Notes Towards a History of Art, Code and Autonomy

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In this paper I will present a view of developments in the history of art, code, and autonomy. This view is not intended to be complete or all embracing but it traces a significant and often ignored line of development in twentieth century art as seen from the perspective of the author's experience.

Introduction

For most of the Common Era (CE) European art has been a representation of something: a portrait of a religious figure or patron, an image of a landscape, real or imagined. Then in the late 19th century the US philosopher Charles Sanders Peirce and the Swiss linguist Ferdinand de Saussure independently investigated a framework that we now know as semiotics. It was a method for examining communication via the relationship between a sign and that which it signified. Although their concern was with the worlds of language and ideas the concepts they were dealing with were a part of the international scholarly milieu and artist like Paul Cezanne and Georges Seurat were simultaneously making comparable analyses of visual representations in the artworks they produced.

The work of these post-impressionists had a profound influence on the art of the 20th century. Art as a formal analysis of it's own processes was the theme of several inter-related strands of 20th century art that, in the late 1960's, overthrew the concept of art as object and replaced this with art as process. The systems and conceptual artists embraced and developed these ideas and then in the 1970's a new generation of artists began to encode these concepts using the formal linguistics made possible by the new science of computing.

Computer art, as such, was not new. By 1970 it was at least 20 years old and already in 1968 Jasia Reichardt[1], at London's Institute of Contemporary Art (ICA), had curated a major historical survey of the field called *Cybernetic Serendipity*[2]. But it was the young artists working at the Slade School of Art's postgraduate Experimental and Computing Department from 1974 to 82 who were specifically addressing ideas from both systems and conceptual art within the context of the emergent computational domain. Their endeavours were recently recognised by scientists as laying one of the foundations for what, a decade later, became known as artificial life or Alife. And one of their focal agendas was an artwork that would exist – and might even be created – independently of human agency.

In order to better understand their contribution we should first revisit some history so we can examine the context of the ideas these artists were engaging with, the

[1] Reichardt, J., **In the Beginning**, in P. Brown, C. Gere, N. Lambert & C. Mason (Eds.), *White Heat Cold Logic: British Computer Art 1960 – 1980*, MIT Press, Leonardo Imprint, 2009

[2] MacGregor, B., **Cybernetic Serendipity Revisited**, in P. Brown, C. Gere, N. Lambert & C. Mason (Eds.), *White Heat Cold Logic: British Computer Art 1960 – 1980*, MIT Press, Leonardo Imprint, 2009

technical and aesthetic innovations that influenced them and their legacy in the art of today.

Beyond Representation

The development of a robust photographic process in the early 1800's (by Daguerre, Fox Talbot and others) undermined one of the major historical obligations of the visual arts – that of representation. The arts were free to pursue other avenues and, of course, find alternative sources of support! By the 1890's the French artist Paul Cezanne was using his artworks to investigate the relationship between the brush marks he made on a rectangular white canvas and the objects those marks represented. In a theoretical sense his work was remarkably similar to his contemporary, the American philosopher Charles Sanders Peirce of whom it is unlikely he was aware. Peirce's *semiotics* is a study of communication via signs and consists of a triadic relationship between the sign or signifier, that which is signified and the interpreter who recognises their relationship. So Cezanne's brush marks are appropriate and facilitate the act of cognition that enables the spectator to correctly attribute them to the object represented – a barn, tree, mountainside, etc… – and comprehend the scene as a whole.

The thoughtful reader will now object – but surely that's what artists have always done? Some six centuries earlier Giotto di Bondone was using appropriate brush marks to enable the correct interpretation of his early renaissance frescos! Cezanne's contribution then is in making explicit this previously implicit – or intuitive – comprehension of the artist's methodology. He puts it into a formal framework where it can be examined and deconstructed then used as a foundation for further analytical thinking and artistic creation. Cezanne's paintings of this period are about the triadic act of cognition; this is their subject and primary reason for existing. So Cezanne becomes one of the first formal conceptual artists of the high modern period and his work had a profound influence on the arts of the dawning 20th century.

In particular artists like Kandinsky and Malevich question the relationship between sign and signified and propose an art where that relationship becomes an abstraction. For them it does not represent something real 'out there' but rather some inner, transcendental or spiritual state of mind. Kandinsky's theosophical studies[3] led him to the work of Leadbeater and Besant on *Thought Forms*[4] (published 1901) that contains illustrations of 'etheric' images that are clearly influential on his later abstractions (see plates M: *Music of Mendelssohn* and G: *Music of Gounod* in particular[5]).

