

## Europe Day

Welcome to ecsite's new logo, and to your new-look newsletter!

Short 'News & Reviews' articles will now appear in the monthly eNews, allowing the quarterly publication to present more reflective 'FOCUS ON' pieces, and to feature interviews with scientists working in areas relevant to science centres & museums. This Spring, enjoy - 'IN THEIR OWN WORDS' - professors Gregory, Jeannerod and Singer.

In 2003, ecsite and NEF (the Network of European Foundations for Innovative Cooperation) initiated a co-operation. Our joint purpose was to experiment with dialogue between science and the public all over Europe and identify best practice. The next step is to develop a special event that we hope will grow to become a European standard: 'YESS' - Yearly European Science & Society day - will be an international event involving citizens in the debate of societal and ethical issues raised by scientific progress in constructive, interactive and innovative ways. Every year, on and around 'Europe Day' (9 May), debates will be held on a specific theme. For 2005, the theme is brain research, with events organised by 15 ecsite member institutions in 11 countries. Our objectives are:

- To discuss subjects related to brain research all around Europe
- To highlight the social impacts of brain research, and its ethical issues
- To develop real dialogue between the scientific community and the public
- To empower citizens to participate in decision making processes.

YESS, has EU patronage, through DG Research. For the latest update on YESS, visit [www.ecsite.net](http://www.ecsite.net). LISTINGS (pages 2-3) lists further brain-related projects developed by ecsite members. And details of 'Europe Day' are at [www.cec.org.uk/whatsnew/may9.html](http://www.cec.org.uk/whatsnew/may9.html)



Hywel Ceri Jones graduated in 1962 from the University of Wales and joined the European Commission as Head of Department for Education and Youth Policies. He was responsible for launching a range of flagship programs, including ERASMUS, COMETT, TEMPUS, and YOUTH FOR EUROPE. In 1993, he moved to the Directorate General for Employment and Social Affairs. Since 2001, Hywel Ceri Jones chairs the Governing Board of the European Policy Centre, a Brussels-based think tank. He joined NEF as the new director in June 2004

Co-operation with NEF and this special issue of the ecsite newsletter is possible thanks in particular to support from NEF's new director, M. Hywel Jones. ecsite is also grateful to the King Baudouin Foundation whose Director, M. Tayart, is currently chair of NEF.

Walter Staveloz, ecsite Executive Director  
Melanie Quin, ecsite Editor (and Director, ecsite-uk)

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#### Copy date:

Copy date for the Summer issue 10 June with publication in July; for the Autumn issue, 9 September with publication in October.

# New projects & exhibitions to tour, on the theme of the Brain

## ATTENTION, EMOTION, AND JUDGMENT: How do minds figure out what to do?

An exhibit development project funded by the National Science Foundation, at The Exploratorium, San Francisco. This four-year exhibit-development project, begun July 2004, will produce 32 new and 8 rebuilt interactive exhibits on the psychology and neuroscience of attention, emotion, and judgment. The project also includes ongoing programming-brain dissections, films, lectures and workshops-and, in collaboration with local universities, psychology research on the museum floor.

Michael Pearce, project director  
E michaelp@exploratorium.edu

## BRAINARIUM: How real is reality?

Immersive FullDome 45-minute show about the Human Brain for Digital Planetaria or similarly equipped theatres.

The producer is LivinGlobe, Germany, in partnership with Sky-Skan Europe and iAS interactive Systems. The visitors are placed "inside the Brain": film sequences in combination with one of the most advanced, scientifically correct computer models of the human brain worldwide visualise how the Brain creates reality. Available end of 2005.

We are looking for Science Centres and exhibition makers that are interested in joining this project. We want to get their input and find out their requirements in order to fit their needs.

E contact@livinglobe.com  
www.livinglobe.com

## the BRAIN

Exhibit at Sharjah science museum  
We have preserved human brain - telling the visitor it's real they all get very excited. We have a rubber model that visitors touch and hold and put on the top of their heads. Very often they ask about relationship between intelligence and wrinkles. In summer camps kids dissect lamb brain.

Nadia Ahmed, Learning centre instructor  
E nadia@shj.gov.ae

## the BRAIN

Permanent exhibit at the National Museum of Emerging Science and Innovation ('Miraikan', formerly 'MeSci'), Tokyo.

Explains the structure and functions of human brain by introducing: neuron, research methods (plastination, PET and topography), brain development, diseases (Alzheimer, Parkinson's disease, stress and depression), integrated function by interactive exhibits on illusion, and interviews from 7 researchers.

www.miraikan.jst.go.jp/e/exhibition/index\_nofla.html

## CURRENT NEWS, SCIENCE NEWS

Science Actualités at [www.cite-sciences.fr](http://www.cite-sciences.fr) lets you search for current news on 'brain'-related subjects. Click <last questions on current events> and put 'brain' in the search box at [www.cite-sciences.fr/francais/ala\\_cite/science\\_actualites/site\\_sactu/accueil.php?langue=an](http://www.cite-sciences.fr/francais/ala_cite/science_actualites/site_sactu/accueil.php?langue=an)

## ESPRIT ES-TU LA? ('Spirit are you there?')

Musée de la main, Fondation Claude Verdan, Lausanne.

Perception, reason, memory, emotions, creativity, trance... The exhibition invites visitors on a journey into the metamorphoses of the mind, from the strange and marvellous phenomena of the psyche to research in neuroscience, seen from historical, ethnographic and artistic perspectives. On show till 23 October 2005.

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www.verdan.ch

## ILLUSIONS

Palais de la découverte, Paris.

An exhibition under development, for display February to August 2006. We start from the principle that sensory illusions can help us to understand perception, and they ways our brain works.

Guy Simonin, Directeur scientifique  
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## Lectures@LIFE

On 21 February Professor Blakemore was the latest in a long line of eminent scientists to speak at the LIFE Science Centre, Newcastle, as part of the Lectures@LIFE programme.

Colin Blakemore, Chief Executive of the Medical Research Council and the Waynflete Professor of Physiology at Oxford used Dali's painting of the Bust of Voltaire and a computer-generated portrait of Margaret Thatcher, as well as the latest research data, to trace our understanding of neuroscience and explode many of the myths we hold about the brain.

www.life.org.uk

## LE VAISSEAU: opening with illusions

The brand new science centre Le Vaisseau in Strasbourg has opened its first temporary exhibition to the public: 'Hocus Focus, la magie des sens' (Hocus Focus, the magic of the senses), 4 January to 28 August 2005.

The interactive exhibition is realised by the Flemish science centre Technopolis, where it has ran under the title 'illusions'. Visitors of Technopolis rated the exposition very high. Hopefully this means Le Vaisseau has started under a lucky star.

More information about the exhibition 'illusions':  
E patricia@technopolis.be  
More information about Le Vaisseau:  
www.levaisseau.com

## MAGIC FOREST

Magic Forest arose after working with Dr Richard Wingate from the Medical Research Council Centre for Developmental Neurology, at Kings College, London. The 2000-01 work tracks the development, proliferation, organisation and ordering of neurones as they develop. The piece uses slide dissolve equipment and two projectors dissolving between each other.

About to be shown at the Design Museum Zurich is 'Simply Complex - Picture-Trees and Tree Pictures in Science', 30 April to 4 September 2005.

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www.museum-gestaltung.ch/E\_welcome.html



The Max Planck Institute for Brain Research is structured into three departments. The Department of Neurochemistry is directed by professor Betz and studies the molecular processes related to transmitter release at synapses and to the regulation of post-synaptic receptors. The Department of Neuroanatomy, directed by professor Wässle, analyses the morphology and the development of the retina of the eye. Professor Singer directs the Department of Neurophysiology whose research is mainly focused on the cerebral cortex and the binding problem. It is related to the question of how the many spatially distributed and simultaneous processes in the cerebral cortex are bound together in order to produce a substrate of a percept and how those processes can self-organise to become coherent. Professor Singer's group follows the hypothesis that the tag that binds processes together is precise temporal synchronisation of the oscillatory activity of neurons. Besides his pure scientific work, Wolf Singer is extremely sensitive and engaged in the problem of giving a correct and attractive image of science to young people. He is persuaded that good communication between research centres and educational actors is fundamental for the development of our society.

