Autonomy, Signature and Creativity

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Art that Creates Itself

It's recounted that the late-19th century Parisian art dealer Ambroise Vollard during the 96th sitting for his portrait by Paul Cezanne (1839 – 1906) asked the artist how many more sittings might be needed? Cezanne admonished him … "if I make one incorrect brush stroke I may have to start the whole painting over again from that mark". Although this encounter is possibly apocryphal it nevertheless highlights the artist's interest in the formal mechanisms of the craft of painting and helps distinguish him from his contemporaries who were members of the impressionist movement. Claude Monet (1840 – 1926), for example, revels in his intuitive facility with brush and paint and achieves a close engagement with his subject – a relationship that seems similar to the Buddhist state of "oneness" with the world or with Freud's concept of the 'oceanic' state of mind, especially as Ehrenzweig[1] revised it. By contrast Cezanne stands apart from his subject allowing his intellect to consider and govern every move.

By the late 19th century photography had appropriated the role of creating likenesses that had previously been the preserve of painting. This enabled artists like Cezanne and Georges-Pierre Seurat (1859 – 1891) to move on from the intuitive, impressionistic representation of the world typical of their contemporaries to begin a more analytical exploration of the relationship between the canvas (the 2-dimensional representation) and the real world (the 3-dimensional scene represented). Their ideas were contemporaneous with, and complementary to, those of the American philosopher Charles Sanders Peirce (1839 – 1914) and the Swiss linguist Ferdinand de Saussure (1857 – 1913) who were both developing formal methods for the analysis of systems of communication via an investigation of signs and the relationship between the "signifier" and the "signified" that became known as Semiotics (Peirce) or Semiology (Saussure).

The work and ideas of these artists and philosophers and their contemporaries had a profound effect on the intellectual climate of the nascent 20th century. In the context of the visual arts – the context of this essay – they engendered an intense and revolutionary period that lasted into the second half of the century and examined both the purposes and methods of visual production and communication. Experimentation was key to this new spirit and the period culminated with artworks and critical theories that simultaneously questioned and undermined many of the assumptions that were held dear by artists of earlier generations.

By the 1960's a number of key critical concepts had emerged and these included the idea that the process – and not the ensuing object – was the key element of the artwork. Also the role of art as an intellectual, rather than an emotional, pursuit was emphasised and, in particular, that the *idea* or *intention* – the conceptual foundation – of the work was considered paramount[2]. Two international art movements emerged in this period that epitomised these ideas: systems art and conceptual art. Amongst the ideas then current were autonomy and signature[3]. Mitchell Whitelaw has addressed the origins of these concepts in 20th century art, for example in the work of Kasimir Malevich (1878 – 1935) and Paul Klee (1879 – 1940)[4]. Many artists describe how the artwork itself, during its construction, takes over the creative process and especially how the work itself dictates the point at which it may be considered complete. During the 1960's many artists were engaging explicitly with these ideas. They were attempting to attenuate personality by using industrial materials and methods

[1] Ehrenzweig, Anton, *The Hidden Order in Art. A Study in the Psychology of Artistic Imagination*, (Berkeley: University of California Press, 1967)
[2] Lippard, Lucy R., *Six Years: The Dematerialization of the Art Object from 1966 to 1972 ...* (University of California Press, 1973, 1997)
[3] At the time of writing the co-authors, together with Margaret Boden and a number of art historians, are developing a research project that will use formal and computational methods to examine the concept of artistic signature.
[4] Whitelaw, Mitchell, 'The Abstract Organism: Towards a Prehistory for A-Life Art', *Leonardo* 34.4, pp. 345-348 (Cambridge, MA: MIT Press, 2001)

Dagstuhl Seminar Proceedings 09291
Computational Creativity : An Interdisciplinary Approach
http://drops.dagstuhl.de/opus/volltexte/2009/2204

to remove the human touch and they were adopting formal, structured content and methods that were considered both universal and personality free.

