Science Learning Centre working with the network of regional Science Learning Centres (SLCs) and relevant organisations in Scotland, Wales and N Ireland.

If the National SLC were a key partner in the initiative they could play a central role in the distribution, as well as assisting in the production. They may not be appropriate venues to present the exhibition but they could identify associated spaces e.g. arts centre or science centres for the exhibition, and they could coordinate the tour. As stated above the 'exhibition in a box' could be based at the SLCs and workshops developed linking in with the exhibition. New funding agreements and arrangements between Wellcome, and the national and regional SLCs may facilitate the development of a strategic initiative such as this.

We have discussed the above with Catherine Aldridge (Network Director SLC) who is of the view that the National Centre would be the obvious choice to take this forward. Miranda Stephenson (National SLC) is also aware of this proposal.

Another potential partner is Creative Partnerships (CP) and we propose liaising with CP in relation to bringing in artists and science communicators to animate launch events. CP may fund further training sessions for their teams of creative agents and partners, or for creative schools. CP may also supply recommendations of these creative partners for schools to employ themselves. We spoke to Rehana Mughal and Becky Swain from Creative Partnerships, both based at the national office.

Katherine Mathieson of NESTA was keen to be kept informed of developments in case there are opportunities for mutuality.

The following organisations could assist in establishing consortia of organisations to develop venues for the tour:

- Local Authority Arts Officer network
- Ecsite-uk – Director, Dr Penny Fiddler
- ASE – Director, Derek Bell
- NSEAD - General Secretary, John Steers
- Touring Exhibitions Group TEG – Sally Fort
- Museums and Libraries Archive Council (MLA)

There is also the possibility of commercial support depending on the form the exhibition takes. For instance if new media is central to the exhibition it may be worth exploring links with a technology company.

6.9 Logistics

6.9.1 Project management

Initially a Wellcome project manager (and other Wellcome staff or external freelancers), perhaps working closely from the start with the National Centre, would need to oversee or undertake the following tasks:

Overall management

- Agree partnership arrangements
- Form a detailed project plan and budget
- Agree a title and look/feel for the project ('What Can We Become?' is a proposal)
- Devise a learning framework to underpin the approach (see appendix 6)
- Devise an evaluation method in detail
- Devise a communications plan in detail (e.g. marketing collateral)
- Brief and recruit designers and other contractors
- Write guidance materials for CPD deliverers, venues and educators using the exhibition tools.
- With the NSLC devise an outline for a CPD course and recruit facilitators
- Ensure that the NSLC can work with other SLC's to develop consortia, facilitating connections between regional SLC and arts/science centres.

Touring exhibition

- Design and construct the touring structure, including a tent/pod, a digital screen, pinboards and forum area.
- Devise a narrative and illustrated texts
- Design and produce 'object dialogue tools'
- Create a digital presentation (e.g. from Pulse projects)
- Negotiate and source tour venues
- Ensure the venue needs are met in terms of funds for events and marketing
- Organise logistics of travel, insurance, installation and maintenance
- Decide on a pricing and access structure (ideally, the exhibition & loan boxes should be free)

Exhibition in a box

- Liaise with designers to translate the content into a box format (mounted images & texts, object dialogue tools, DVD, paper-based guidance).
- Oversee the sourcing of 14 boxes, packing of materials
- Distribution to 14 venues. (For example, 1 national SLC, 9 regional SLCs and 3 others in Scotland, Wales and Northern Ireland.)
- Ensure the host venues have materials to support teachers (information and loan system).

Website

- Decide on web strategy (how these materials sit with other Creative Encounters/Wellcome education resources, and how they make use of other websites e.g. NSLC & CP)
- Design a home page for 'What Can We Become?'
- Translate the exhibition content so that some of it can be easily downloaded from the web.
- Edit guidance texts to suit online format

Once launched the management could be handed over to National Science Learning Centre, as a strategic initiative though its network of regional Science Learning Centres and also using its links with equivalent organisations in Scotland, Northern Ireland and Wales. (See David Barlex's report for details and contact names.)

6.9.2 Evaluation

To some extent this feasibility study is a beginning of the process of evaluation. A comprehensive evaluation strategy informed by this study will need to be developed in relation to the project plan. Ideally this should be considered in relation to the Creative Encounters programme. Just as there is a wider advocacy role for the touring exhibition, it also offers up the potential of providing a means of evaluating the wider Creative Encounters programme.

Given the nature of the initiative it is proposed that the evaluation, whilst exploring the aims and objectives of the exhibition and associated resources, should focus on the furthering of creative learning for children and young people, and professionals. There are a number of examples of frameworks for creative learning (**see appendix 6** for a proposed approach to knowledge and skills drawing on the 'wider curriculum dimensions' of the new curriculum). The Creative Partnerships evaluation framework devised by Anna Cutler is an interesting model, which has been applied across CP at both national and regional levels (with varying degrees of success). Similarly the evaluation of the exhibition and associated resources could be devised centrally and customised for different venues and audiences to work in a range of contexts. The focus on creative learning also provides an opportunity to build in creative approaches to evaluation, blurring boundaries between creative practice and critical reflection.

It is worth noting that comprehensive Public Engagement evaluation guidelines have been produced by Wellcome. These guidelines have been developed by Wellcome in order to help grant holders plan and implement the evaluation of their projects.

Why evaluate?

- Exhibition and resources are intended to develop and grow in context, so it is crucial that the evaluation informs this ongoing development
- It will provide evidence for Wellcome in relation to the stated aims and objectives
- It will contribute to the development of the field in general.

What to evaluate?

- Establish parameters - refine aims and objectives above and make them SMART
- Ensure project parameters are flexible enough to adapt to changes and can address unexpected outcomes which may not relate to stated aims and objectives
- Internal aspects e.g. operational structures, effectiveness of partnership working and so on
- External aspects e.g. impact on audiences, media coverage and so on

- Creative learning (see comment above)
- Content (aesthetic, scientific and pedagogical elements) in relation to the target audiences
- Social, ethical and/or cultural aspects of the exhibition and associated resources
- Different formats mutually supporting each other - touring exhibition, 'exhibition in a box' and on-line resources

When to evaluate?

- Consider at outset
- Formative and summative evaluation procedures put in place throughout the project

How to evaluate?

- Mix the approach to data gathering using both quantitative and qualitative methods
- Traditional methods - questionnaires, interviews, focus groups, observation, comments books and boxes
- Creative strategies, for example making pinboards and discussion area into reflection spaces, gathering data from comments walls, vox pops, drawings etc.

Who should evaluate?

- Appoint external evaluator
- Build in means of coordinators and delivery partners informing the process and gathering data
- Facilitate commentary from a range of audiences/participants - children, young people, educators, science communicators and arts educators.