## Brain research in Europe: ethical problems in research and the role of science in education - Interview with Wolf Singer, director of the Department of Neurophysiology of the Max Planck Institute for Brain Research

### Does Europe have an excellence in Brain research as in other topics, like for example nanotechnologies?

In Europe we have certainly a number of Institutions which produce highly competitive research at the world level but basic research is unfortunately less funded in Europe than in the USA. Moreover, the coordination of research in Europe is not good enough. We do have excellent research centres but in terms of number of researchers and productivity we are very far from the USA. The problem is that around Europe we have different languages and different curricula. The exchange of students between Universities is still not so easy. Moreover, most of European Universities are under-funded.

### What would you suggest to improve European research?

I think that we do not give enough importance to basic science. Science is driven by curiosity and hypothesis, it cannot be the direct result of applicability arguments. In the best and most original science we almost do not know what will be discovered tomorrow. In the organisation of our political systems science has to justify its existence by proving that "what you do today will have an

application tomorrow". This is not how science works. I can give an example: we discovered a couple of years ago that one of the signals that are maybe responsible for the binding of one of the distributed brain functions (namely precise temporal coordination) is something that is swapped in schizophrenic patients. Nobody would have imagined this and nobody would have been able to make direct research on this hypothesis because this hypothesis was simply not around.

We should let those people who are original and gifted for science play for a while, give them the good conditions for their play and we could obtain new and surprising results. Making the transfer possible to the applications should be the last step of the research process and not its basic motivation!

### Which are the legislation or ethical problems you encounter in your research work?

Research on physiology and examination of high level functions can only be done on awake and trained primates and in Europe we have excessively strict laws about the use of animals in scientific research which makes this research very difficult or either impossible in some institutions. Moreover, the

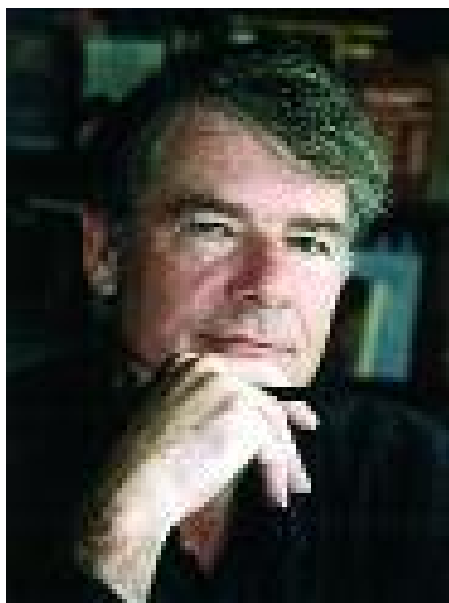
high amount of questionableness coming from the population on the subject of research on animals deters young people from entering this field: they are afraid by the social pressure they should support. European scientific research on some topics is in danger because of those problems.

### You mean that we should improve the image of brain research scientists in order to attract more young people to this field?

I think that it is essential for the future of European research to organise networks of scientific institutions working in close relation with schools, in order to make scientists able to teach to young people, early enough, what is science really about and to fight against the prejudices preventing them from developing an interest on many different scientific subjects.

### You are engaged in the European Dana Alliance for the Brain (EDAB, <http://www.edab.net/>). What are the purposes and activities of this network?

EDAB is an organisation of European leading brain scientists having the goal to inform the general public and decision makers about the importance of brain research.



Prof. Wolf Singer, Max Planck Institute for Brain Research

Once a year EDAB organises the "Brain awareness week" with a high concentration of media activities and conferences all around Europe. Many other activities are supported during the whole year. For example, I have organised a network connecting scientific institutions and local schools. The schools can express the wish of having lectures on some specific topic and the network connects them to the scientists experts of the topic. It becomes a self organised process which works beautifully! It is extremely important to support this dialogue between science and society and the scientists have to make an effort to be more responsive to the media, write and explain science to decrease the scepticism.

**Besides the ethical problem of research on animals, there are many other important topics in the actual neuroethics debate. First of them, the problem of the use of neural stem cells in research and therapies of many different diseases.**

Stem cell therapy for brain disease is still far away. The transplantation of stem cells has been debated for the cure of Parkinson's disease but it is still not sure if this kind of therapies could produce a positive effect. The use of stem cells for the brain is much more difficult compared to other organs because in the case of the brain cells should be able to bind to the right place, make the right connections and have the right experience to be functional and this is of course a long way. We have to carefully continue this exploration of therapies. I see two main ethical issues with the transplant of stem cells: whether we should use stem cells and where we get the cells from. Those issues are general to medicine and not specific to neuroscience.

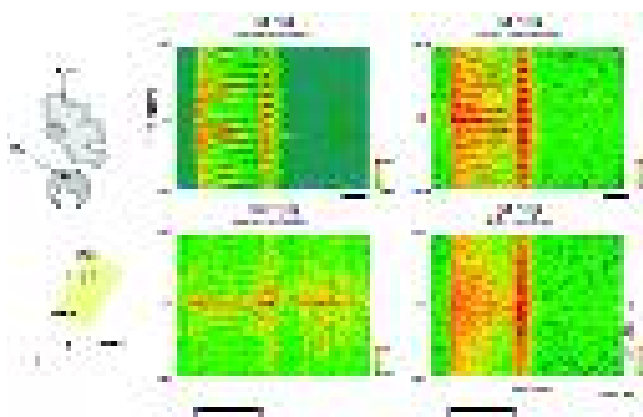
One ethical topic which is specific to our discipline is to establish how to use electrical stimulation of brain activity. It works beautifully to counter certain effects of Parkinson's disease and recently there are also attempts to apply it to people suffering from compulsive neuroses. The question is to decide how far can we go in this direction, and this topic has to be discussed publicly.

**Some of the therapies for brain diseases could be applied to healthy people in order to enhance their brain capabilities. What is your position about those "brain enhancers"?**

I do not know how effective those drugs are, it is not excluded that they can work but it is certainly not in a close future that everybody will be able to take brain enhancers. Moreover, assuming that they are helpful for your learning performances, there is maybe a price to pay for this enhancement: you could learn things that you would better forget after a while! It is difficult to imagine how those methods could be used on a long run; of course we do use coffee and tea to make our life more exciting. We also already manipulate the performances of our neurons in order to get asleep, so my final answer is: if there are no side effects, why not legitimate the use of brain enhancers?

**Do you participate in ethical debates in neuroscience?**

I am involved in discussions about the question of the 'Free will' ('Arbitre Libre'). I think that brain research should have an important voice on this debate. With respect to brain development for example we could help in discussing the question 'how long are you not yet an adult'? We have learned that brain develops much longer than we thought (up to 20 years) This could bring us to reconsider the choice of the so called 'age of maturity'.



Correlogram from Prof. Singer's lab, Department of Neurophysiology

**What is your position about genetic determinism?**

The brain is a highly adaptive organ that is permanently changing. Much of brain functional architecture is determined by the genes and this determines how the brain works

Many of our cognitive and motor functions are determined by genetic predisposition. The role of experience is obviously very big, so brains can be very different from their "trajectory capacities" because of the enormous plasticity that makes them receptive to the environment. Those multiple factors determine how you are and who you are but it is difficult to give a weight to genes, early age development or re-modification by subsequent learning.

**Are you also interested in the search for the neuronal substrate of consciousness?**

This is not precisely one of the objectives of the research in my group and it's a very difficult topic. There are possibilities that the conscious state is a particularly coherent state that concerns a large number of neurons and additionally engages a coherent activity, but those are just hypothesis...

**What could be the contribution of brain research to the development of performing education methods or tools?**

We could use our knowledge about the critical periods of development, the periods when certain things can be easily learned. There are "windows" which close after a while for language acquisition for example, but also for the learning of social skills or musical skills. Politicians and people working in the educational system should understand how important it is to take care of the young people early enough, to really make sure that they get an optimal support for their development. As we learn more about how critical periods are organised, we can advice teachers about how to instruct scholars, what to teach and when. Moreover, we should

remember how important it is to consolidate memories, to have rest periods, to be positively motivated, be concentrated and have attention in order to learn properly.