The many influences on this generation of artists included: analytical philosophy; systems theory; artificial intelligence, communications theory; cellular automata (early artificial life); unpredictable deterministic systems (early chaos theory); formal grammars; learning systems and more. Many of these influences were auspiced by a growing awareness of the work of Norbert Weiner (1894 – 1964) and William Ross-Ashby (1903 – 1972)[5]. Weiner's "Cybernetics"[6] which first introduced the subject to a wider audience, is subtitled "the study of control and communication in the animal and the machine" and contributed significantly to a reassessment of the human condition. This revoked the renaissance-inspired view of a human-centric universe – the first-person-singular, perspectival view of the world – and replaced it with one where humans were on a level with other forms of life and even with their machines. It's possible to see that the work of the Cubists some 50 years before – which emerges directly from Cezanne's experiments – was an early progenitor of this heterarchical and multi-perspective worldview.

Human superstitions, religion and egocentric concepts of self and importance were, at best, illusionary and human influence was largely peripheral to the working of the universe. It's perhaps worth noting that humans were not relegated to a position of total inconsequence! George Spencer Brown, a contemporary British analytical philosopher, suggested that humans (and other possible alien life forms) are a mechanism by which the universe is able to perceive itself[7]. This concept continues today in the Anthropic Principle, which is an essential component of Many Universe cosmologies like, for example, String Theory where it serves to distinguish this universe from others and, especially, to account for why the fundamental constants that govern this universe have the values they have. It is also interesting to note as an aside that Spencer Brown's work influenced the Chilean biologists Humberto Maturana and Francisco Varela and their development of the concept of autopoiesis[8].

In the 1960s artworld these emerging ideas had an equal impact. They reinforced the search for an art that emerges from universal processes rather than from personal fetishes and illusions of self. In the ensuing dialogue a key concept emerged – that of signature.

However, before looking at signature, it is worth examining the work of three pioneers who addressed the influence of cybernetics and what has become known as the computational paradigm and whose work also embeds a claim for autonomy.

Nicolas Schöffer (1912-1992) formulated his idea of a kinetic art that was not only active and re-active, like the work of his contemporaries, but also autonomous and pro-active in Paris, in the 1950's. He developed sculptural concepts he called: Spatiodynamism (1948), Luminodynamism (1957) and Chronodynamism (1959) and was influenced by the new ideas that had been popularised by Wiener and Ross Ashby. His CYSP 1 (1956) is accepted as the first autonomous cybernetic sculpture. Its name is formed from CYbernetic SPatiodynamism 1. It was controlled by an "electronic brain" (almost certainly an analogue circuit) that was provided by the Dutch electronics company Philips. In addition to its internal movement CYSP 1 was mounted on a mobile base that contained the actuators and control system. Photosensitive cells and a microphone sampled variations in colour, light and sound and so it was…

> *"…excited by the colour blue, which means that it moves forward, retreats or makes a quick turn, and makes its plates turn fast; it becomes calm with red, but at the same time it is excited by silence and calmed by noise. It is also excited in the dark and becomes calm in intense light."*

On its second outing CYSP 1 performed with Maurice Béjart's ballet, on the roof of Le Corbusier's Cité Radieuse, as part of the Avant-Garde Art Festival, held in Marseille. Schöffer said of his work:

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[5] Ashby, W. Ross, *Introduction to Cybernetics* (London: Chapman & Hall, 1956)
[6] Wiener, Norbert, *Cybernetics: Or the Control and Communication in the Animal and the Machine* (Cambridge, MA: MIT Press. 1948)
[7] Spencer Brown, George, *Laws of Form* (London: Allen & Unwin, 1969)
[8] Kauffman, Louis H. and Francisco J. Varela, Form Dynamics, Journal of Social Biological Structures, Vol. 3, pp. 171-206, 1980

"Spatiodynamic sculpture, for the first time, makes it possible to replace man with a work of abstract art, acting on its own initiative, which introduces into the show world a new being whose behaviour and career are capable of ample developments"[9].