6.9.3 Communications

This proposal is in itself a communications project, aiming to disseminate across the UK creative approaches to learning in and beyond science. Our recommendations would ensure a breadth of public engagement and a depth of professional educational engagement. We propose the use of multiple channels (web, exhibition, resources and CPD hosted by partners) to disseminate the same coherent set of materials.

That said, on their own, these products will not promote themselves. The target audiences will need persuading:

- to visit the exhibition, ideally with their learning groups
- take part in the CPD activities
- borrow the exhibition boxes
- or download materials from the website
- use them for active learning projects in their schools or other settings
- cascade the creative learning approaches with their colleagues.

This will require a more detailed communications strategy and the production of some marketing collateral.

This may include:

- Defining the brand, title, straplines and key statements of purpose

- Internal marketing to Wellcome staff and partners
- Defining partnerships as routes to market (agreeing roles, providing collateral)
- Press coverage (especially educational press)
- Representation at professional conferences and seminars
- Links to the website across science, arts and educational resource websites
- Information copy and designed branded materials for use in emails and letters to target audiences
- Tools for word-of-mouth and digital viral spread.

6.10 Next steps

6.10.1 Pilot project

Prior to establishing a national touring exhibition we suggest that Wellcome set up a pilot initiative in two regions which involve the partners identified above. The pilot would be informed by the above recommendations and test the logistics of the project, as well as providing a basis for a costing the exhibition and associated resources.

About the authors

Vivienne Reiss

Vivienne Reiss is a freelance arts consultant who devises and manages cultural programmes. She has extensive experience in research and evaluation and advises on art and educational activities associated with museums/galleries and national cultural institutions. Vivienne was formerly head of visual arts learning and development at the Arts Council's national office. She was a member of the project team leading a review of the visual arts sector which informed the development of *Turning Point,* the Arts Council of England's ten year strategy for the contemporary visual arts. Prior to working for the Arts Council Vivienne was a curator programming gallery exhibitions and developing public art initiatives.

Bridget McKenzie

Bridget is founding director of Flow Associates, a consultancy supporting cultural and educational organisations to engage more effectively with new and educational audiences, especially in areas connecting the arts and sciences. Clients include the Science Museum, Thackray Museum, Hunterian Museum (Royal College of Surgeons), Clore Duffield Museum, NESTA and Creative Partnerships. Before setting up the company, Bridget was head of learning at the British Library (2002-2006), where she established a renowned programme innovating in the field of 'creative enquiry'. This role followed a range of experiences, including Education Officer for Tate, lead consultant for the Artworks Awards and coordinator of the Young at Art widening participation programme for the University of the Arts.

References

1. Junior Cafe Scientifique http://www.juniorcafesci.org.uk/

Junior Cafe Scientifique (JCS) in schools has developed from the Cafe Scientifique movement - evening meetings between scientists and public, which take place in bars, cafes, theatres and pubs outside the academic environment. JCS take place in cafeterias, common rooms or libraries, not classrooms; at lunchtime or after school, so that audience and speaker meet as equals, without barriers. There are cafes in schools across the north of England.

2. Wonderland http://www.helenstoreyfoundation.org/pro7.htm

Wonderland is a collaboration with Professor Helen Storey, artist and designer, and Tony Ryan Professor of Physical Chemistry and director of the Polymer Centre at the University of Sheffield, it is supported by the EPSRC. The research aims to produce two connected bodies of work through the creation of new materials. First a collection of clothes that could, through a multitude of live and in-situ chemical reactions, slowly disappear over the duration of the installation, and secondly a collection of products that would behave in the same way, leaving the exhibition empty at the end.

3. Inside DNA http://www.ecsite-uk.net/travelling/inside-dna/

Inside DNA: A genomic revolution is a new touring exhibition led by Ecsite-UK: the UK Network of Science Centres and Museums (five-year project) and produced by At-Bristol. The exhibition will tour to science centres and museums and is funded by Wellcome. The exhibition will be accompanied by associated learning and engagement programmes; and provide the infrastructure for multi-site engagement activities featuring live links between sites hosting the main exhibition and the exhiblets.

4. **Lab in a Lorry http://www.labinalorry.org.uk/**

Lab in a Lorry is an interactive mobile physics laboratory staffed by volunteer practising scientists and engineers. The aim of Lab in a Lorry is to give young people aged 11-14 the opportunity to do experimental science in the way it actually happens; exploratory, accidental, informed by curiosity and intuition, but also bounded and guided by the experience and insight of practicing scientists. It is aimed at 11-14 year old young people. Year-round, the vehicles tour the UK and Ireland – visiting schools, festivals, and other venues.

Appendix 1: Summary of approach

The issues to be addressed throughout the study - following meeting on June 8th with Simon Parry

Achieving the Wellcome's purpose - Clarifying the overall aims & concept of the exhibition

Disseminating Wellcome practice

- How will it add value and enhance the impact of Wellcome Trust initiatives that focus on young people's engagement (especially Pulse, but also other programmes)?
- What do Wellcome's internal stakeholders see as the key purpose and ideal approach?

Professional development

- How will it develop capacity and support the development of a community of practice in creative learning about biomedical science?
- How will it generate opportunities for professional development, both subject-specific and interdisciplinary, for artists, scientists and educators/cultural sector workers?
- How will it effectively cross disciplinary/curricular boundaries, spanning formal and informal education sectors in order to broaden reach and appeal?
- In particular, what are the implications of the changes in the science curriculum (21st Century Science) and the new Futures in Action National Curriculum, for this particular project?
- What can we learn from CPD programmes in similar contexts?

Young people

- How will young people be engaged as audiences? How will young people's voices be included?
- What are some general principles of approach that we can learn from similar practice focusing on young people's learning?

Curatorial approach – general principles

- How will it make best use of innovative curatorial approaches? What other exhibitions or curatorial approaches can inspire this exhibition?
- How will it achieve a balance between conveying the 'process' of creative learning yet creating an engaging experience for visitors?

Evaluation – feeding into practice

- How can evaluation be built into the exhibition & programme to support a) the Wellcome Trust and b) the wider professional community enhance practice in creative learning in science?

Achieving the exhibition (and associated programme) - considering how the exhibition will be shaped and delivered

Types of venue

- What are the different possibilities and constraints in different sites for exhibitions – especially multipurpose cultural-learning centres, galleries, schools (school galleries) and libraries? What are some specific venues?

Content

- What can be the possibilities for content? (e.g. broad or focused themes, diversity)
- What could be its key messages or stories?

Format

- What are the best options for format? (e.g. modules or one unit, scale)
- How would technology enable delivery of the programme?
- How could collection artefacts, commissioned art objects, interactive exhibits, texts and multimedia/moving image be used?
- What display systems could support this? (e.g. custom, off the shelf)

Evaluation

- How can front end, formative and summative evaluation be built in to the process of creating the exhibition?