With thanks to the  
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Marc Jeannerod is professor of neurophysiology at the University Claude Bernard Lyon 1, and director of the Institute for Cognitive Science at the same University. His research concerns the relations between action and brain and the physiological basis of motor control. The action is the interface between individuals and between the individuals and the external world. Trying to understand how action is translated by the brain has a very deep implications in the interpretation of cognition: it relates to communication between individuals, to their intentions and their interaction with the surrounding world. The work of Marc Jeannerod and his team has completely changed the concept of action representation, enabling a new approach to the understanding of mental diseases as schizophrenia.

## Action representation in the brain, cognitive neuroscience, and science communication Interview with Marc Jeannerod

**You are a neurophysiologist. Can you tell us about your approach to cognitive science and about the main objectives and results of your research?**

I am interested in what happens in the brain when we think about an action, when we prepare it or when we execute it.

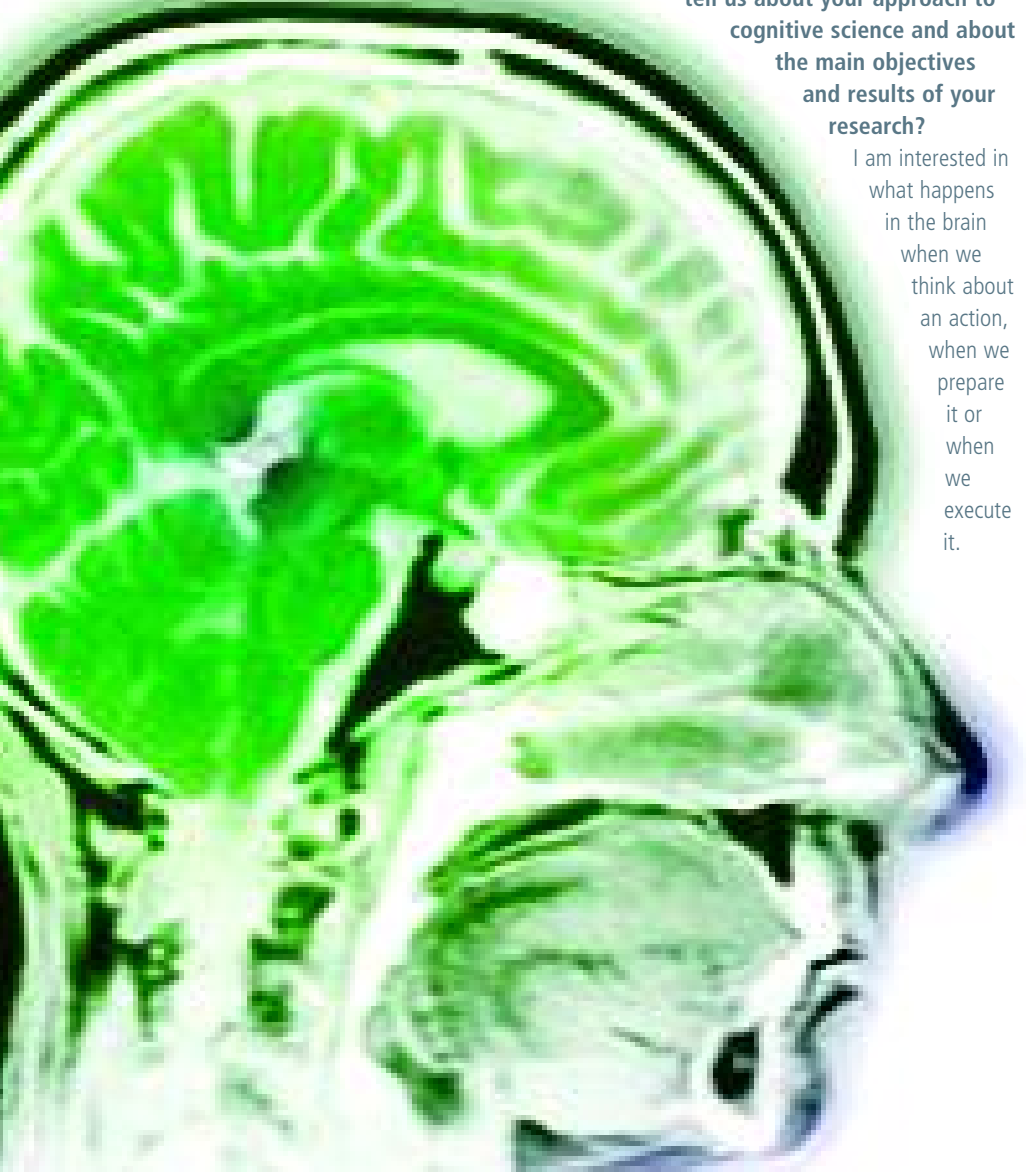
One of my group's main results has been to show that the activated cerebral network corresponding to a certain action is the same if we execute the action or if we just mentally represent it.

This means that preparing an action is, in some way, similar to executing it. We have obtained this result thanks to modern, non-invasive imaging techniques. The most frequently used methods are functional magnetic resonance and magneto-encephalography, which allow us to detect the physical variations produced in the brain when a subject executes an action or a purely mental operation.

From that starting point, we try to understand what happens in patients who have trouble with motor cognition, who do not recognise their actions, who do not interpret somebody else's actions correctly or who have any kind of trouble in communicating or understanding the action. In particular, we have concentrated on schizophrenic patients. Compared to normal individuals, schizophrenic patients present hyperactivity in a precise region of the cerebral cortex.

**Your group conducts basic research. Are your results useful in developing drugs or techniques to treat patients?**

Our team is concerned with the cerebral zones displaying differences between normal and diseased people. In other groups, pharmacologists are in charge of the search for drugs that modify cerebral transmission in those significant areas.





**Let's discuss cognitive neuroscience. What are the basic principles of this science at the border of so many different subjects: physiology, psychology, anthropology, language...**

The starting point of cognitive neuroscience is that our mind constructs representations of the world, of ourselves, of other people. Thanks to imaging techniques can determine the regions of the brain corresponding to those representations.

Cognitive sciences try to "naturalise" the different states of the mind, the cognitive states (like thinking about something) and the interior language.

To "naturalise" means to understand which are the cerebral bases of those states and to treat them as natural phenomena, ie as phenomena having an origin or a cause in the brain.

Cognitive neuroscience is related to very personal subjects like the relations between individuals, thinking and beliefs.

**The fundamental principle of cognitive science, the fact that the human brain functions by representation and computation, is an empirical conjecture that has been challenged by certain scientists and philosophers - because emotions or conscience would be neglected by the cognitive sciences. What is your opinion?**

This criticism came from the American neuroscientist Damasio, author of the book 'Descartes' Error: Emotion, Reason, and the Human Brain'.

He says that Descartes' mistake is to say that

thought is what defines man, and so Descartes neglects emotion and passion. Damasio is right in saying that we must take account of emotions and passions, but he is wrong in saying that cognitive science does not do so. In our search for mental representations, we have long been interested in the communication between individuals, in the perception of emotions, and those elements are as important to cognitive scientists as judgment or thinking.

**You wrote with the psychoanalyst Jacques Hochmann the book "Esprit, où es-tu? Psychanalyse et neuroscience", about the difficult relationship between psychoanalysis and neuroscience.**

**Would you summarise the issues for us?** Freud, the founder of psychoanalysis, discovered phenomena that are very important for describing people's subjective state, like unconsciousness. Curiously, modern psychoanalysts refuse to accept the notion of 'naturalisation' of psychic states and the fact that the unconscious can have a 'physical translation' in the brain. I personally think that they refuse to believe in 'naturalization' because if they accepted it they would lose their specialism and become psychiatrists...

Eric Kandell, a recent Nobel prize winner, made important discoveries in the field of memory and learning in the brain, and was a psychoanalyst at the beginning of his career.