Edward Ihnatowicz (1926-1988) described himself as a Cybernetic Sculptor[10]. His *Sound Activated Mobile (SAM)* consisted of four parabolic reflectors, shaped like the petals of a flower on an articulating neck. Each reflector focussed sound on its own microphone and an analogue circuit could then compare inputs and operate hydraulics that positioned the flower so it pointed towards the dominant sound. SAM would track moving sounds and gave spectators the eerie feeling that they were being observed. Not long afterwards Ihnatowicz was commissioned by Philips to create the *Senster* for their Evoluon science centre in Eindhoven. It was a large (4 m) and ambitious minicomputer controlled interactive sculpture that responded to sound and movement and was exhibited from 1970-74 when it was dismantled due to high maintenance costs. Its behaviour was exceptionally life-like[11] and Ihnatowicz was an early proponent of a "bottom up" approach to artificial intelligence or what we would now call artificial life. He was inspired by his reading of the developmental psychologist Jean Piaget to suggest that machines would never attain intelligence until they learned to interact with their environment[12]. In recent years he has been widely acknowledged in the scientific world as an early pioneer of what has become known as artificial life or a-life.

Harold Cohen (born 1928) is a well-established artist who represented Britain with his brother Bernard (who later became Slade Professor) at the 1966 Venice Biennale. In 1969 he began working at the University of California at San Diego (UCSD) where he became interested in computers and programming. From 1971 he was involved in the AI Laboratory at Stanford University where Edward Feigenbaum was developing Expert Systems. These systems get around a major problem in classical, top-down, disembodied AI research – the problem of context. The human mind has an amazing facility to quickly apply a multitude of contextual information to the cognition of ambiguities common in speech and other forms of inter-human communication. Even high-speed modern computers with their linear processing structures can't compete. Feigenbaum was one of a number of researchers in the late 60's and early 1970's who suggested that this could be overcome by limiting the area of intelligence to small, well-defined knowledge bases where ambiguities could be reduced sufficiently to enable the contextual cross-referencing to be resolved. Researchers at the Stamford Lab. developed many valuable expert systems like Mycin that was used to diagnose infectious diseases and prescribe antimicrobial therapy. As a Guest Scholar and artist-in-residence from 1971-73 Cohen began to develop an expert system he called AARON. He continues to work on it and jokes that it's the oldest piece of software in continuous development. AARON is a classical top-down AI package. It contains an internal database and set of rules that enable it to interpret its knowledge base to produce sophisticated and unique drawings. Although Cohen is interested in investigating issues to do with cognition and drawing in general his major achievement has been the externalisation and codification of his own drawing and cognitive abilities. AARON produces 100% genuine and original Cohen artworks without the need for the human artist's intervention[13].

Signature

Just a few months ago, in June 2008, someone paid $86 million for Francis Bacon's "Triptych 1976" – the latest record for a work of contemporary art. It's improbable but possible that they bought the painting because it will look good in their corporate or domestic accommodation. It's far more likely that they bought it to deposit in a secure vault for a few years so that they can then sell it on at a good profit. It was described by the vendors as "totemic" and is believed to be the last remaining major work by the artist that is in private hands. But, really it's just a bit of old fabric with some pigment smeared on it. If we ignore the economic indicators – like recession and inflation – that traditionally favour the art investment market there are only two good reasons that somebody had

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[9] Schöffer, Nicolas, quoted from: http://www.olats.org/schoffer/cyspe.htm – (referenced 15/08/06)
[10] Zivanovic, Alex, maintains a comprehensive website on Ihnatowicz' work – see http://www.senster.com (referenced 16/08/2006)
[11] Zivanovic, Alex, 'The Technologies of Edward Ihnatowicz', in Charlie Gere, Paul Brown, Nick Lambert & Catherine Mason (eds.), *White Heat Cold Logic: British Computer Art 1960 – 1980* (Cambridge, MA: MIT Press, Leonardo Imprint, to appear)
[12] Brown, Paul, private conversation with Edward Ihnatowicz (mid 1970's)
[13] Cohen, Harold, 'Reconfiguring', in Charlie Gere, Paul Brown, Nick Lambert & Catherine Mason (eds.), *White Heat Cold Logic: British Computer Art 1960 – 1980* (Cambridge, MA: MIT Press, Leonardo Imprint, to appear)

$86 million dollars-worth of confidence in this investment. Firstly it's rare. But more importantly - that bit of paint-smeared fabric bears the attribute of the unique signature style of an artist who is considered important and, even better, who is dead and so incapable of making any more.