Audience programmes

- What are the best strategies for engaging audiences within and beyond the exhibitions – young people, teachers, artists, scientists (professionals from different disciplines) and the wider public?
- Which events & marketing are appropriate for which audience groups?
- What resources, associated activities and interpretive materials should there be?

Leveraging partners – working with others

- What are some initiatives in 2008-2009 that will support the success of the project?
- Who are key partners and what might be their role?

Logistics

- What are the issues of crating, transport, storage and insurance (assuming the recommended formats)?
- What would be expected of tour venues?

Appendix 2: Interviewees

Jeremy Airey Professional Development Leader, National Science Learning Centre

Catherine Aldridge Network Project Director, Science Learning Centres

Sally Bacon Executive Director, Clore Duffield Foundation

Derek Bell Chief Executive, Association for Science Education

Elio Caccavale Designer and artist

Meroë Candy Wellcome Project Manager, Arts

Caroline Coates Helen Storey Foundation

Mike Jones Technical Director, Film & Video Umbrella

Anna Ledgard Teacher and Creative Learning Producer

Suzanne Lee All Change

Katherine Mathieson Head of Future Innovators, (NESTA) National Endowment for Science, Technology and the Arts

Rehana Mughal Cultural Partnerships, Creative Partnerships

James Peto Wellcome Senior Curator, Public Programmes

Marie-Lise Sheppard Wellcome Administrator, Arts

Caroline Smith Administrative Director, Film & Video Umbrella

Marjorie Smith National Development Officer for the SAPS Biotechnology Scotland Project

John Steers General Secretary, National Society for Education in Art and Design

Becky Swain Learning: Creative Partnerships

Written response: Susan Benn and Cathy Bereznicki PAL (see appendix 7).

Appendix 3: Pulse and Sci-art initiatives for repurposing for the exhibition

Selected Pulse projects 2003-6

Described in terms of form, content and where known age group

Stan's Cafe - Interactive installation, replace humans with grains of rice to convey the consequences of vaccination and human global cost of disease. http://www.stanscafe.co.uk/ (no images of the project on website)
The history of disease, vaccination, ethics, statistics and citizenship KS3

PVA Media Lab - film http://www.pva.org.uk/ (film is accessible on line)
DNA and how it affects identity KS3/4

Campbell Works - interactive art installation - cardboard labyrinth emulating the structure of the brain, the audience represents physical thoughts travelling through it.
http://www.campbellworks.pwp.blueyonder.co.uk/galleryexhibitionspast.html Good images of installation
(extended project through CE digital enhancement programme)
Communicating brain function to young people KS3

All Change – artworks and performances combining dance, digital images, sound and text. NB DVD of stills. Project website host artworks and information about the science topics. www.allchangearts.org
Comprehensive documentation of process, interesting video clips from live performance and videos projected during the performance (extended project through CE digital enhancement programme)
Stem cell research and gene therapy, deafness, diabetes, Parkinson's and motor neurone disease - young people (informal learning)

ActionDog Productions – Hollywood/Bollywood style film http://www.actiondog.net/
Microbes and disease, explores how a killer disease strives to protect itself, surviving against all the progress of modern science

ActionDog Production - music project inspired by Honda's Power of Screams TV commercial. Voice, digital media and physical theatre. Visual and audio recreation of what is happening as different medical conditions develop.
(extended project through CE digital enhancement programme)
Impact of smoking and poor diet and the development of heart disease

Central School of Speech and Drama - multimedia and performance art exhibition/event of young transsexual people's art work http://scidentity.blogspot.com/ (text based blog)
Relationship between the science of sex and sexed identities - young people (informal learning)

Resource Base – DVD resource: drama, dance, poetry and documentary film a music promo; interviews with two dermatology experts, and behind-the-scenes chats with the participants. http://www.resource-base.co.uk/mainindex
(extended project through CE digital enhancement programme)
Explores pigmentation from a young black perspective - initially young people (informal learning)

First Light Big Screen Science – films http://www.firstlightmovies.com/
Xenotransplantation to Attention Deficit Hyperactivity Disorder

Lansdowne Centre for Electronic Arts Ere Be Dragons - artwork/game uses gps to as creative gaming and contemporary hybrid art. http://lansdown.mdx.ac.uk/people/stephen/dragons/index.html
Health issue of obesity and illness caused by inactivity

Oh Art! Oxford House - creative writing and visual arts project
Pigmentation and skin lightening - young people (informal learning)

Creative Room Nottingham City Council – interactive 3D/sonic sculpture
Exploration and discoveries in cognitive neuroscience

Duncan of Jordanstone College of Art and Design – artwork in visual media
DNA (project was with children 7-10)
The Roundhouse – film
Sickle Cell - young people (informal learning)

Dorset County Hospital – live art site, specific events
A study of masculinity conceived through working with males aged 5 - 75s (impact of science on male roles)

Selected Sci-Art Projects (2004)

Wellcome officers suggested the following Sciart initiatives to be re presented in the exhibition:

Dawn Chorus
Artist Marcus Coates' exhibition and education project, a large-scale bio-acoustic video installation of bird songs sung, with the aid of digital manipulation, by members of the public. The project explores birdsong as a system of competing processes evolved to optimise species survival.

Hybrids

Hybrids by the artist and designer Elio Caccavale explores the emergence of biological hybrids in biotechnologies, and our human, personal, moral, aesthetic and socio-cultural responses to them. The project focuses on xenotransplantation and the breeding of GM animals incorporating human genetic material.

Ex Memoria

Film director Josh Appignanesi's short fiction film exploring the experience of Dementia through a 'face-to-face encounter'.

Small Animal Animations

Artist Suky Best has produced prototypes of a series of drawn graphic animations that are abstractions from the movements of groups of small animals, insects and organisms.

The Invisible Stain

Filmmaker Roz Mortimer's experimental documentary explores the recently discovered presence of persistent organic pollutants and endocrine disrupting contaminants in the environment, particularly the potential effects of these pollutants on Inuit communities living in the arctic rim.

Appendix 4: Selected teaching/learning projects & resources funded by Wellcome

Big Screen Science

First Light Big Screen Science involved information-labs, bringing together teachers, scientists and filmmakers to explore science/arts links. The resulting education resource specifically explores KS4 Ideas and Evidence in Science, covering a range of topics from Xenotransplantation to Attention Deficit Hyperactivity Disorder, and encourages cross-curricular links.