So it was up to the more playful and, I suspect, much less spiritually minded artist Marcel Duchamp to challenge the sign-signified representation with works like *Roue de bicyclette* (1913) and the more notorious *Fountain* (1917). In 1915 Duchamp coined the name *Readymade* to describe these and other works and they clearly

[3] Kandinsky, Wassily, **Concerning The Spiritual In Art** (original title - The Art of Spiritual Harmony), 1914. Can be downloaded from : http://www.gutenberg.org/etext/5321

[4] Besant, Annie Wood and Leadbeater, Charles Webster, **Thought Forms**, 1901. Can be downloaded from http://www.gutenberg.org/etext/16269

[5] **Thought Forms** website - http://www.anandgholap.net/Thought_Forms-AB_CWL.htm

undermined and collapsed the relationship between signifier and signified. By so doing they also undermined what was then understood as the nature of art itself and, as Duchamp no doubt intended, asked many more questions than they answered. Previously artists (or their assistants) made works of art but Duchamp certainly didn't make *Bottle Rack* (1914) the first of his 'unmodified' readymades – he just bought it in a local hardware shop. The piece became art because – and only because – Duchamp intentionally named it as such. His readymade: *Tinned Chance: Trois Stoppages Etalon* was made by dropping three one-metre long pieces of string onto a glued canvas. Each curve was then cut out to make a rule that Duchamp used in the construction of subsequent works like *The Large Glass: The Bride Stripped Bare by Her Bachelors, Even (La mariée mise à nu par ses célibataires, meme, 1915-23)*. As in much of Duchamp's art this work questions the idea of authorship and intentionality and serves to illustrate his longstanding fascination with chance and mathematics. Like most of his output the stoppages are deliberately enigmatic and, in particular, his readymades question the idea of an art with intrinsic meaning and suggest instead a precursor of later postmodern thought in offering an 'open' signifier whose pluralistic interpretation is brought to the experience by the spectator. With his later *Rotative Plaques* and then *Rotoreliefs* he created kinetic pieces that directly experimented with visual cognition and that he specifically instructed should not be exhibited as art. The rotoreliefs feature in his experimental film *Anémic Cinéma* made in 1926[6].

Theo van Doesburg published his *Manifesto of Concrete Art* in the only issue of the magazine *Art Concret* (1930). The Swiss polymath Max Bill who became one of the movement's highest-profile members later revised the definition:

> "*We call those works of art concrete that came into being on the basis of their inherent resources and rules - without external borrowing from natural phenomena, without transforming those phenomena, in other words: not by abstraction.*"

Art Concret rejects external referentiality, its artefacts are closed, self-referential and their meaning is intrinsic. They refer not to the outside phenomenological world or an inner spiritual world but only to themselves. Ironically this supreme art of disinterest materialises in the decade that saw Europe devoured by Fascism. After the ensuing Second World War (1939-45) Art Concret had a major influence on the emergence of several art movements including: systems art, conceptual art and minimalism.

The Dawn of the Digital

Konrad Zuse pioneered the application of electronic digital processing before the war but the German government did not support his ideas[7]. And so it was at Bletchley Park, the UK's then-secret code and cipher centre, in the south of England[8], that a group of pioneers developed the first practical digital computer.

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[6] See: http://www.youtube.com/watch?v=dXINTf8kXCc (turn off the sound!)

[7] See: http://user.cs.tu-berlin.de/~zuse/Konrad_Zuse/en/rechner_z3.html – after the war Zuse established a computer company and his 1961 pen plotter, the Graphomat Z64 was used by German computer art pioneers Georg Nees and Frieder Nake. http://user.cs.tu-berlin.de/~zuse/Konrad_Zuse/en/rechner_z64.html

[8] See: http://en.wikipedia.org/wiki/Bletchley_Park

Colossus[9] was a special purpose system that existed only to go through the myriad permutations of German Enigma encodings attempting to decrypt their meaning. After the war a number of general-purpose but non-stored program computers were built but it is generally agreed that the first general-purpose, stored-program computer was the Manchester Small-Scale Experimental Machine (SSEM) – or Baby, as it was fondly known[10]. It ran it's first program on 21 June 1948 and was superseded by the Manchester Mark 1 which ran a program that's amongst the earliest works of digital computer art: Christopher Strachey's *Love Letters* in1952[11].