The revolution against signature back in the 1960's had two roots. One, described in the previous section was the challenge of creating a work that existed as a "pure" manifestation of an idea that was unsullied by the personality (beliefs, prejudices, opinions, attitudes, biases, etc…) of its creator(s). There was also a reaction by artists against the commercial artworld's economic exploitation of their work and this was also related to the artists' rejection of the galleries focus on the unique (i.e. signed) object at a time when the artists themselves were increasingly concerned with process – the kind of exploitation illustrated by the paragraph above. During this period I was personally involved in this dialogue and although it represents a fairly simplistic overview of what was a more complex situation it is, however, beyond the scope of this essay to describe it in further detail. Nevertheless, the rejection of signature – and signature style – was mainly composed of aspects of economic subversion and intellectual/conceptual challenge and this essay is concerned with the latter.

Signature is not, of course, just – if it ever was – the unique autograph of the artist – this is the first thing the forger learns to reproduce. Signature is implicit in the artist's choice of subject, medium and within salient features embedded, often unconsciously, in the execution of that medium. In the world of oil painting for example the artist's choice of content, minor figurative features, stylistic flourishes, composition, representation of content, preparation of substrate, make of paint, colour palette, type of brushes, the way they mix and apply the paint and so on… may all contribute salient features that can be identified by a professional assessor who can then use them to make an authoritative attribution of authorship.


Figure 1 - Nova Express lightshow c 1968

In the late 1960's I believed that I would be able to make unsigned artworks by using a computer system that I programmed. Prior to this I had first produced flat, geometric paintings using masking tape, liquid acrylic paint and broad soft brushes that enabled me to create an anonymous "industrial" finish. Then for several years I was artistic director of a lightshow called Nova Express (figure 1). We were successful and played with many of the major bands of the time like Pink Floyd, the Who, Nice and Canned Heat as well as more in-depth collaborations with leading experimental arts groups including Meredith Monk and the House Company, Electronica Musica Viva and The Welfare State. More importantly we had sufficient income to invest in equipment and so were able to experiment with a wide variety of projection technologies both in rehearsal and performance.

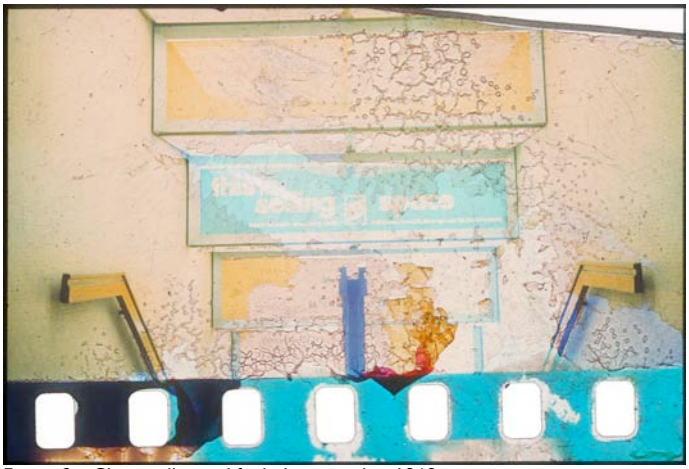
Figure 2 - Chemically modified photograph c 1968

