Pask Parallels

Richard Brown

DIFFUSION GENERATOR

Pask Parallels

Richard Brown, October 2007

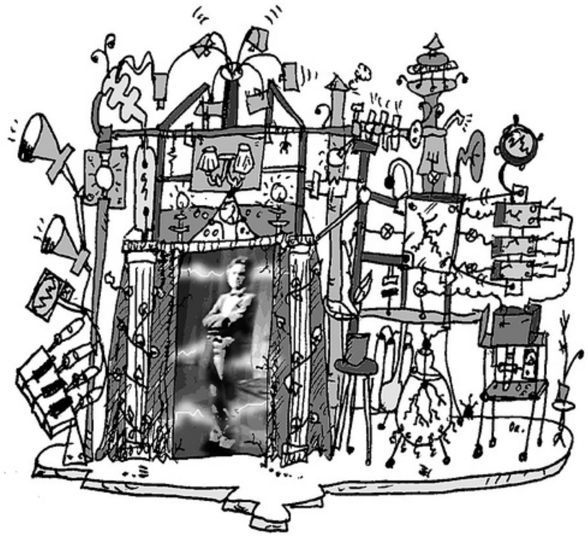
This essay charts over a period of ten years, a series of art and research experiments, which move between the analogue and the digital, resulting in the discovery of the work of Gordon Pask and culminating in the Pask inspired exhibition Maverick Machines. The title of the essay reflects a series of research and experiments that bear striking similarities to the electrochemical work of Pask yet were created without any knowledge of Gordon Pask or his work.

In 1997, I created an evolving artwork I named *The Electrochemical Glass*, which by 2000 had sprouted iron tendrils, and in 2003, over a two month period, in spectacular fashion, one tendril grew extremely rapidly (illustration below).

Maverick Machines: An exhibition inspired by the work of Gordon Pask

The *Maverick Machines* exhibition represents the completion of a phase of research activity in electrochemical processes and blends my own investigations and interests with those of many others who are investigating and producing work inspired by Gordon Pask, especially Jon Bird and Andy Webster, Army of Clerks, Roman Kirschner and Usman Haque.

The title of the exhibition was suggested by Jon Bird and originates from the chapter by the same name in one of Pasks books, *Microman*. The cartoon advertising the exhibition was drawn by myself and inspired by the Heath Robinson-like cartoons of Pask in *Calculator Saturnalias*.



Maverick Machines illustration, Richard Brown, 2007.

Tim OShea, the Principal of the University of Edinburgh, had once invited Pask to visit Edinburgh University. Tim described to me the theatricality of the basement workshop of Gordon Pask, with its velvet drapes and roman columns. This theatricality and the eccentric kitsch of his cartoons very much influenced the design of the exhibition. Tim opened the exhibition with a

In creating the *Glass* I was completely unaware of the work of Gordon Pask, it was not until much later through researching Artificial Life that I discovered the electrochemical dendrite experiments of Pask.

Parallel to the continuing evolution of the *Glass*, between 1995-2001 I created and exhibited three Virtual Unreality installations: *Alembic*, *Biotica* and the *Starfish*.

Alembic 1997 | *Biotica* 2000 | *Starfish* 2006

The installations used a combination of projectors, digital computers, programming and transparent gestural interfaces to create dynamic, responsive and immersive environments.

Alembic

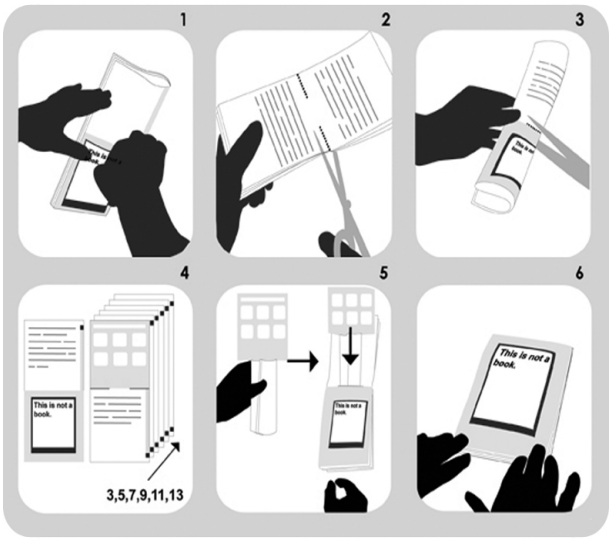
Alembic, an alchemical term for distillation vessel, was inspired by ideas of alchemical transformation and the notion of Dynamic Form, a term Umberto Boccioni used in 1913 in reference to his sculpture *Unique Forms of Continuity in Space* [1].