His scientific papers accept that we can explain psychoanalysis by the mechanisms he has discovered in the brain.

His work could be extremely useful in advancing the dialogue between neuroscientists and psychoanalysts.

**You participate in many debates about the ethics or philosophy of research. What are the current hot topics?**

A subject which is starting to worry many people is that modern neuro-imaging techniques allow us to enter individuals' mental state. The problem is where to stop, what we can investigate and what we must avoid?

My personal opinion is that scientists should study the mechanisms common to everybody - those that enable us to think, represent or remember things - but that they should stop at the content of those thoughts, representations or memories.

There is no real risk for the moment, because current imaging techniques do not allow us to look into the individual content of thoughts.

Anyway, I believe that science should be concerned with subjectivity and not intimacy.

**You have a strong interest in communicating science to the public. Your recent book 'Le cerveau intime' won the Jean Rostand Prize for scientific communication.**

**And you developed an exhibition at La Cité des Sciences on the same subject. Can you share with us the challenges and achievements of the exhibition, from your point of view?**

There is a tendency in exhibitions to make things which are esthetical, spectacular and easily understood.

Sometimes this could lower the scientific content of the exhibition. I was very pleased by the professional team at La Cité des Sciences, because they immediately understood my need for scientific integrity. They really helped me preserve the honest scientific content of the presentation. The challenge in such an important event is that it is seen by a large variety of people with different backgrounds. As a final result I think we achieved the right compromise to deal with all those different demands.

**What are the most powerful ways of bringing science and research closer to citizens?**

I think that a good initiative is organising cycles of lectures on a large variety of scientific subjects. For a few years, I have become more engaged in this kind of initiative and I am always surprised to discover how many people participate in lectures, even in small villages in the [French] provinces.

There is very strong public interest, but scientists have to make an extra effort to make their subjects understandable and attractive.

A new science museum will open in Lyon in two years' time, 'Le Musée des Confluences', located at the confluence of the Rhône and Saône rivers. The museum will be structured around three main thematic areas: Origin, Definition, and Future of Man. My team is currently collaborating on this project, with many other French scientific-research groups. The new museum plans cycles of lectures with the ambitious objective of drawing science and society together.

With thanks to the ersite interviewer,  
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Richard Gregory FRS is Emeritus Professor of Neuropsychology at the University of Bristol. To ecsite members, he is also known as our founding president (1989-90) and as founder of the UK's first independent science centre: the Exploratory in Bristol was open

Daily to the public 1987-99, before being replaced by the Lottery Funded 'Explore-At-Bristol'. Gregory's early scientific career was in the Department of Experimental Psychology, Cambridge University, where he designed and directed the Special Senses Laboratory which was used to investigate perceptual problems to be anticipated for astronauts: judgement of speed and distance for moon landing and docking. He also investigated a rare case of adult recovery from blindness. This showed that exploratory touch is very important for visual perception, and proved a powerful influence on his later development of 'plores' (exhibits) for visitors to the Exploratory science centre ([www.exploratory.org.uk](http://www.exploratory.org.uk)).

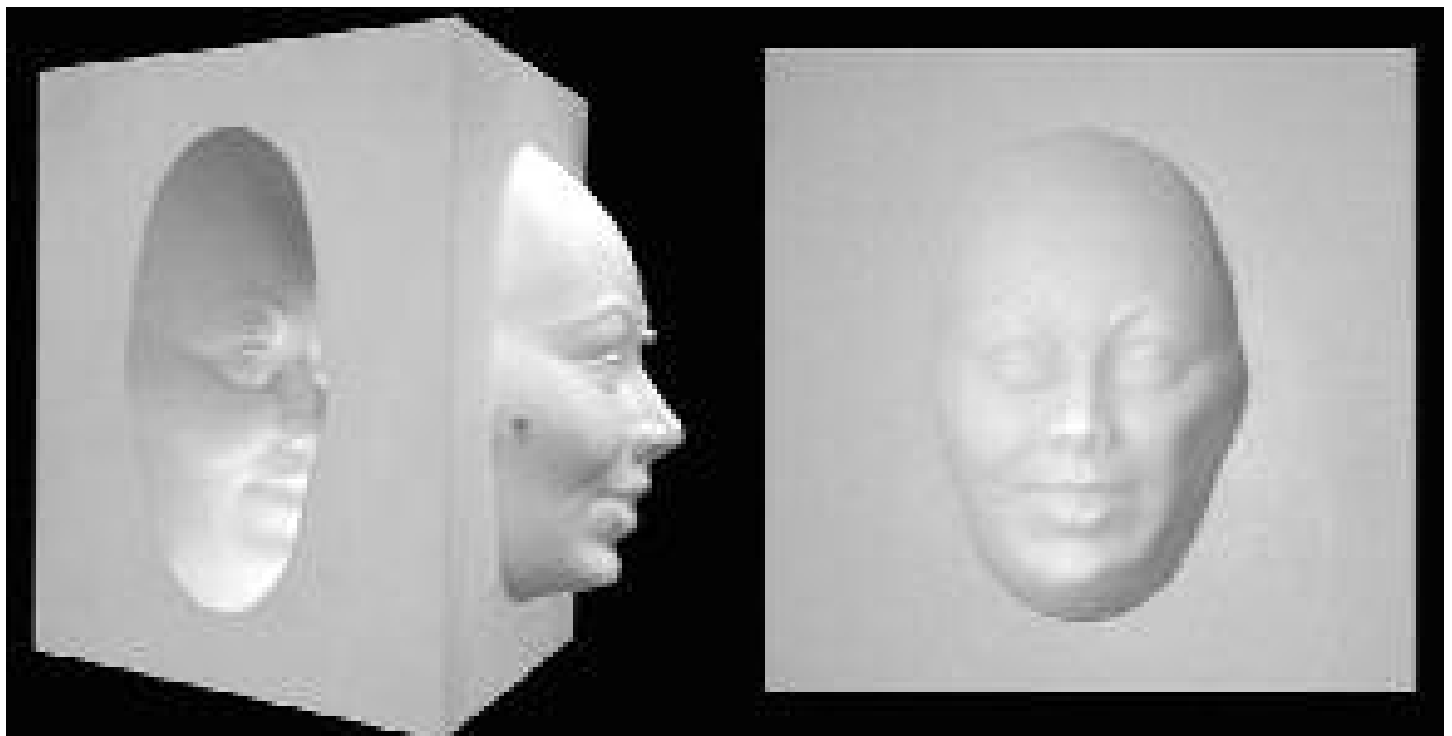
## Science centres: let's make science central - Richard Gregory makes the case

Museums preserve and display meaningful objects from the past, while science centres, having few objects worth looking at present (or should) phenomena for hands-on experiments. Some background knowledge is needed for both. When we lack necessary knowledge and concepts, we are effectively blind. With no understanding a steam engine is meaningless shapes of metal, a telescope but a senseless tube on a weirdly complicated stand.

Phenomena are keys to science. But a spectrum is no more than a pattern of coloured lines, until one knows something of what a spectroscope does and how it works.

One needs some notions of light, of atoms, and jumps of energy. Then, the coloured lines start to speak. They tell us what stars are made of, how they are moving, and their distances in space and time.

It is interesting to compare the appeal of photographs of engines, or the lines of a spectrum or whatever, with real engines or spectroscopes one can use. In the Exploratory in Bristol we had both photographs of spectra and real spectroscopes with glass tubes of glowing plasmas - 'Rainbows to the Stars'. The spectroscopes with their glowing plasmas won hands down. But once seen for real, photographs (like one's holiday snaps) and indeed books, take



Hollow mask - demonstrating the power of knowledge for seeing. Although this is truly a hollow mask, it is seen as a normal nose sticking-out face. Knowledge, derived over years, that faces are convex dominates, and overcomes the evidence of the eyes that this mask is hollow; until seen close to with both eyes. Here misapplied knowledge misleads; showing the power of knowledge for seeing, and that misapplied knowledge and false assumptions can lead basic perception astray.



on far richer meaning. Like so many of the wonderful phenomena of science, spectral lines are beautiful, fascinating, and so inspire many people to seek their meaning.