Let's Talk

Lets Talk is a resource produced by Marjorie Smith (SAPS Biotechnology Scotland Project) which provides discursive activities for both primary and secondary pupils (ages 10-13). It involves activities designed to enable teachers to raise awareness of scientific issues with their pupils through different approaches including: drama and expressive arts, discussion card based activities, debate activities. Subjects include: Plants matter – habitat destruction; importance of plants for food and medicine; Human reproduction – test-tube babies; designer babies; Environmental issues – pollution, habitat destruction, global warming, world health and poverty. The resource responds to A Curriculum for Excellence (ACE) aim to promote innovative teaching and learning, including discussion of social, moral, and ethical issues.

Science and Plants for Schools

Science and Plants for Schools produced by Marjorie Smith (SAPS Biotechnology Scotland Project) involved activities to enable primary teachers to raise scientific issues with their pupils - linked to the primary curriculum. These activities have been trialled, via teacher training institutions, in 25 schools in the UK.

Citizen Science

Citizen Science is designed to engage young people and teachers in discussion about bio-medical science issues that affect society today. It was set up by the At-Bristol Education team and the University of Bristol, along with teachers and scientists. It involved practical workshops for teachers on new discussion and debating skills and approaches included video conferencing, chat rooms, drama and filming.

On-line resources relate to themes and issues include cloning, nanotechnology, genetic testing, plastic surgery, childhood obesity and animal rights. Students are introduced to these issues through games similar to Pictionary, Taboo, Pairs and Consequences etc It also outlines approaches such as the TV chat show format to encourage students to debate social, political and health issues surrounding issues such as alcohol consumption.

www.at-bristol.org.uk/cz/Default.htm

BioEthics Education Project (BEEP)

BEEP is an interactive website and virtual learning environment for secondary school science teachers and their students. It is a teaching resource developed to highlight the moral, ethical, social, economic, environmental and technological implications and applications of biology.

www.beep.ac.uk/content/index.php.

Creative Encounters resources

Resource Base

The initial Colour Coded project was originally targeted at Key Stage 4 it explored the science and social impact of skin colour from a young black perspective. The project is now being repurposed for a younger, Key Stage 2 audience. The resource includes six short stimulus films and a range of activities and resource sheets that can be used with children in years 5 and 6 within SEAL, PSHE, Citizenship and Science.

Campbell Works

The Mind Mine project was an installation that communicated brain function to young people, this now being developed into an experimental web project. The extension project will include a virtual rendering of the installation with images, film and animation and down loadable games and experiments and worksheets, it is aimed at KS3 students.

Action Dog Productions

This audio visual resource explores the impact of smoking and poor diet and the development of heart disease and consequently a heart attack. The web resource is based on artwork from Corporeal Cacophony and the project presents learning activities aimed at KS3. It includes audio files and lesson plans, worksheets, and suggested homework.

www.actiondog.net/corporeal_cacophony

All Change

All Change are developing a new resource exploring the process, outcomes and learning from two Pulse funded projects - Skin Deep and Playing God? The resource explores the ethical dilemmas posed by stem cell research and genetic therapy and the impact of genetic science on peoples' lives. It is aimed at both science and arts educators/practitioners working with young people in informal education. In addition the site will host a young people's (14-19 years) section where they can view artworks, explore issues and questions, access science information and links to other resources, view scientists' and artists' profiles, and find the thoughts and views of peer-group participants involved in both projects.

Paddy Hartley working with The Gillies Archive

Project Façade remote handling is an extension of the original project which looks at facial reconstructive surgery. The proposed resource includes downloadable visual presentation and a series of 3D rapid prototype data files of key artefacts including a shrapnel/shell fragment, Gillies Archive Patient face casts, prosthetic mask implant and Skull and implant section. The resource is aimed at A Level Science teachers, Art teachers and History teachers and students and 1st Year+ Medical, History and Art Students.

Appendix 5: The Context of Science Learning – author David Barlex

Professional development provision in England, Wales, Northern Ireland and Scotland

Professional development provision in England

The Science Learning Centre network

Science Learning Centres are a national network for professional development in science teaching. The Centres support teachers in enhancing their professional skills by learning more about contemporary scientific ideas and in experimenting with effective teaching approaches and gaining experience of modern scientific techniques.

The aim is to improve science teaching, raise morale in the teaching profession and to inspire pupils by providing them with a more exciting, intellectually stimulating and relevant science education, enabling them to gain the knowledge and the understanding they need - both as the citizens and as the scientists of the future.

There are nine regional Centres in England and one National Centre to serve the UK. Each of the Centres has a main base but is developing satellite Centres and online resources which can be accessed by teachers from across the country.

The Centres offer courses in the latest scientific research and industry, as well as education initiatives across all key stages and Post-16, to science teachers, technicians, FE lecturers and teachers tackling the ethics of science in society e.g. citizenship teachers.

Each of the Centres is equipped with new labs and ICT resources to provide advanced training. They are working with leading scientific organisations and businesses to ensure that the content delivered to the teachers is contemporary and relevant.

The Centres and contact details are listed below

There is a single point of contact for working with the Science Learning Centre network. Contact the Network Project Director by emailing your queries or ideas to enquiries@network.slcs.ac.uk.

Engaging with the Science Learning Centre Network is the most obvious and effective means of reaching science teachers. It is important to note that a revised Key Stage 3 curriculum has been published and schools are working towards implementation in September 2008 so developing exhibitions in which there is a clear relationship between exhibition content and new requirements will be important. The SLCN will be key to ensuring the relevance of the exhibition from this time.

However it is important to note that all science learning centres have reported some measure of difficulty with regard to teachers gaining release from school during the working day so that many courses are limited to twilight provision.

The science learning centres have an extensive portal website:

www.sciencelearningcentres.org.uk

STEMNET

STEMNET's key role for HM Government is to ensure that *all* schools and colleges across the UK have access to appropriate information and advice on STEM Enhancement and Enrichment support, thus encouraging more young people to engage with and become inspired by Science, Technology, Engineering and Mathematics (STEM). As part of this, STEMNET contracts with local partners to provide services to support STEM Enhancement & Enrichment in schools and colleges across the UK. These contracts (currently called 'SETPOINT' contracts) are arranged on a sub-regional basis.

For the period 1st August 2008 to 31st March 2011, subject to final funding decisions from HM Government, STEMNET will issue two contracts per sub-regional area -

- One for Brokerage of STEM Enhancement & Enrichment (E&E) – the provision of impartial, tailored advice on STEM E&E to ALL schools and colleges, with particular efforts made to establish a proactive dialogue with each secondary school and college;
- One for local management of the Science & Engineering Ambassadors (SEAs) Programme, ensuring that all schools and colleges have access to vetted, trained role models who can support teachers and help promote positive images of STEM.

A key difference between STEMNET and Science Learning Centres is that SETPOINTS regularly organise activities that involve pupils as well as teachers.

