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DRAWING ON THE BRAIN, AN ART-SCIENCE COLLABORATION

Summary

Some results from and reflections on a PET study into art-student volunteers performing drawing tasks, presented in the form of a talk illustrated with an interactive visual display.

Keywords

Brain, Imaging, Perception, Drawing, Interactive, Positron Emission Tomography (PET)

I would like to present some results and reflections on an art-science collaboration which I think fits quite well with the conference theme "Education as a Bridge between Art & Science" This collaboration took the form of a Positron Emission Tomography (PET) study of six right-handed male art-student volunteers engaged in simple drawing tasks.

I helped Professor Chris Frith, of the Institute of Neurology, London University, a little in the design of the experiment, procured the volunteers, and have produced a visual account of the events in the form of a director movie, designed to complement the scientific papers. The experiment was carried out by Dr Gabriella Bottini at the Cyclotron Unit of Hammersmith Hospital in London.

Some background

Gabriella is a research scientist from Milan. One of her areas of expertise is 'Neglect' (Anosognosia) which in severe cases results in complete neglect of a side of the body & of the perceived world - including denial of hand & arm ownership & inability to process half a scene in front of them.

Chris is a research scientist who has conducted numerous PET studies, on both volunteers - including me, and on patients, these being related to his principal area of expertise - schizophrenia. He now works at Queen Square in London at the Functional Brain Imaging Laboratory funded by the Wellcome Trust. He is studying brain activity associated with memory, imagery, will, and other of the 'higher cognitive functions' associated with consciousness.

As seems typical of constructivist artists, I have long been fascinated by science & technology, and try to bring this combination of interests to my teaching in UK art-schools, where my interests in the psychology of perception (spurred by writers such as Gregory, Gibson, Vidy, & Dennett, have influenced my attempts to teach, among other things, drawing, and lately computer modelling, at various stages of my teaching career.

I've made & shown constructed work since 1967 & since 1980 I've been using simple electronics to make works incorporating light sources. Recently I've managed to obtain some usable 3D modelling software, Vidi's Presenter Professional package, & now supplement workshop models for projects with computer generated versions. This development allowed me to produce good quality images from models for a catalogue prior to a recent show in Berlin.

Now once an artist gets interested in perception, s/he may

become interested not only in the visual depth cues & their employment in illusion-making, but in the eye itself, in the optic pathways, in the visual processing areas of the brain. In the '70s I remember being intrigued by accounts of the split-brain studies by Sperry, Gazzaniga & others in America. These studies were of some eight people, crippled by severe & regular epilepsy, reverberating between the hemispheres, who had been promised a new lease of life by an operation to separate the brain hemispheres by cutting the corpus collosum, (a commissurotomy) effectively leaving them with two brains, which by clever experimental presentation could be addressed separately, for example a patient was asked (to his right hemisphere) to pick up an object from under a cloth and replied that he did not understand the question while performing the task correctly!

The information from the split-brain studies gave greater clarity to models of the brain which have become part of popular culture, giving we amateurs of the brain a convenient model in which quite different functions occur in each hemisphere, the left (right-side controlling) hemisphere specialising in language & calculation and the right (left-side controlling) hemisphere dealing with images & spacial information. (Leonardo vol 29 #3 this year, has a piece by the psychologist Petrov with an variation of this, tidily locating logic in the left hemisphere & emotion in the right) An aim of this paper is to show that this simple '2 buckets' model needs a little revision.

Imagine this bit of video of me in position in the PET camera, and you will appreciate the limitations imposed by the apparatus, where the volunteer, flat on his back, is stuffed into what looks like a giant washing machine, with one arm attached to a water line, and has to remain still, without moving his head for two and a half hours. To the physical limitations must be added the experimental constraints, for the tasks must be performable as near identically as possible, by 6 different volunteers.

Little wonder that, as the reality of the experimental situation pressed upon our initial ambitions, the proposed tasks became ever simpler. The volunteer, is asked to imagine a cube, arms length in size, and to trace simple figures on the faces.

In task 1 (The shapes task) he traces his choice of square, triangle, ellipse or infinity sign on a given face of the cube. In task 2 (the planes task) he traces a given shape on his choice of surface while in the control task he is told what to draw & where to draw it.

What are the conclusions of this experiment? we see from the following that form generation indeed occurs in the left hemisphere but that spacial processing takes place in both hemispheres, I'll quote CF

"By comparison of the pattern of brain activity associated with each of these tasks we hoped to be able to distinguish the areas involved when the hand is used to generate forms from those involved when the hand explores different positions in space. Comparison of the two experimental tasks has revealed very interesting results. We have identified one area concerned with generating forms (left middle temporal lobe) and a different area concerned with generating position in space (bilateral parietal lobe). The areas we have identified are essentially the same as those previously shown to be associated with the perception of form and position in space when no movements are made and the volunteer simply looks at objects. This intimate asso-

ciation between perception and production has interesting implications for brain function in general and conceivably might have relevance for the teaching of drawing skills ...It is clear that even the simplest drawing depends on a complex interaction between many brain systems. Far from demystifying it, brain imaging studies of the underlying physiological processes enhance our appreciation of what a truly remarkable skill drawing is."

For me this experiment gave an opportunity to see investigative science in action and to tackle the problem of presenting the experiment so that we could understand some of the results & get a flavour of the ongoing struggle to understand the mysterious "plate of porridge" (Richard Gregory's phrase) between our ears.

Bill Viola is reported to have said recently "it is not necessary that the 20thC artist draws well but that he thinks well" If one thinks of drawing as not simply a craft skill but also as a means of externalising ones well-thought thoughts then Einstein's "My pencil & i are cleverer than I am" is much more compelling

London September 1996

If you would like to see some of the visual material mentioned above please visit :-

<http://www.mondrian.demon.co.uk>