Pictures are extraordinary objects, well worth considering in a science centre! Consider looking at a picture of a person, or some other familiar kind of object. One sees the patterns of paint as almost alive, breathing.

This incredible jump from pattern to picture, is given by knowledge, as of living breathing people - knowledge developed interactively through childhood.

In a gallery or museum, we project our knowledge, developed through years of experience, into pictures and objects beyond touch. The knowledgeable viewer imbues them with life. But when the knowledge is missing there is no meaning to project, so we are effectively blind. This is the fate of perhaps most visitors.

A picture - indeed vision itself - has only limited power to give new knowledge. And pictures can easily fool us. Many well-known illusions are due to false assumptions, and knowledge misapplied. Wonderful as many pictures are, I am tempted to call them eye-cons!

For pictures get their power to represent, from our hard-earned knowledge through interacting with objects, to fool the eyes into seeing patterns of paint or ink as entirely different things, in other spaces and other times. But this only works because we know about people, and trees and buildings, and other familiar objects found in pictures.

But science is different and harder to see - as so much of science is unfamiliar - so science centres must be different from picture galleries and

museums. For generally the visitor is not familiar with the phenomena, or at first have the knowledge to see what is going on in a science centre. Hands-on experience is the best introduction, much as we discovered how to see as children.

A dramatic demonstration of the power of knowledge for seeing, is the hollow face illusion - a hollow mask appearing as a normal, convex face. A hollow face is so unlikely this "perceptual hypothesis" is rejected by the observer's brain, though it is true.

Providing hands-on experience for seeing must add immensely to the visual experience of Museums. Couldn't museums have robust and not heart-breaking destructible working models, for hands-on exploring of principles needed to see their wonderful objects?

A present danger is to shy away from science, as being too difficult; but children and adults like the challenge of puzzles and quizzes, and would not expect to understand everything at first sight or touch. Learning to see is a gradual, unfolding process, which can be richly served by museums and science centres, when their objects and activities have meaning. This is extending the experiments we all did as young children with toys and people, so in science centres the inquisitive child in us can continue to grow through adult life, by playing.

This makes one wonder at the amazing attraction of the Harry Potter books. Of course they are great school stories. But they are based on magic. What is magic's appeal? Does science lack magic? - surely not!

As Arthur Clarke said, 'Any advanced technology is indistinguishable from magic.' The difference is, science's technology actually works.

Perhaps the magic of science is lost in our teaching. Can't science teaching, and science centres, learn from Harry Potter? To my mind a spectroscope, a microscope or a telescope, is far more wonderful than a magic wand. For instruments reveal secrets and work miracles we can perform.

They have real magic, which generally works for us when we understand though can always be dangerous. Experimenting carries some risks, which is a problem for schools and science centres. Though the only accident in the Exploratory was a small girl tripping over the metal stand of a notice, warning people to take care.

It is a sad waste of time and money to run a 'science' centre without the wonder of real science.

It should be presenting intriguing significant phenomena, with experiments and hypotheses open to challenge by evidence and arguments.

Indeed, there is little point developing education if there is not a corresponding increase in questioning and discovering; so surely museums and science centres should be integral to education; as well as being a lot of fun and inspiring in their own ways.

The media's assumption that attention-span is limited to ten minutes is surely wrong - but may become true, if sustained presentations and discussions are banned.



Of course attention-span for boring programmes is limited; but when captured, interest can grow and last a lifetime.

The experience of science centres is self-paced. The visitor may walk away, through boredom or to have a quiet think, perhaps to return. Several bites of the cherry (or do I mean apple?) are needed, and each bite may be more rewarding.

But not until bites add information!

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Diana Issidorides is senior scientist at NEMO science centre, Amsterdam, where she has been since the project began as 'newMetropolis' in the early 1990s.

As a cognitive psychologist turned exhibition developer, she here plays the role of 'agent provocateur' to challenge our approach to exhibition development from a psychological perspective.

## Back to the drawing board: tools and tips

We are five years into the third millennium. We all, I presume, still share a love of science, and share the core belief that our institutions are pivotal in inspiring and encouraging that lifelong love affair with science.

Yet, we seem to have somehow stopped asking ourselves two basic questions which we really need to re-examine:

- Are we getting complacent about how best to make 'science' come alive in our science centres and museums?
- Are we neglecting our own lifelong learning by our inability to incorporate new insights from the science of mind into the core business of our institutions?

As a cognitive psychologist turned exhibition developer, I answer 'yes', and suggest it's time we went back to the drawing board.

The 21<sup>st</sup> century challenge for all of us working in science museums and science centers, is to create

what I would like to call 'brain-based free-choice learning environments': programmes, exhibitions and other experiences that have been conceived, developed and designed with the toolbox of cognitive science.

A toolbox full of instruments and gadgets that reflect the ways in which the human brain perceives, constructs meaning, learns and remembers.

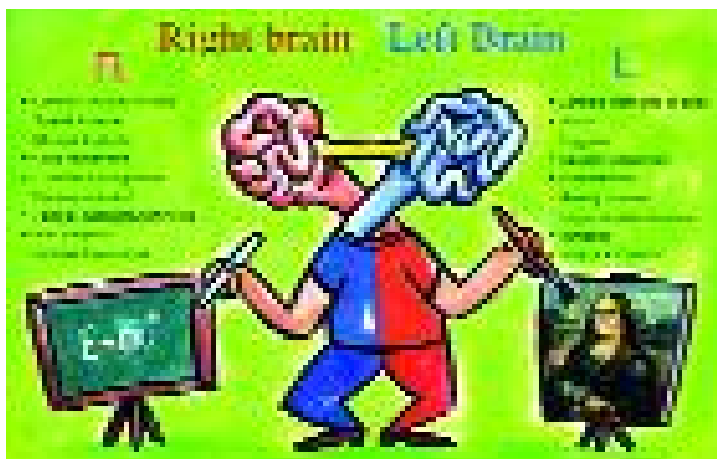
I will describe three important tools contained in cognitive science's toolbox.

They can greatly enhance the impact and effectiveness of our exhibitions and our free-

choice learning environments. They can make them memorable, instead of just plain interesting or fun.

### Tool 1: The right- AND left-brain brushes

Though oversimplified in the popular media, the important finding here is that our two distinct brain hemispheres process different kinds of information and 'think' and 'learn' in different ways: just look at the way the brushes are used in the image!



The psychology of learning confirms that memorability is best and understanding deepest when information has been acquired from many different angles:

- From the spatial and visual on the one hand to the verbal on the other
- From the musical and artistic to the linguistic
- From the fantastic to the realistic
- From the intuitive to the logical and from the emotional to the rational!

So, tip #1: use both right- and left-brain brushes to skillfully 'paint' knowledge and impressions onto

the 'canvas' of your visitors' brain.

In practice: create a varied mix of exhibits and experiences so that both parts of the brain are stimulated and different ways of thinking and different ways of encoding information are encouraged!

### Tool 2: The multiply-intelligent wrenches

The second insight from research on the mind and cognition concerns intelligence, which comes in at least seven different shapes and sizes.