The first point of contact with regard to the role of STEMNET in supporting a Wellcome exhibition is Pat Longford, Director of programmes. She is based at:

STEMNET, 2nd Floor, Weston House, 246 High Holborn, London WC1V 7EX

Tel: 020 3206 0450 and email pat.longford@stemnet.org.uk

Arrangements within particular regions can be developed by discussion with any of the nine regional directors, details listed below.

STEMNET has an extensive website at http://www.stemnet.org.uk

The Association for Science Education (ASE)

The ASE provides some in-service training through ASE INSET Services and although these are not extensive it will be beneficial to discuss a partnership with Mike Bell, the Director. He is based at:

ASE INSET Services, Barclays Venture Centre, Sir William Lyons Road, Coventry, CV4 7EZ

Tel: 024 7669 0053, Fax: 024 7669 0726 and email mbell20709@aol.com

This name is not to be confused with Derek Bell, the overall director of ASE. It is also worth noting that the ASE has a large annual conference in January and a Wellcome Trust presence with regard to promoting the exhibition could be useful.

The ASE has an extensive website at http://www.ase.org.uk/

Professional development provision in Wales

The National Science Learning Centre has the brief for providing professional development in Wales as there are no regional centres based there. Given the location of the National Science Learning Centre I think it unlikely that many Welsh science teachers access professional development through this route.

Heather Campbell, STEMNET Regional Director South West manages SETPOINT South West and Wales contracts which cover the six sub-regions of the South West and Wales and it might be possible to develop exhibition related professional development in Wales through her office.

In addition it is worth considering Techniquest. Techniquest is an educational charity, established in 1986 and based in Cardiff, Wales. Their mission is to engage people with science and to motivate them to learn more and we also address science-related areas such as maths, engineering and technology.

Techniquest works extensively with public audiences, and provide a range of services to schools and teachers to complement the formal education provision in Wales.

Techniquest operates exhibitions, shows and programmes intended to make science accessible to people throughout Wales, and to improve the quality of public debate about science and technology.

The main site in Cardiff Bay is a top visitor attraction and provides a comfortable, clear and highly enjoyable experience for all ages. Exhibitions, science theatre, planetarium and much more are on offer.

Visitors can also find the Techniquest 'experience' at three other locations in Wales, in Wrexham, Llanberis and Oakwood.

My experience of working with Techniquest is that the organisation would be willing to collaborate with a Wellcome exhibition.

Contact details are

Business Services, Stuart Street, Cardiff, CF10 5BW

Tel: +44 (0) 29 20 475 475, Fax: +44 (0) 29 20 482 517 and email: business@techniquest.org

Techniquest has an extensive website at http://www.techniquest.org/start/

Professional development provision in Northern Ireland

The National Science Learning Centre has the brief for providing professional development in Northern Ireland, as there are no regional centres based in Northern Ireland. Given the location of the National Science Learning Centre it is unlikely that many Northern Ireland science teachers access professional development through this route.

There is a SETPOINT in Northern Ireland – Sentinus, and my experience of working with Sentinus is that the organisation would be willing to collaborate with a Wellcome exhibition. Contact details are:

Brian Campbell, Setinus, 19a Ballinderry Road, Lisburn, BT28 2SA

Tel: 0289 262 7755, Fax: 0289 262 7744 and Email: info@sentinus.co.uk

Sentinus has a website at http://www.sentinus.co.uk

Professional development provision in Scotland

The situation in Scotland is different from that elsewhere in the UK. There is a national CPD Network that consists of representatives from the CPD teams in every Scottish local authority as well as key organisations such as the Scottish Centre for Studies in School Administration (SCSSA), the TAC team, and the SQA. The team is active in supporting these organisations in their management and delivery of CPD by frequent meetings, working groups, conferences and visits.

The focus of CPD is through professional development and review. There is extensive documentation. See for example the document Continuing Professional Development.
http://www.scotland.gov.uk/Resource/Doc/47021/0023973.pdf

This approach does not exclude subject based CPD but much of the thrust is concerned with more general issues of organisation and management. The role of a Wellcome exhibition would need to take this into account and also be put in the context of curriculum reform that is taking place in Scotland at the moment – see later.

An important and useful first port of call would be to contact Margaret Alcorn, the national CPD Co-ordinator via email marked for her attention and sent to ruth@cosla.gov.uk

The National CPD Team operates from offices in Glasgow and Edinburgh

Edinburgh office, COSLA Rosebery House, 9 Haymarket Terrace, Edinburgh, EH12 5XZ.

Glasgow office, Learning and Teaching Scotland, The Optima, 58 Robertson Street, Glasgow G2 8DU

Although there is no STEMNET regional director for Scotland there are three SETPOINTS: SETPOINT Scotland East, SETPOINT Scotland North East and SETPOINT Scotland West. Details are below

The Scottish SETPOINTS have a website at http://www.setpointscotland.org.uk/index.cfm

It would make sense to contact the Scottish SETPOINTS as they might act as a delivery arm with regard to CPD proposals developed at a national level through Margaret Alcorn.

Curriculum requirements in England, Wales, Northern Ireland and Scotland

Curriculum reform in England

A new programme of study for all subjects in the National Curriculum has been agreed and published. Implementation is to begin in September 2008. Each subject has the same structure:

- An Importance Statement
- Key Concepts
- Key Processes
- Range and content
- Curriculum opportunities

It will be important that the Wellcome exhibition has strong and purposeful links to this structure and the new requirements.

The importance statement reads:

> *"The study of science fires pupils' curiosity about phenomena in the world around them and offers opportunities to find explanations. It engages learners at many levels, linking direct practical experience with scientific ideas. Experimentation and modelling are used to develop and evaluate explanations, encouraging critical and creative thought. Pupils learn how knowledge and understanding in science are rooted in evidence. They discover how scientific ideas contribute to technological change – affecting industry, business and medicine and improving quality of life. They trace the development of science worldwide and recognise its cultural significance. They learn to question and discuss issues that may affect their own lives, the directions of societies and the future of the world."*

The key concepts are:

- Scientific thinking
- Applications and implications of science
- Cultural understanding
- Collaboration

The key processes are:

- Practical and enquiry skills
- Critical understanding of evidence
- Communication

Range and content includes:

- Energy, electricity and forces
- Chemical and material behaviour
- Organisms, behaviour and health
- The environment, Earth and universe

There are four attainment targets

- AT1 How science works
- AT2 Organisms, their behaviour and the environment
- AT3 Materials, their properties and the Earth
- AT4 Energy, forces and space

It is in the area of 'How science works' that most teachers will be dealing with new territory and elements of a Wellcome exhibition that dealt with that will be well received.

Curriculum reform in Wales

The Welsh Assembly held national consultation on proposals for national curriculum subject orders, during the period 8 January – 30 March 2007. The overall response to the consultation was very positive. The implementation for the revised orders for Key Stage 3 will take place from September 2008 for years 7 and 8, and from September 2009 for Year 9.