The experience of working live with two other operators using both random and structured techniques to integrate our projections with the performers on-stage had a major influence on me. I began to see that art could be an ephemeral, less precious and significantly, an uncontrolled experience. Back in my studio I could drop some coloured ink into water and watch this process of mixing, which was maybe only 2 cm in diameter, projected up to several metres

across. The heat of the projection lamp created turbulent flurries and the resulting time-based artwork was an intricate visual fractal – an immersive and absorbing experience. Apart from gently squeezing the ink dropper I had not really created this event, I didn't try to shape or control it at all. I had nowhere near the amount of control I would have exercised if I had been painting a canvas or carving a sculpture. Factors like heat, gravity, turbulence, etc… were completely beyond my control – the work existed as a visualisation of a physical event in contrast to a deliberately created aesthetic object: I was watching the laws of physics and chemistry working "live" on the screen. Furthermore I could build a machine to squeeze the dropper! My longstanding interest in autonomy began. Around the same time I also began to experiment with chemically modified photographs (figure 2) and electrostatics (figure 3).

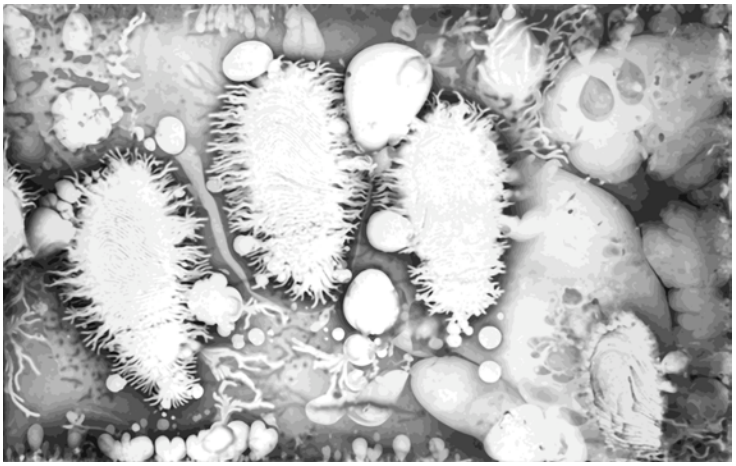
Figure 3 - Electrograph c 1974

I had discovered computers at the Cybernetic Serendipity exhibition at the ICA in 1968[14] and by 1974 was using them exclusively in my work. The computer was a machine and produced images using an offline Calcomp pen plotter – so the entire process was automated and I didn't have to physically engage with the work throughout its production. Furthermore by employing a simple formal symbolic programming language like FORTRAN[15] I thought I should be able to distance myself further from the work. By utilising very simple drawing "primitives" and distributing these about the image space first by using random procedures and later using the agency of cellular automata I planned to produce work that would have the potential of developing a unique and autonomous signature and that this would be significantly different from my own. I believed that using a symbolic language could initiate a process that would enable me to distance myself far enough from that process and its outputs for it to have the potential of developing its own intrinsic qualities including a unique signature.

It retrospect it was a over-optimistic expectation but, at the time it seemed reasonable and led directly to a couple of decades of interesting and productive engagement with computer systems, computational theory, artificial intelligence, artificial life, and so on… One of the works I produced is shown in figures 4. More are illustrated in Catherine Mason's insightful history of the computer arts in the UK[16], in Honor Beddard & Doug Dodds' *Digital Pioneers*[17] and on my website[18]. However by the early 1990s, after 20 years following this particular avenue, it became obvious that – however interesting or valuable the work I had produced was – the fundamental aim of autonomy had not been achieved and in that respect the work was a cul-de-sac. The artworks that had been created were clearly signed with my own name.

During the second half of the 20th century we learned a great deal about the signatures of life, their codes and manifestations. Signatures, like life itself, are extremely robust and not easy to ignore, disguise or overcome. Research in many fields has demonstrated that they are strongly relativistic. The myriad bonds that define a signature are transmitted by even the simplest symbol system and for this reason any attempt to create autonomy by formal construction, as I had attempted, is unlikely to succeed.