Electrochemical Glass
Iron, Copper, Aluminium in conductive fluid
October December 2003

The evolving metallic growths are created by the changing electrical activity between the dissimilar metals which act as a primitive battery, dissolving, transforming and reforming the metals through ionic migration under varying electric field potentials.

The resultant flow and formations of the metals embody the underlying layers of complex interactivity and emergence through electrochemical action between the three base metals of iron, copper and aluminium.

Pask Parallels
Richard Brown
created on: Wed Mar 5 15:54:27 2008



Alembic uses a particle simulation of matter to represent Dynamic Form. A gestural interface enables participants to directly effect the simulation, transforming the simulated matter, thereby becoming creators of their own experience. By moving around the central projection, participants are able to melt, freeze and shape matter by moving around the central circular projection. The temperature of the *Alembic* moving through fire, air, earth and water is represented by filtered white noise, each element corresponding to a particular frequency range.

Biotica

The aims of *Biotica* were to produce an immersive three-dimensional flying simulation of Artificial Life and to harness emergence as a productive force for creating life-like organisms from a primitive soup. The *Biotica* software produced interesting emergent behaviours amongst colonies of Artificial Life creatures, however the Digital DNA that defined each creature had to be painstakingly hand crafted, rather than evolving or emerging from a primitive soup. Due to the abstract rendering and somewhat difficult user interface, the *Biotica* installation was not so

successful in producing an engaging or immersive experience of Artificial Life. However the connectionist finite state automata design behind the *Biotica* software may serve as a foundation for further exploration of complex processes influenced by dynamic spatial relationships. The design research and the successes and shortcomings of the *Biotica* project are documented in the book *Biotica: Art, Life and Emergence.* [2]

Starfish

Through a commission for the Mind Zone of Millennium Dome, the *Neural Net Starfish* was born, designed to be the opposite of *Biotica* - immediately accessible, easy to use, familiar and engaging.

The *Starfish* reaches out a tentacle towards the hand; if the participant moves too quickly the tentacle retracts suddenly in an organic and life-like manner. (A bit like the way a snail eye stalk retracts if you touch it.) Stroking the neural net skin causes the net to fire, producing pulsations of colour on the skin. The *Starfish* has magnetic and mimetic qualities: people caress, stroke, slap and prod the creature, reacting and treating the simulation as if it were a living thing.

new building, situated on the site of its forthcoming building. Website: Onsite01.blogspot.com

6. Computational Thinking Seminars, Wednesday 31 May 2006, Richard Brown: Art, Creativity, Innovation and Experimental Science: Alternative ways of thinking, challenging paradigms and pushing boundaries. Archive: http://www.inf.ed.ac.uk/research/programmes/comp-think/previous.html

7. Jonathan Mills' Analog Computing Page: http://www.cs.indiana.edu/~jwmills/ANALOG.NOTEBOOK/klm/klm.html

8. Unconventional Computing: definition and links to conferences: http://en.wikipedia.org/wiki/Unconventional_computing

References

1. Umberto Boccioni describes Dynamic Form as a species of the Fourth Dimension. I came across this description in Chapter 1 of the wonderful book The Fourth Dimension and Non Euclidean Geometry by Linda Dalrymple Henderson., Princeton University Press, 1983.

2. *Biotica: Art, Emergence and Artificial Life* by Richard Brown, ISBN 1-874175-33-0, RCA 2001. http://www.amazon.co.uk/Biotica-Art-Emergence-Artificial-Life/dp/1874175330

3. Two incomplete treatises on the vegetative growth of metals and minerals, The Newton Project, University of Sussex. http://www.newtonproject.sussex.ac.uk/catalogue/viewcat.php?id=ALCH00081

4. Transcript of Maverick Machines opening speech by Tim OShea, Principle of Edinburgh University: http://maverickmachines.com/WordPress/?attachment_id=79

5. OnSite was a collaborative exhibition with three students from Edinburgh College of Art designed to evoke a public awareness of Informatics and its

interaction. With the advent of nano-materials and molecular computing, Pasks concepts of systems thinking using physics and analogues now have a relevance and importance in the ongoing development in the expanding field of non-digital computing.

Images, videos, details of the exhibition, its development and associated essays can be found on the website *http://maverickmachines.com.*

Through exhibiting *Biotica* at Siggraph in 2000, I met Jon McCormack and Alan Dorin, who were also creating A-Life artworks at CEMA - Centre for Electronic Media Art, Monash University in Melbourne Australia.