But it was John von Neumann, Julian H. Bigelow and their colleague's work at Princeton's Institute for Advanced Study in the US that led to the computer we know today. They widely publicised their progress and it was adopted internationally as the scheme for modern digital computing and is known today as *The Von Neumann Architecture*. As early as 1953 the Princeton IAS Machine was running Nils Aall Barricelli's *Experiments in Bionumeric Evolution*[12]. This early example of evolutionary computing ran in the 5k memory of the IAS machine and "*consisted of a 32 x 32 x 40 bit matrix of charged spots on the face of 40 Williams memory tubes, made from modified 5-inch oscilloscope displays*"[13]. Von Neumann himself also worked on *Cellular Automata* and especially his *Universal Constructor*[14]. Arthur Burks completed von Neumann's *Theory of Self Reproducing Automata*[15] after his death in 1957.

The evolution of computing was accompanied by a host of complementary formal theories and systems. They included: Boolean logic; 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. Artists were influenced by these new ways of thinking and, in particular during the 1950s and '60s there was a growing awareness of the work of Norbert Weiner and William Ross-Ashby[16]. Weiner's *Cybernetics*[17] 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 finally 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

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[9] See: http://en.wikipedia.org/wiki/Colossus_computer

[10] See: http://www.computer50.org/

[11] A simulation of Strachey's **Love Letters** is here: http://www.alpha60.de/research/muc/

[12] Dyson, George, **Barricelli's Universe**, *PAGE 64 – the Bulletin of the Computer Arts Society*, 2007. Downloadable from: http://lansdown.mdx.ac.uk/CAS/page/PAGE64.pdf
See also: http://www.ted.com/talks/george_dyson_at_the_birth_of_the_computer.html

[13] Dyson, George, 2007, op cit

[14] http://en.wikipedia.org/wiki/Von_Neumann_universal_constructor

[15] von Neumann, John; Burks, Arthur W. (1966) **Theory of Self-Reproducing Automata**, can be downloaded from: http://web.archive.org/web/20080105213853/www.walenz.org/vonNeumann/index.html

[16] Ashby, W. Ross, **Introduction to Cybernetics**, London: Chapman & Hall, 1956. Can be downloaded from: http://pespmc1.vub.ac.be/books/IntroCyb.pdf

[17] Wiener, Norbert, **Cybernetics: Or the Control and Communication in the Animal and the Machine**, Cambridge, MA: MIT Press. 1948

some 50 years before – which emerges directly from Cezanne's experiments – was an early progenitor of this heterarchical and multi-perspective worldview.

George Dyson traces the history of machine evolution back to Darwin in his book *Darwin Among the Machines: The Evolution of Global Intelligence*[18]. Dyson takes his title from an article published in 1863 in *The Press* newspaper, Christchurch, New Zealand[19], by Samuel Butler – who was corresponding with Darwin – and which he later integrated into his book *Erewhon*[20].

The Idea Becomes a Machine

In 1948 – the same year that Baby ran its first program (which found the highest factor of an integer[21]) – the US artist Charles Biederman published his *Art as the Evolution of Visual Knowledge*[22]. As the title suggests Biederman aligns art with science as a way of exploring and comprehending the universe and implicitly proposes a role for art as a component of the study of visual cognition. As might be expected the artist was a strong proponent of abstraction. In a public correspondence with the UK artist Jeffrey Steele that ran in the pages of *Studio International* magazine during the 1960's he criticized Steele's belief in a 'pure' art similar in concept to Bill's Art Concret. All art, he argued, must be grounded at some level in reality and that the idea of an art disengaged with reality was no more than an illusion.

Steele was the founder of the UK's Systems Group and he disagreed. For him and his colleagues in the pan-European systems movement a work of art could be the result of a set of self-referential rules – a *system* – that generated itself via iteration. This was not new – system's art traces its heritage back thru Art Concret and the random and chance experiments of Dadaists like Duchamp to Rodchenko's Constructivism[23]. It presages an art that is a component part of reality and not just something that is derived from – or reflects – reality. A key concept that emerges over this period is *autonomy*. Many artists acknowledged autonomy during the 20th century by rejecting the frame (which reinforced the perception of a window and a representation of something beyond) and the plinth. This is implicit in Art Concret and the work of many of the artists working within the international Kinetics movement. In 1956 the Hungarian/French kinetic artist Nicolas Schöffer made autonomy explicit when he described his new interactive sculpture *CYSP 1 (CYbernetic SPatiodynamism 1)*:

> *"Spatiodynamic sculpture, for the first time, makes it possible to replace man with a work of abstract*[24] *art, acting on its own initiative, which introduces into the show*

[18] Dyson, George, **Darwin Among the Machines: The Evolution of Global Intelligence**, Allen Lane Science, 1998.