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[14] Reichardt, Jasia, 'In the Beginning', in Charlie Gere, Paul Brown, Nick Lambert & Catherine Mason (eds.), *White Heat Cold Logic: British Computer Art 1960 – 1980* (Cambridge, MA: MIT Press, Leonardo Imprint, to appear)
[15] FORTRAN or FORmula TRANslation was an early "high level" language devised for mathematical and scientific applications and it was the first programming language I learned
[16] Mason, Catherine, *A Computer in the Art Room: the origins of British computer arts 1950-80*, (JJG Norfolk, 2008)
[17] Beddard, Honor and Douglas Dodds, *V&A Pattern: Digital Pioneers*, (V&A Publishing, London, 2009)
[18] http://www.paul-brown.com > gallery > timebased – Java Runtime Environment is required

I was not too disappointed by my failure. The work I had made was interesting and had further potential. The quest for autonomy was put to one side. It re-emerged in 2000 when, as the recipient of an Australia Council New Media Arts Fellowship I spent a year at the Centre for Computational Neuroscience and Robotics (CCNR) at the University of Sussex in the UK. Here I learned about many exciting new developments in artificial life and these inspired me to readdress the question of autonomous artworks.

The DrawBots – an interdisciplinary exercise

During my year as artist-in-residence at the CCNR I had several discussions with Phil Husbands – the CCNR co-director – and his colleagues about the problem of autonomy and the limitations of the signature problem for a designed – or top-down – solution. Maybe it would be possible to make an autonomous agent using bottom-up techniques where the agent could evolve, adapt and learn for itself?

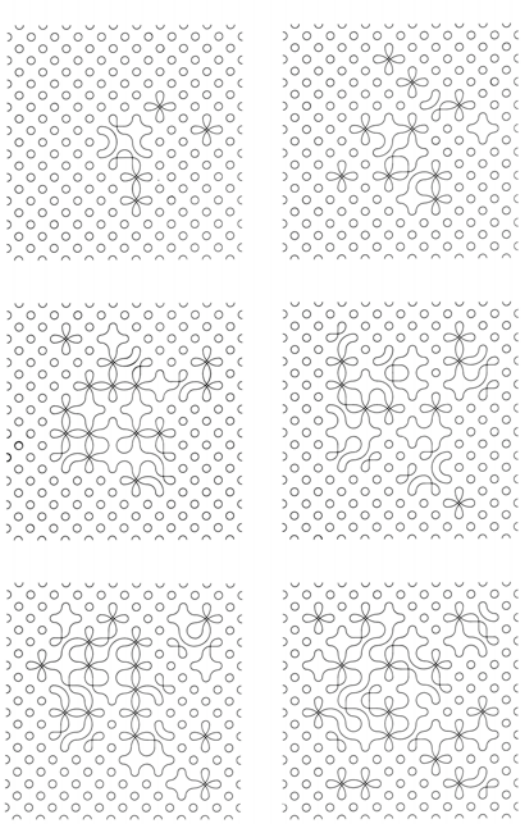

Figure 4 - LifeMods, computer assisted drawing 1976

Phil and I had both been involved in previous art-science collaborations and were keen to devise a programme that would have the potential of significant outcomes for all participants. Art-Sci partnerships tend to fall into three categories. In the first the artist appropriates a scientific idea and enlists the help of scientists in order to make it work. In the second the scientist appropriates the artist's skill in order to enhance the communication of their work. Both these models can be interesting, financially and intellectually rewarding and can lead to interesting outcomes and deliverables. However we are more interested in a third model for collaboration.

In this final category the artist and scientist (possibly with others) work together closely on an ongoing basis (or for the full duration of a research project) and each benefit from the other's perspective, skills and knowledge. All parties can derive significant benefits from their collaboration including new knowledge, artworks, published papers and intellectual property. However, the principal benefit from this close, ongoing collaboration is not concerned with outcomes or products but rather with the methodological and intellectual value of combining different perspectives and the potential for thinking "outside the box". The American artist Donna Cox coined the term "Renaissance Team" to describe this kind of working relationship[19].