For pupils from the age of seven, the requirements in respect of the 12 National Curriculum subjects have been restructured. The purpose of these changes is to identify the skills for each subject and the range of contexts, opportunities and activities through which these skills should be developed and applied. Content has been updated to ensure relevance to the 21st century and manageability for learners and teachers.

At present there appears to be no on line version of the revised curriculum requirements but as in England it will be important to align the exhibition with elements of the revised curriculum that teachers see as problematic.

Curriculum reform in Northern Ireland

There has been considerable curriculum reform in Northern Ireland. See www.nicurriculum.org.uk

The document http://www.nicurriculum.org.uk/docs/key_stage_3/statutory_curriculum_ks3.pdf spells out the details. Interestingly the role of the subjects is described as contributing to:

- Developing pupils' knowledge, understanding and skills,
- Developing pupils as individuals,
- Developing pupils as Contributors to Society
- Developing pupils as Contributors to the Economy and the Environment.

This organising framework should make it relatively easy to align a Wellcome exhibition with curriculum requirements. For example, within 'Developing pupils as Contributors to Society' we find the following:

> *Pupils should have opportunities to:*
>
> *Investigate how the media (internet, television, radio, newspapers) help inform the public about science and science related issues. Explore some of the strengths and limitations of these sources of information, for example, maintain a journal of science issues in the news and compare and contrast different approaches to dealing with scientific issues etc.*
>
> *(Media Awareness)*
>
> *Explore some ethical dilemmas arising from scientific developments, for example, testing of new chemical products for weapons development, growing genetically modified crops etc.*
>
> *(Ethical Awareness)*
>
> *Opportunities must also be provided to explore issues related to:*
>
> *(Citizenship)*
>
> *Consider factors that need to be taken into account when assessing statements that claim to be based on scientific research into issues affecting society, for example, the nature, quality and source of the data etc.*
>
> *(Cultural Understanding)*
>
> *Consider how the development of scientific ideas or theories relate to the historical or cultural context, for example, the development of the heliocentric model of the solar system, Jenner's work on vaccination etc.*

The minimum statutory requirements for the curriculum at Key Stage 3 will come into effect as follows:

- Year 8, from September 2007;
- Year 9, from September 2008; and
- Year 10, from September 2009.

Curriculum reform in Scotland

The Scottish curriculum is currently going through a national review called Curriculum for Excellence with the aim of developing a streamlined curriculum for 3-18-year-olds and implementing new approaches to assessment.

Work on the Curriculum for Excellence guidance has been taking place during 2006, followed by schools piloting/trialling elements from the guidance. Concentrated work to refine and finalise the guidance will take place from January 2007 along with ongoing engagement and Continuing Professional Development (CPD) with educationalists.

From August 2007 there will be a year of familiarisation, preparation and development with ongoing CPD and implementation of Curriculum for Excellence will begin in August 2008.

As with the Northern Ireland curriculum the relationship between broad educational aims and science education are clearly described:

- Developing successful learners

Through science, children and young people develop their interest in, and understanding of, the living, material and physical world. They increase their understanding of scientific ideas and approaches. They become aware of the pace and significance of developments in the sciences and can evaluate the impact of these. Through first-hand observation, practical activities, open-ended challenges and investigations, and discussion and debate, children and young people can develop a range of skills in critical thinking as well as literacy, communication and numeracy.

- Developing confident individuals

  Science is an important part of our heritage and its applications are part of our everyday lives at work, at leisure or in the home. In order to develop as confident individuals, children and young people need to learn about current science in relevant, real-life contexts and acquire the confidence to use scientific terms and ideas. They can learn to express and justify their views on science-based issues of importance to society.

- Developing responsible citizens

  Children and young people should come to appreciate that science is a dynamic, creative, human process which contributes greatly to the development of human culture, both nationally and globally. They can recognise that the rate of development in science and technology and their impact have enormous implications for the wellbeing of our society. The values that guide scientific endeavour - respect for living things and the environment; respect for evidence and the opinions of others; honesty in collecting and presenting data; an openness to new ideas - are the basis of responsible citizenship.

- Developing effective contributors

  Science offers opportunities for children and young people to engage in a wide range of collaborative investigative tasks, both within and beyond the classroom, where they learn to design and use experiments, interpret data, make deductions and draw conclusions based on evidence. Through these experiences and activities they can develop important skills to be enterprising and creative adults in a world where the skills and knowledge of science are needed across all sectors of the economy.

The revised curriculum will be based on the big ideas of contemporary science and the scientific concepts that underpin these. Experiences and outcomes will be grouped in the following way:

- Our living world: including the diversity of living things, the uniqueness of being human and the importance of cells
- Our material world: including uses and properties of materials, sustainability, the chemistry of life processes and the applications of chemistry in society
- Our physical world: including harnessing and using energy sources, motion and travel on land, sea, air and space the development of communication systems.

See http://www.curriculumforexcellencescotland.gov.uk/index.asp

As with the Northern Ireland curriculum such an explicit organising framework should make it relatively easy to align a Wellcome exhibition with curriculum requirements.

The emerging STEM agenda

STEM stands for Science, Technology, Engineering and Mathematics. STEM activities explore the interdisciplinary connections between science, design & technology and mathematics with special reference to those sorts of activities that might be termed engineering or have a strong engineering component.

The STEM Programme is a national initiative whose aim is to improve the support for STEM subjects in schools and colleges. The Programme has its origins in a report published in October 2006 which proposed a series of measures to enhance the effectiveness of government funding in two areas: the flow of qualified people into the STEM workforce; and STEM literacy in the population. The STEM report itself derives from the Treasury's *Science and Innovation Investment Framework 2004 – 2014* and the follow up *Next Steps* report, both of which laid heavy emphasis on the economic importance of securing a long term supply of people trained in STEM subjects. The Programme thus has high-level political support. This provenance has also given it a somewhat instrumental appearance, with success measured in terms of numbers of students taking A Levels in science, and similar rather simple indicators.

A STEM seminar was held at the Royal Society in May 2007. The Report from John Holman and Michael Reiss identified the following benefits of exploring the interdisciplinary connections:

- Marching in curriculum step – co-ordinating the sequence of work in the three subjects so that they can provide mutual support
- Painting a fuller picture of STEM outside the classroom – leading to increased motivation to choose the subjects and consider a related career
- Showing the value of difficult subjects – enabling pupils to appreciate the contribution of these subjects to our lives
- Uncovering the engineering and mathematics that lie hidden in other parts of the curriculum – science and design & technology are replete with examples of engineering that have mathematics embedded and making these explicit will help pupils see the value of studying mathematics.