In the 1980s, psychologist Howard Gardner first introduced the theory of 'multiple

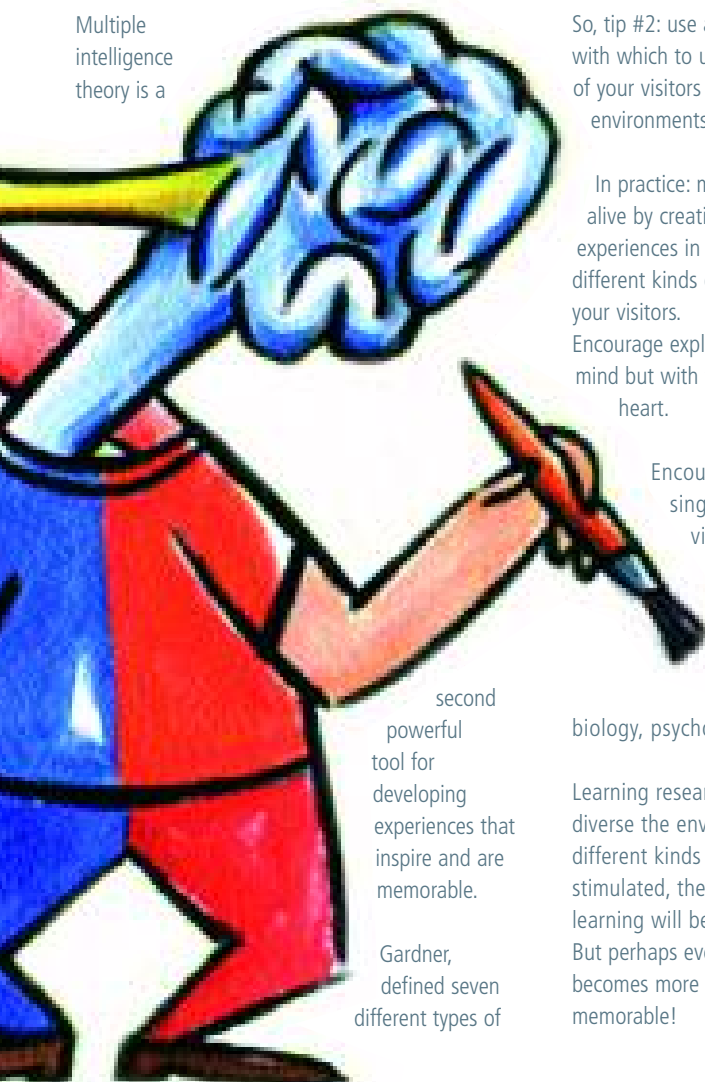
intelligences' and revolutionised the way scientists and educators thought about the mind, cognition and learning. He argued that human beings have many different ways of representing meaning, many kinds of intelligence, and strongly criticised the predominant view that there was a Single





Intelligence that can be measured by an IQ test: "All of these intelligences are there to be mobilised, and if they are not, one could well call education 'half brained'" (Howard Gardner, 2001).

Multiple intelligence theory is a



second powerful tool for developing experiences that inspire and are memorable.

Gardner, defined seven different types of

intelligence (verbal/linguistic, logical/mathematical, visual/spatial, bodily/kinetic, musical, intra-personal [self-smart], and interpersonal [people-smart]) and emphasised that:

- All of these intelligences are possessed by all of us!
- Though formal education almost exclusively focuses on language, logic

and math, all of them are as important. When we learn, develop skills, or solve problems, these intelligences complement and strengthen one another.

So, tip #2: use at least seven different wrenches with which to unlock and enrich the minds of your visitors in free-choice learning environments!

In practice: make science memorable and come alive by creating rich and diverse kinds of experiences in an exhibition, so that the many different kinds of intelligence are stimulated in your visitors. Encourage exploration not only with the mind but with the hands, feet, whole body and heart.

Encourage the understanding of a single topic from many different view points or angles - the verbal, the visual, the logical, the physical, mathematical, the musical, the rational, social, emotional; and from many different disciplines - physics, biology, psychology, humanities, art.

Learning research has shown that the more diverse the environment and the more different kinds of intelligence that are stimulated, the more effective and successful learning will be.

But perhaps even more crucial: learning becomes more fun and enjoyable and thus memorable!

## Tool 3: Different learning-style tape measures

The third crucial insight from research on how the brain learns is that we all have different learning styles - personal and characteristic strengths and preferences in the ways we take in, process and retain information.

There are many examples of learning styles, and many different learning styles have been described by different researchers. Common divisions include: auditory learners, visual learners, tactile learners, social learners.

Others define four dichotomous dimensions, such as: extroversion versus introversion; sensing versus intuition; thinking versus feeling; perceiving versus judging.

Still others talk of doers, thinkers, dreamers, deciders, etc.

So, tip #3: use all the different learning-style tape measures when constructing your exhibitions and free-choice learning environments.

In practice: provide content in as many different ways possible: verbal, visual, auditory, tactile, kinaesthetic, so that as many senses as possible are stimulated and as many learning styles are accommodated in your free-choice learning environments. Mix interactives with minds-on experiences, real artefacts, intriguing models and objects, beautiful images, artworks, humorous and surprising texts, cartoons and jokes.

Interactivity should not be made synonymous to push-turn-press-and-leave experiences.

In conclusion, let's put a bit of 'ole Einstein back into our institutions, with his wonderful: "Logic will take you from A to B. Imagination will take you everywhere".

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Meeting of Minds: European Citizens' Deliberation on Brain Sciences is an ambitious initiative designed to encourage debate about societal and ethical issues raised by brain science and establish a new form of participatory governance in Europe. Citizens from nine European countries will be invited to discuss the societal consequences of brain research, pinpoint their differences, identify any common ground and discuss the issues with experts, stakeholders and policymakers. It is the largest, most comprehensive project of its kind. Meeting of Minds is an initiative of the partner consortium comprising King Baudouin Foundation (project coordinator and co-funder), the University of Westminster, the Flemish Institute for Science and Technology Assessment, the Danish Board of Technology, the Cité des Sciences et de l'Industrie, the Stiftung Deutsches Hygiene-Museum, the Fondazione IDIS - Città della Scienza, the Rathenau Institute, the Science Museum, the University of Debrecen, the Eugenides Foundation and the University of Liège, with the support of the European Commission. Here, Lisa Jamieson of the Science Museum reflects on the evolving project.

## Meeting of Minds

"Brain sciences cover not only the treatments of neurological disease, but also constitute an important narrative about what it is to be human" - Andreas Roepstorff, medical anthropologist, University of Aarhus.

This statement, made at the European workshop The Present and Future of Brain Science: What is

Possible, What is Desirable? which was convened in April 2004 as the first staging post of this exciting and innovative project, summarises nicely why this subject is perfect for citizens' deliberation - it has many fascinating social, psychological and philosophical implications and it is through this dynamic and developing field that we are better able to understand and articulate what it means

to be human. Neuroscience today is on the cusp of a revolution, similar to the unravelling of the human genome in the 1990s. The association between brain and behavior is stronger than the association between genes and behavior, yet the public debate about genetics and its broad social, ethical and moral implications far overshadows the debate thus far on neuroscience.

Meeting of Minds aims to rectify this.

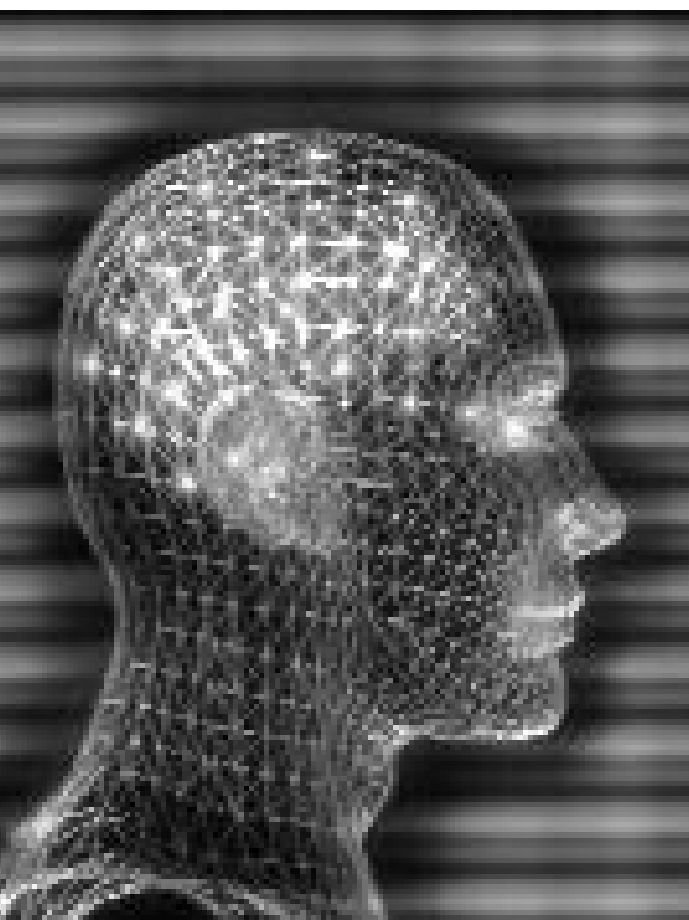
Although national and local arenas are still key for governance and debate, social and scientific challenges are becoming less constrained by international borders and in the future there will be an even more acute need for debate and decision-making models tailored to the cross-country level.