I was invited over for a three month residency. Upon arriving, although I felt it was expected that I might create another *Biotica*, I was a bit weary of programming and digital simulations, and wanted to create something new. The electrochemical glass and its evolving dendrites beckoned the strangely alien, yet familiar organic beauty of the dendrite, exhibiting a type of emergence so much richer than anything possible in computer simulation.

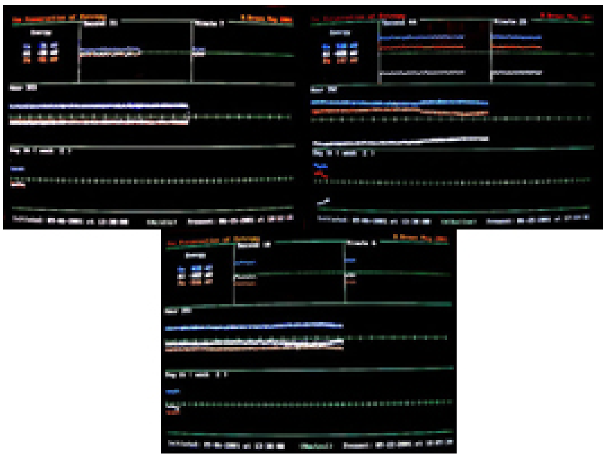
In the book *Biotica*, Joe Faith, suggests that emergence is dependent on complexity all the way down. I set out to investigate and reproduce the hidden complex processes behind the electrochemical glass.

For my residency, I created *The Preservation of Entropy*, a scientific experiment designed to be displayed as an evolving art work, examining and revealing the hidden processes in electrochemical activity.

The Preservation of Entropy

The Preservation of Entropy, Monash University 2001; installation and close up of alkaline vessel.

Six Vitrine displays arranged in a triangular formation, held three hand-blown glass flasks containing liquids of acid, alkaline and salt and three old DOS computers. In the liquid in each flask were immersed three rods of aluminium, copper and iron. The electricity activity between the metals were monitored through A to D converters on the computers and displayed via a program written in BASIC.



Screenshots of electrical activities: acid, alkali, salt (neutral).

The displays were similar to heart beat monitors, showing and recording activities over seconds, minutes, hours, and days. The work was displayed in a public thoroughfare so that people would notice and reflect on the progressive changes as they passed by over the weeks and months, possibly years.

The activities were indeed complex and varying, sometimes in cycles over odd lengths of time, one being recorded oscillating over a 23 hour period. I

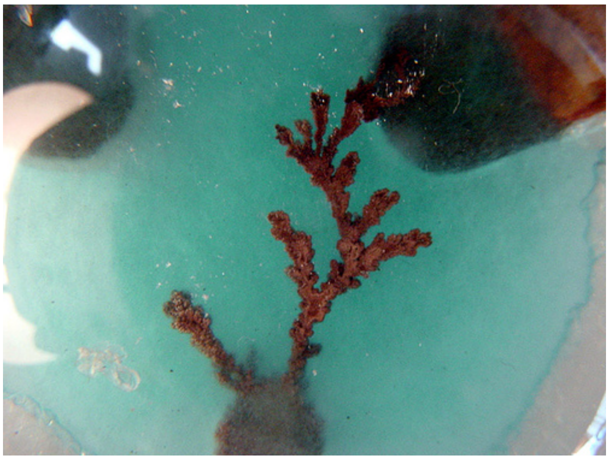
wondered how the recorded electrical waveforms might sound if converted to audio, but time had run out.

During the writing of *Biotica* in 2000, I met Joe Faith in Sussex University who studying for a PhD in what was then known as Cognitive Systems (Cogs). Cogs researched emergent and evolving systems, across electronics, robotics, and music. Margaret Boden, (author of Artificial Intelligence and Natural Man) is based at Sussex, alongside Phil Husbands and Inman Harvey, among others.

Blip, a series of art/science experiments and engagements also emerged from Brighton, co-organised by Jon Bird who first introduced me the work of Gordon Pask. Alongside Andy Webster, they were working on recreating an experiment of Pask known as *Pasks Ear*. Andy and Jon had produced a video *Tuning Pasks Ear*, which showed split screen, a growing dendrite accompanied by the playing and tuning of a wine Glass. Pask apparently had influenced a dendrite to recognise sound; in the video art work, the idea that a dendrite might be influenced by sound is suggested, rather than made real.