The report stresses that all members of the community need to be treated as autonomous players and that it will be necessary to foster a culture of co-operation not competition. The report also notes firmly that it is important to preserve the integrity and identity of individual subjects, as well as showing how the subjects support one another

The full report is available at this address:

http://web.data.org.uk/data/news/pdfs/joint_stem_meeting_2007.pdf

The emphasis on engineering within STEM may militate against engagement with a Wellcome exhibition. The Royal Academy of Engineering is a significant player within the development and provision of professional development for science and technology teachers. However SCORE (Science Community Partnership Supporting Education) is a key stakeholder in the STEM agenda and will playing a key role in supporting in service training for science teachers. SCORE is convened by the Royal Society and the other founding partners are the Institute of Physics, the Royal Society of Chemistry, the Institute of Biology, the Biosciences Federation, the Science Council and the Association for Science Education.

(See http://www.royalsociety.ac.uk/page.asp?id=5216)

I think it is important for those developing the exhibition to keep an eye on STEM developments as it might be possible to align STEM related professional development requirements to the exhibition as details of both the professional development requirements and the exhibition content become clearer.

Contacts database

Science Learning Centres

- The National Science Learning Centre (based at the University of York): The White Rose University Consortium, comprising of the Universities of Leeds, Sheffield, York and Sheffield Hallam

- Science Learning Centre London: The Institute of Education in partnership with the Science Museum, Birkbeck College and University College London
- Science Learning Centre East of England: The University of Hertfordshire in partnership with the ASE, Hertfordshire LEA, Bio-Rad Laboratories and SETPOINT Hertfordshire
- Science Learning Centre South East: The University of Southampton
- Science Learning Centre East Midlands: The University of Leicester in partnership with the University of Nottingham and Bishop Grosseteste College
- Science Learning Centre Yorkshire and the Humber: The White Rose University Consortium, comprising of Sheffield Hallam University, University of Leeds, University of York and University of Sheffield. The Centre will be based at Sheffield Hallam University
- Science Learning Centre North West: Manchester Metropolitan University in partnership with St Martin's College Lancaster and SETPOINT Greater Manchester
- Science Learning Centre North East: Durham University in partnership with Framwellgate School, Durham County Council, Newcastle University, Life Knowledge Park, Sunderland University, Teesside University, Northumbrian Water plc and Nissan Motor Manufacturing (UK) Ltd
- Science Learning Centre West Midlands: Keele University in partnership with Staffordshire Education Service, Stoke-on-Trent LEA, SERCO Learning and Staffordshire University
- Science Learning Centre South West: At-Bristol in partnership with the University of Bristol and University of Plymouth

STEMNET Regional Directors

Ajay Sharman, Regional Director South East

Ajay manages six key SETPOINTs across the region. He is jointly funded by SEEDA, supporting a wider education and skills agenda for the region.

Barry Lewis, Regional Director West Midland

Barry manages SETPOINT West Midlands contracts which cover the six sub-regions of Birmingham/Solihull, the Black Country.

Cathy Brown, Regional Director East Midland

Cathy works with 5 SETPOINTs in East Midlands, creating relationships with regional organisations, progressing the establishment of a regional STEM Support Centre.

Gus McSkimming, Regional Director Yorkshire

Heather Campbell, Regional Director South West

Heather manages SETPOINT South West and Wales contracts which cover the six sub-regions of the South West and Wales

Kevin Burke, Regional Director North West

Kevin works with 5 SETPOINTs in North West, and 1 SETPOINT in Northern Ireland, creating relationships with regional organisations, progressing establishment of Regional STEM Support Centre, and leading the STEMNET working group for Quality Management.

Kirsten Bodley, Regional Director London

With the support of Adrian Fenton, Kirsten is Science Communication Manager for London and also a member of several London steering groups: London Science Challenge, Capital Skills Project, IAG project.

Leslie Whyte-Venables, Regional Director East

Working with SETPOINTs and other delivery organisations, funding bodies and networks, Leslie focus is raising the quality of STEM support for schools in Bedfordshire and Luton, Essex, Norfolk, Cambridge, Herts and Suffolk.

Sam Pearson, Regional Director North East

Sam manages the SETPOINT North East contracts which cover the four sub-regions of the North East; County Durham, Northumberland, Tees Valley and Tyne & Wear.

Contact is most easily made via the London office Tel: 020 3206 0450

Scottish SETPOINTS

SETPOINT Scotland East
Frank McKeever
Careers Scotland Centre
100 Manor Street
Falkirk FK1 1NV

Phone 01324 620311Fax 01324 624062
Email frank.mckeever@careers-scotland.org.uk

SETPOINT Scotland North East
Rm B34 St Mary's
University of Aberdeen
Elphinstone Road
Aberdeen AB24 3UF

Phone 01224 274348 Fax 01224 274190
Email setpoint@abdn.ac.uk

SETPOINT Scotland West
Steve Brindley
The Technology & Science Alliance
Kelvin Building
University of Glasgow
GLASGOW G12 8QQ

Phone 0141 330 6396 / 5370 Fax 0141 330 2806
Email s.brindley@physics.gla.ac.uk

Appendix 6: Learning models in creative science

Developed by Bridget McKenzie/Flow Associates for learning programmes to underpin Science Museum touring exhibition The Science of Survival. Designed to support the curriculum reforms that include wider curriculum dimensions, sustainability and creative learning.

FRAMEWORK FOR LEARNING FOCUSED ON HUMAN INGENUITY AND

CULTURES IN GLOBAL SOCIETY

Exchange and conflict between societies (over natural resources/territories and values/cultures)

Laws and rights (e.g. about valuing human life)

Relationships (e.g. how people organise lives together in units and communities)

How knowledge is discovered and used (e.g. educational & scientific methods)

Attitudes to work, health, children (e.g. informal values in the media & communities)

MACRO

THE ENVIRONMENT

Earth as part of the Universe (e.g. Can humans live elsewhere? Does biological life exist elsewhere?)