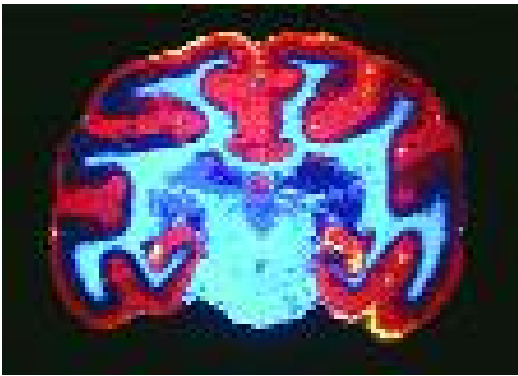


"The King Baudouin Foundation initiated Meeting of Minds in accordance with its ambition to stimulate the development of debate and decision-making models tailored to the transnational level. We wanted a project that that would stimulate the development and evaluation of new forms of social debate, decision-making processes and political approaches" - Tinne Vandensande, Project Manager, King Baudouin Foundation.

Meeting of Minds has an innovative design that was developed by the partner consortium using their substantial expertise in participatory process. Over the past 12 months of the design phase the partner consortium agreed that the methodology should follow the following criteria:

- Innovativeness; the methodology must not just be "run of the mill"





- European dimension; the European aspect is crucial and the participants should be encouraged to think of the project as an international one. It should not simply consist of a series of national activities without proper integrating, cross-national elements.
- Public policy relevance; the methodology and subject should be chosen to be able to create direct links with policy-making, by providing the findings that the researchers and policy makers are searching for
- Public dimension; public and media access to the initiative should be built into the methodology to make it relevant and interesting to them and encourage them to get involved
- Citizen deliberation; a special feature of the methodology should be the public deliberation among citizen volunteers, thus complementing the predominantly closed, stakeholder-based deliberative forms currently being used in European policy-making.
- Transparency and accountability; the participatory process and its outcomes, as well as the organisations involved have to be transparent and accountable.
- Evaluation; Given the nature of this initiative - to design and implement a new participatory method in the European context - it is imperative that an evaluation is carried out. This will help to draw lessons for the design and use of participatory methods in technology assessment and governance processes at European level.

"The challenge for this project is to realize European citizenship and public participation on a European level. It is a privilege to be able to carry out such a pilot project in collaboration with this heterogeneous group of partners" - Jorg Naumann, Head of Science Unit, Stiftung Deutsches Hygiene-Museum.

The project outcomes will be a recommendation report, passed to the European Commission, summarising the thoughts, hopes and desires of

all the European citizens. This will be supplemented by a national report from each country detailing specific areas of interest to that country. Comparing and contrasting these two reports will be one of the most fascinating elements of this project. But the outcomes will reach far beyond these reports and recommendations. The outcomes on the citizens might include; increased knowledge and understanding of brain science and the personal impact, increased empowerment to take an active role in social debate and policy making as a whole a better shared understanding of the view of other European citizens and a unique culturally exchange, unlike anything ever seen before.

"Hopefully Città della Scienza's involvement in projects on science and society will serve as a catalyst to stimulate similar activities with the public in museums and cultural institutions in Italy" - Jennifer Palumbo, Science Centre, Fondazione IDIS - Città della Scienza.

Then there will be an impact on the policy makers and their work; involving all interested groups in policy making of this type makes democracy more democratic and should enable the establishment of socially sustainable policies.

A significant media profile for the project will be one way to ensure success. By capturing the imagination of journalists throughout Europe and securing column inches, radio airtime and television coverage we hope to raise awareness and understanding of these issues amongst European citizens as a whole and amongst the scientists and policy makers that we want heed the project outcomes.

"In order to be able to create a wider social impact, we must communicate the messages of the project in a very clear manner, and find novel ways to have our voice heard in an environment heavily loaded with information" -

Glykeria Anyfandi, Project development, Eugenides Foundation.

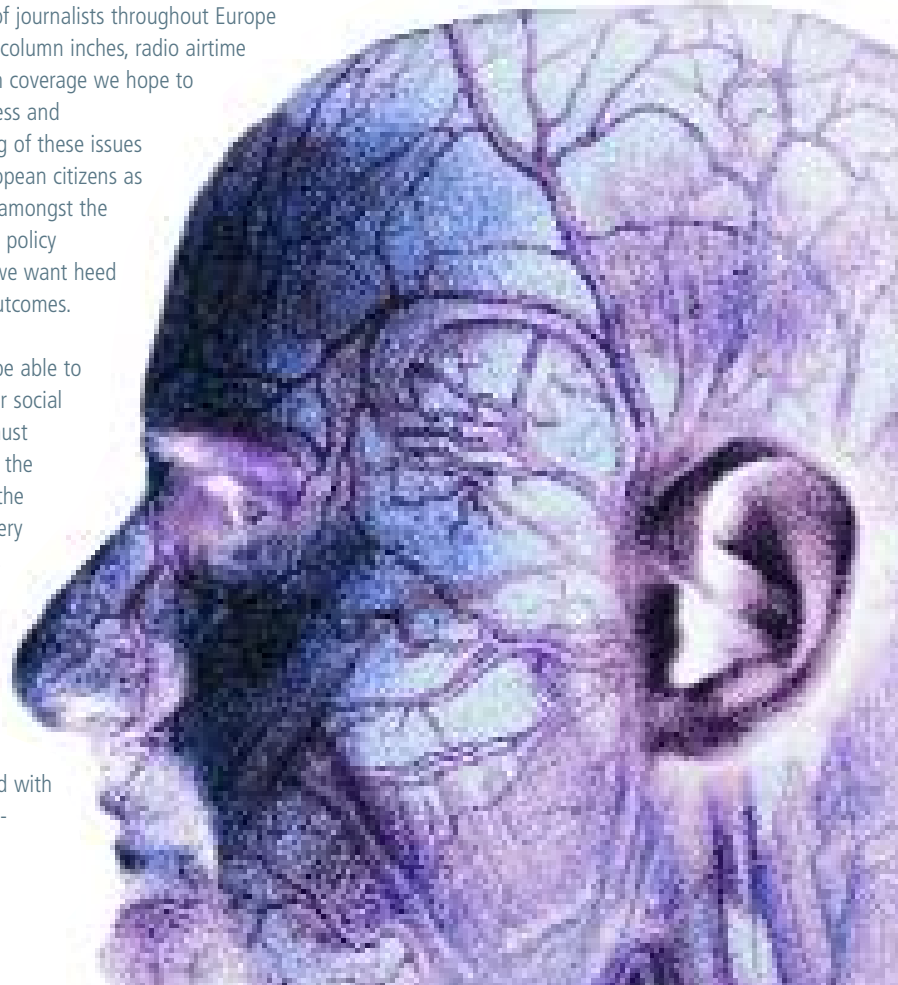
Can you imagine how inspiring and rewarding for a mother of 2 from Greece or a young teacher from Denmark to see the project they've contributed to appear on a satellite news channel or a national newspaper?

A total of 126 European citizens will participate as panel members and we hope that many thousands more will take part by contributing to the on-line discussion boards. We'd like to encourage all ECSITE members to supplement Meeting of Minds by hosting other events on this topic that will help to raise brain science as an issue worthy of public debate and to help capture the media attention.

"I'm dreaming of involving all kinds of artist in a 'Meeting of Minds Festival' but we can't do it alone. Perhaps we need to create a partnership with ECSITE Centres, art museums and centres to bring this idea to life" - Tinne Vandensande, Project Manager, Kind Baudouin Foundation

And many other ideas that you may have had yourselves while reading this piece!