As a result of the work of Jon Bird and Andy Webster I recognised that the *Electrochemical*

application of a maverick machine. I first met Michael Kozicki from Axon Technologies through pure serendipity after exhibiting the image of a simple dendritic switch at an Arts and Informatics exhibition in October 2006 I organised entitled *OnSite*. [5]



Dendritic Switch, OnSite. October, 2006

Michael approached me excitedly explaining that the dendritic image he had seen was exactly the same as those in the nano-devices his company Axon technologies were developing. Axon are producing memory devices based on dendritic

growth at the nano scale in a solid substrate of electrochemical glass. They knew nothing of the work of Gordon Pask and were extremely excited by the parallels between their research and his.

It is somewhat ironic that the maverick electrochemical experiments of Pask have now found commercial application by Axon without them having prior knowledge of his visionary work.

During my residency in Informatics I gave a talk in the Computational Thinking lecture series where I suggested that analogue computers can offer significant advantages over the digital, in areas of concurrency and non-Turing computability.[6] There are other examples of real world analogue applications, such as the Extended Analogue Computing of Jonathan Mills [7], which serves to demonstrate how modern day analogue devices can solve real-time problems not possible using conventional digital computing techniques. Further examples of alternative computing media can be found via the research strand Unconventional Computing.[8]

A cybernetic view suggests that it is not the materiality that is of interest but the underlying interdependent processes and their modes of

Glass was exhibiting, albeit slowly, the same kind of dendritic growth Pask had been experimenting with.
The idea that computational processes might be realised through electrochemical action of metals in solutions resonated with the experiments had I carried out in the *Preservation of Entropy*, and the complex interactions present in the continuing growth of the *Glass*.

In 2005, the journal *Strange Attractor*, published images of the glass and an article The Electrochemical Glass - A slow-evolving artwork from a living alchemist ; which describes the electrochemical processes behind the *Glass*, and its connections with the work of Gordon Pask and that of Jon Bird and Andy Webster.
In 2006, whilst working as Artist in Residence at the Edinburgh School of Informatics, I was awarded a grant from the Calouste Gulbenkian Foundation, which enabled me to further develop my interests in electrochemical processes and investigate further the dendritic work of Gordon Pask.
Rather than monitor the electrochemical processes as in the P*reservation of Entropy* installation, I set out to generate and control their

formations. One of the aims was to produce an active dendritic circuit able to oscillate or respond to its environment. I investigated varying metals and solutions, circuits and devices, including the use of 'Water Glass' as used in the well known chemical experiment 'Silica Garden', a type of chemical growth dating back to the work of Newton with his 'Vegetative Metals'. [3]

Electrochemical Silica Garden Experiment, 2006.

Further details of the research work and experiments I made as artist in residence in Edinburgh School of Informatics can be found at http://artsinformatica.blogspot.com.

wonderful description of his encounters with Pask, his speech in full can be read on the maverick machine website. [4]

Through creating the exhibition I became aware of Pasks ongoing influence on architecture; Karen Martin introduced me to Stephen Gage from the Bartlett School of Architecture, and the Interactive Architecture Workshop, where the work of Pask has a great influence on performative architecture. Usman Haque also has a Paskian influence on the Bartlett, and many of his works are concerned with conversational spaces of an architectural nature. Pask also taught at the Architecture Association - his ideas continue to branch dentrically outwards, influencing a range of activities and disciplines across art, architecture, computing theory, music and performance.

Pask represented Cybernetics, a term now that seems very 1970s. The concepts underlying cybernetics are not media specific, but can be applied to ecological, electrical, chemical, or biological systems - any set of connected processes that are able to influence and be influenced by each other.

I was lucky enough to study Computers and Cybernetics in 1997, and the ideas of feedback loops continue to influence my thinking about interactive systems.

Pask said anything can be a computer, and he also appeared to be dismissive of the digital computer, likening it to a magic lantern, as if it were the projector of a seductive false reality. Much of Pasks work and thinking seems to revolve around the use of the analogue and analogies, with mechanical allusions to thinking about thinking and conversation theory with actors playing varying roles. This theme is developed in the exhibition with computation devices using electrochemical, electromagnetic and static electricity processes.

The two beige computers in the exhibition certainly appear dull in contrast to the visceral materials of the maverick machines liquids, mechanics, copper, glass and wood. Like Pask, I am also interested in alternative computing paradigms, finding the digital rather dry and software programming very time intensive.

Axon Technologies, who are featured in the exhibition, have produced a nano-dendritic-memory device, a real world