The eco-system (e.g. climate and biodiversity as backdrop to human population)

Abuse and care of animals (e.g. human relationship to animals, including our consumption of animals & genetic research)

Use of natural resources such as water, oil, trees and other plants (e.g. including the effects of these on the body)

Designing and building communities (e.g. living for wellbeing)

Human population (e.g. epidemiology)

CULTURAL

NATURAL

HUMAN INGENUITY

EVOLUTION AND ADAPTATION

Being imaginative

Identifying and solving problems

Breaking rules & making new connections

Learning from other innovators

Personal motivation and inspiration (e.g. my aspirations)

Personal belief systems (e.g. about health, diet, reproduction or identity)

My self in my body (e.g. effects of appearance, gender, illness or skin colour)

How bodies adapt to environments (e.g. genetics, evolution)

What and how we eat (e.g. growing, processing, consuming)

Where and how we live (e.g. shelter, consumption, dress)

Relationships and reproduction (e.g. genetics, sex, growth)

Illness and medicine (e.g. biology and health)

Physical activities and skills (e.g. exercise, capacity of bodies to adapt)

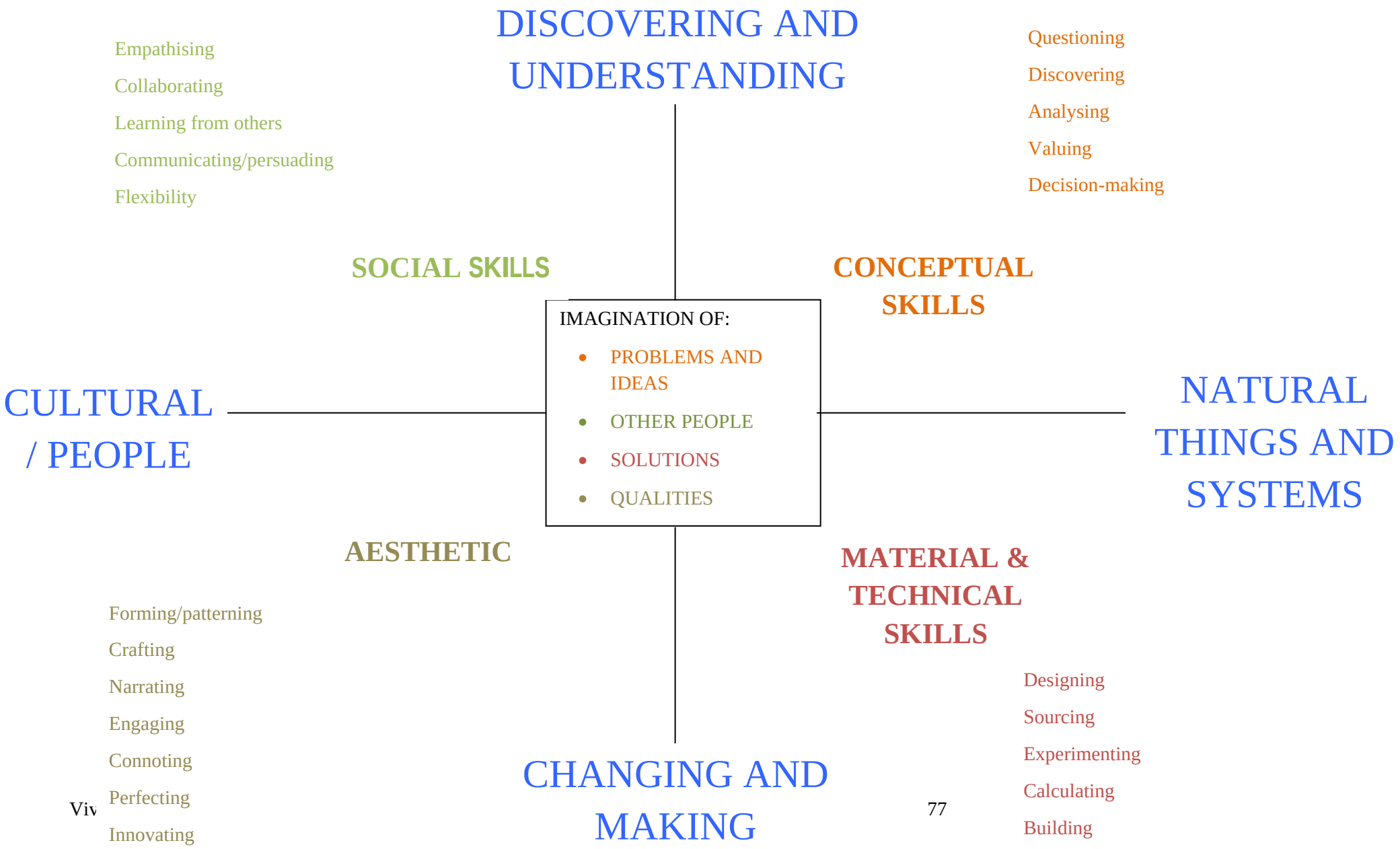
MIND AND IDENTITY

Ltd

MICRO

MY BODY

FRAMEWORK FOR LEARNING SKILLS AROUND HUMAN INGENUITY



PAL

Appendix 7: PAL Response

PAL Labs are specifically designed to create growing communities of enquiry. Over 17 years PAL has run 117 Labs involving over 3700 highly talented artists, scientists, teachers and policy makers from the UK and overseas.

These small interdisciplinary Labs begin by being relatively private. The methodology encourages participants to continue to work together on a self motivated basis, in some cases for many years after their laboratory experience.

After careful consideration of Wellcome's stated needs, we have weighed up a spectrum of potential public engagement for Wellcome; which extends from the consumerist (eg run an exhibition and invite people along to see it) through to the deeply embedded (use the exhibition as a resource to create a sustainable community of enquiry).

Not surprisingly, PAL would be keen to work with Wellcome on the more embedded approach to public engagement so as to ensure that its knowledge and experience has a longer and more powerful life and offers better value for its past and future investment in funding awards.

How might PAL do this?

PAL's design/development process for residential 'Lab programmes' is now being differentiated to make new forms of *Live Labs. Live Labs* would offer a powerful way to create new public relationships with touring exhibitions and other events.

Showcasing Wellcome's work would take place in diverse venues across and between communities. These might be geographically based and/or built around a set of ideas. Site specific locations such as museums and galleries, city walks, parks and gardens, schools and libraries, hospitals and health centres, shopping centres and other voluntary and community settings, would be used. Communities of residents, artists, educators and some of Wellcome's research scientists would be drawn into the dynamics of a *Live Lab* to have conversations in which all participate on

a level playing field. Concerns, questions and interests would be shared and new collaborative activities invented. The experience would build longer lasting impact from an exhibition or a screening, a live performance, a shopping trip or a period of illness.

One illustration of a geographical location in which PAL already has some of the constituents of such a community is Liverpool, where we have scientists, artists and teachers who have all participated in Creative Science Teaching Labs or other science based PAL Labs. Their enthusiasm and passion for science communication can be harnessed and used to build a responsive community ready to make the most of Wellcome's local exhibitions or events.

This longer term strategic embedded approach, developed at the inception of a new project and/or to capture and grow existing material (of which Wellcome has so much to draw upon) is a real opportunity to use PAL's imaginative curatorial intervention. There is much scope internationally for this approach.

Susan Benn and Cathy Bereznicki 22nd August 2007

PAL 6 Flitcroft Street London WC2H 8DJ
Telephone +44 (0)20 7240 8040 Fax +44 (0)20 7240 8540 Email info@pallabs.org
www.pallabs.org