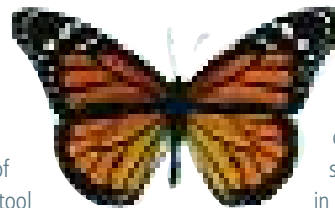
E [lisa.jamieson@nmsi.ac.uk](mailto:lisa.jamieson@nmsi.ac.uk)



DeCiDe - Deliberative Citizens' Debates - is a project funded by the European Commission under the Science and Governance programme. ecsite, At-Bristol, La Cité des Science et de l'Industrie, Città della Scienza and Heureka form the consortium, whose task is to develop a tool to facilitate deliberative debates on contemporary issues across European science centres and museums, and to monitor the outcomes of such discussions.

The format that the DeCiDe consortium will use is developed in collaboration with nef, the new economics foundation, and inspired by the successful 'Democs' card game. Project manager Andrea Bandelli reports and reflects.

## When citizens decide



### Playing cards to make policy recommendations?

Since 2001, nef has been using a debate format where groups of six to nine people can get acquainted, discuss and eventually deliberate on policy positions on a wide variety of subjects. The format is innovative: each participant takes part to the debate by literally 'putting on the table' cards that represent facts or issues related to a specific subject. This generates discussion, which allows the participants to 'cluster' their cards into themes that represent the common ground between all participants. The advantage of using visual aids in the form of cards and a mapping board means that participants can focus on the debate without getting lost in out-of-topic conversations, and at any given time they can see where the discussion is leading. When all participants have put their cards on the table, the consensus-forming phase begins.

More often than not, economics, development, environmental and social issues are higher on the citizens' agenda than risk and technological assessment.

**During a 'Democs' session it is quite common to find people with rather diverging initial opinions agreeing on a policy, when they themselves are in charge of setting the agenda for discussion.**

'Democs' received funding from the Wellcome Trust for a series of card games on medical issues, and was also used during the UK 'GM Nation?' debate in 2003.

Inspired by this innovative bottom-up approach to deliberative debates, the DeCiDe consortium approached nef in 2003, and explored how the

'Democs' model could be used at the European level. The network of science centres seemed a perfect tool to organise debates in several countries, with museums providing the necessary background information for participants, in the form of exhibitions and programmes. Moreover, the links between science centres and schools are a valuable asset when trying to involve students in better understanding the role of dialogue in democracy.

consortium. During this phase, several trials are being conducted in order to fine tune the card format, to make it as straightforward and simple as possible, and to get the most out of the playful activity involved in trading cards.

At the same time the team is finalising the topics which will be the subjects for debates. By putting together nef's expertise and the consortium's know-how (developed through successive European collaborative projects such as Bionet), the partners agreed on the following six topics:

- Stem cells
- Pre-implantation genetic testing ('designer babies')
- Xeno-transplantation

### The goals of DeCiDe

Adapting the 'Democs' format for a European audience is the first task of the DeCiDe



Playing the 'Democs' game



From diverging opinions, group consensus emerges

- Nanotechnology
- Brain Research
- New drugs and medicines.

For each topic, the focus will be on policy making at the European level.

Kits containing all the necessary cards and tools to conduct a debate will be available for free, and will also be downloadable from the ecsite website. The debates will be 'self-facilitated', that is, they will not need a moderator or a leader. Much as in board games, participants should be able to understand the rules of the game and organise the discussions themselves.

In addition to making the tools freely available to all ecsite members, the consortium will launch a grant scheme to allow 12 institutions from



different countries to invest in monitoring and assessment of the debates (see box 'DeCiDe Grants').

## Evaluation

A comprehensive evaluation of the results of DeCiDe is the second main component of the project. One area of investigation will be the role of dialogue during and after the deliberation process. It has been noted from the available feedback on 'Democs' that this format is in fact a catalyst for dialogue - all participants engage in active, constructive dialogue during the game, and a large majority continue talking afterwards, often spending several hours talking through issues initiated by the game event. Subjects of investigation will include: How does dialogue influence decision making? Is the stimulus to carry on the debate long lasting, or is it essentially limited to direct engagement in the game event?

Given the role of the cards in the debate process, it is easy to see which arguments (represented by the facts and issues on the cards) are instrumental in creating the clusters on which participants base their deliberations. Such information is recorded during the debate process, and will be evaluated to compare results between different countries. This will allow us to see, for example, how different communities of citizens react to a

deliberative consultation, and it will provide each participating institution with useful information about their audiences that can be discussed with experts and policy makers.

For all information about the DeCiDe project, please contact:  
Andrea Bandelli  
Executive project manager  
E andrea@bandelli.com  
Tel. +31 20 4234 966

More information about the 'Democs' game, including background research and documents can be found on the nef website [www.neweconomics.org/gen/democs.aspx](http://www.neweconomics.org/gen/democs.aspx)

## DeCiDe Grants

In June 2005, ecsite will publish a call to solicit applications for 12 DeCiDe grants. Each grant will be 3500, to cover logistic and personnel costs incurred in organising and assessing game events.

Criteria to be used to award the grants will include the following:

- Ability to host at least six DeCiDe game events (one per topic) with a minimum of 12 participants per event between October 2005 and April 2006
- Availability of a science journalist to attend the debates to write a report, according to the evaluation criteria set out by the DeCiDe evaluation team
- Commitment of science centre/museum staff to provide factual feedback on the debates in English via a web form
- Description of exhibitions and/or programmes available at the institution on the topics of DeCiDe
- Description of education activities on the topic
- Ability and commitment to invite local, national or EU politicians and/or policy makers to the events
- Availability of in-house scientific expertise on the subjects, or structural collaboration with universities or other institutions to provide that expertise
- Evidence of the relevance of DeCiDe debates at local and national level
- Evidence of previous similar projects and/or parallel initiatives.

**Ecsite annual conference, Helsinki-Vantaa: 10-12 June 2005**

From 2005 on, the Ecsite Annual Conference will move to Spring/Summer - the first new - date Annual Conference is at Heureka, the Finnish Science Centre.

Online registration is now open at: [http://www.ecsite.net/new/ac05\\_index.asp](http://www.ecsite.net/new/ac05_index.asp) You will also find there the full programme, the post-conference tours (to Saint-Petersburg, Tallinn and Lapland!), the hotels, etc.

For details, check: [www.ecsite.net](http://www.ecsite.net)  
Michaël Revnillard, Conference Manager:  
E [mrenvillard@ecsite.net](mailto:mrenvillard@ecsite.net)

**Ecsite-Technopolis Science Centre Academy, Mechelen, 15-18 September 2005**

Following the success of former Science Centre Academies, Ecsite, Technopolis and other leading science centres in Europe are organising the Science Centre Academy 2005. The 4-day programme is designed for everyone who is planning to set up a new science centre.

INTERESTED? Send an email to to request detailed information.

**TiLE exhibition and forum, Maastricht: 27-29 September 2005**

The 14<sup>th</sup> TiLE exhibition and forum returns to the Maastricht Exhibition and Congress Centre (MECC). The change from June to September allows operators of leisure attractions, who were unable to attend previously because of the run up to the summer holidays, to come to TiLE 2005.

For further information, please visit our website: [www.andrich.com/tile](http://www.andrich.com/tile).

**Museum Management Courses at the Deutsches Museum, Munich**

The Museum continues to offer its successful one-week courses: 26-30 September in English; 14-18 November in German. The course are organised and taught by senior staff of the Museum. Presentations cover the main aspects of running a museum with the emphasis on effective functioning of the overall system. Participants have full access to the day-to-day workings of the Deutsches Museum.

For full information:  
E [n.hildisch@deutsches-museum.de](mailto:n.hildisch@deutsches-museum.de)

**ASTC Annual Conference 2005, Richmond, Virginia: 15-18 October 2005**

Hosted by the Science Museum of Virginia, Richmond, the ASTC conference takes the theme of 'Partnerships for Excellence: Seeking Strategic Alliances to Increase our Impact'.

For details, check: [www.astc.org](http://www.astc.org)

**Euro Science Open Forum 2006, Munich: 15-17 July 2006**

Submissions for sessions must be made before July 2005.

For more information check: [www.esof2006.org](http://www.esof2006.org)

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