We devised a project that would attempt to use evolutionary robotics and evolutionary and adaptive systems to make a robot that could produce interesting and non-repetitive drawings. It is perhaps worth emphasising that we were not seeking (or expecting) "good" drawing behaviour but simply something that would invoke the response of "interesting". We nicknamed our project the DrawBots and our funding bid was eventually successful and the three-year project began in 2005.

A major influence on the development of the DrawBots was a research project undertaken by Kyran Dale in 2000 when he was a PhD candidate in the CCNR. Kyran was working on an evolutionary robotics model of wasp foraging behaviour. I attended a seminar Kyran gave and was impressed with the quality of several of the illustrations used (figure 5). I had been teaching art students for many years and remarked that if a student had submitted similar drawings for their annual "crit" they would

[19] Cox, Donna, 'Renaissance Teams and Scientific Visualization: A Convergence of Art and Science', *Collaboration in Computer Graphics Education: Proceedings SIGGRAPH 88 Educator's Workshop* (August 1-5, 1988, pp. 81 – 104)

have been well received and the student would have been likely to pass. Clearly there is a problem of intention here. Although these had some surface similarly to "freeform" drawings made with a soft pencil or charcoal they were functional illustrations of a scientific research program and were not intended to be "read" as works of fine art. Perhaps more importantly the paths of the simulated wasp were determined by a quantitative measure – the wasp was hungry and was searching for food. If it found food it survived to reproduce and promote its genome. If it failed it died. Our DrawBots project lacks this quantitative foundation. This obvious drawback was also a feature – from the scientific point of view the research has the potential of providing valuable insight on the application of evolutionary and adaptive methods to qualitative – or more generally non-quantitative – behaviour and phenomena.

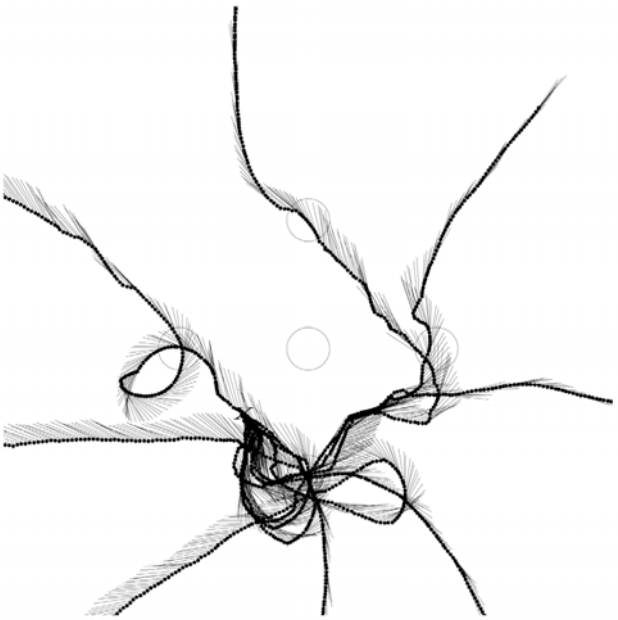

Figure 5 - Wasp Foraging Simulation, Kyran Dale, 2000

The project continues and although it has produced valuable outcomes the goal of an autonomous drawing robot remains elusive. This essay is not intended to describe the outcome of our project but rather explain its history and context in 20th century art and ideas.

Acknowledgments

I am grateful for the ongoing contributions of my colleagues on the Drawbots project: Margaret Boden, Phil Husbands, Charlie Gere, Ernest Edmonds, Jon McCormack, Mitchell Whitelaw, Jon Bird, Dustin Stokes, Bill Bigge, Linc Smith and Simone Gristwood. Project advisors included Sue Gollifer, Tony Longson and Rob Saunders.

The Arts And Humanities Research Council – AHRC – funded the project and it was based at the CCNR, School of Informatics, University of Sussex and at the University of Lancaster.

This essay is based on a longer report on the Drawbots Project co-authored by Phil Husbands and Paul Brown[20].

20 Husbands, Phil and Paul Brown, 'Not Intelligent by Design' in *Digital Research in the Arts and Humanities: Art Practice*, Ashgate, to appear.