[19] http://en.wikipedia.org/wiki/Darwin_among_the_Machines

[20] Butler, Samuel, **Erewhon**, 1872. Can be downloaded from: http://www.gutenberg.org/etext/1906

[21] Tootill, Geoff , **The Original Original Program**, RESURRECTION – The Bulletin of the Computer Conservation Society, No 20, Summer 1998, online here: http://www.cs.man.ac.uk/CCS/res/res20.htm#e

[22] Biederman, Charles, **Art as the Evolution of Visual Knowledge**, Red Wing Press, Minnesota, 1948

[23] Lejeune, Rose, **Rodchenko & Popova: Defining Constructivism, at the Tate Modern, London**, California Literary Review. Online at: http://calitreview.com/2842

[24] This use of the work 'abstract' is confusing as the work was quite definitely not intended, as the quote demonstrates, to abstract from anything and was intended as a 'thing in itself'.

> *world a new being whose behaviour and career are capable of ample developments"*[25].

CYSP 1 had an 'electronic brain' – almost certainly an analogue system – made by Philips and this controlled actuators that enabled it to move around, change colour and articulate its limbs in response to environmental stimuli. Later in 1956 CYSP 1 performed with Maurice Béjart's ballet company on the roof of Le Corbusier's Cité Radieuse, as part of the Avant-Garde Art Festival, held in Marseille.

And so in the early years of the second half of the 20th century a number of strands converged that had a major effect on the post-war art world. But, before we consider this effect, and the consequences for contemporary practice we need to consider another key attribute of the arts that was receiving critical attention at that time: the artist's *signature*.

Artistic signature is not only the autograph mark of the artist. It is implicit in the conception of the work; choice of subject, the execution of the work, choice of media, micro-artefacts embedded in the working of the media and in its intentionality. And it is signature that drives the art collection market: institutional and individual collectors, however philanthropic their intention, expect a return on their investment.

During the post war period many artists were investigating ways they could attenuate if not remove evidence of signature. This had two major drivers: the formalists, as we have seen, were anxious to make a statement that art was not about personal expression. Art was about exploring meaning in the universe and should not be distracted by the irrelevant personal indulgences of the artist. Other artists defied signature in an attempt to challenge the commercial art market that relied on signature to establish and reify their sense of value. Robert Rauschenberg's 'Erased de Kooning Drawing' (1953) provides an interesting example (which, of course, also invokes other and more complex themes).

During the 1960's many of the themes described above merged and converged. Attempts to attenuate signature encouraged the use of industrial materials and methods and led to Minimalism. But another group of artist's, following Duchamp's example, were working to downplay the object itself in favour of the process that produced it[26]. Two complementary, and often overlapping, genres emerged from this debate: systems and conceptual art. The work of the US artist Sol Lewitt illustrates this crossover. Lewitt was often described as a minimalist – a label he challenged – "*Recently there has been much written about minimal art, but I have not discovered anyone who admits to doing this kind of thing*"[27]. Instead he described himself as a conceptual artist however his use of the term is somewhat different to the way it was employed by the European conceptualists. In European terminology Lewitt was much closer to systems than conceptual art. His often-quoted statement in the

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[25] Quoted from: http://www.olats.org/schoffer/cyspe.htm

[26] Lippard, Lucy, **Six Years: The Dematerialization of the Art Object from 1966-1972**, London: Studio Vista, 1973

[27] Lewitt, Sol, **Paragraphs on Conceptual Art**, Artforum, June, 1967. Also available online at: http://www.tufts.edu/programs/mma/fah188/sol_lewitt/paragraphs%20on%20conceptual%20art.htm

1967 essay *Paragraphs of Conceptual Art* illustrates this difference: "*The idea becomes a machine that makes the art.*" [28]

Many conceptualists were proposing that the idea (or linguistic dialogue or critical framework) *was* the artwork. By contrast Lewitt is proposing that art emerges from a process or system and that this process is auspiced by an idea. It is also clear that Lewitt is using the term *machine* in a metaphorical sense to stand for a process or system that does not require human intervention. For Lewitt the artwork is composed of the input (idea), process (system) and the output (object) – that is to say it includes both the conception *and* the execution. However because the object can easily be remade it is devalued – the essential content of the work is the idea from which the work can be recreated. In his work "Incomplete Open Cubes" Lewitt asked, "How many unique instances are there of an open incomplete cube?" To answer the question he painstakingly made them and then removed copies that resulted from symmetry (rotation and mirroring) and came up with the answer: 122. This was, of course, a pragmatic result and it was only later, with the help of a mathematician, that Lewitt was able to prove conclusively that he had discovered the correct number.

Lewitt was also well known for his facsimile (fax) works. He would fax a set of instructions and the receiver would employ local assistants to actually construct the work by following those instructions. The works were made from standard off-the-shelf materials – like 2in x 2in lengths of timber or later by drawing directly onto prepared walls. From this it's also clear that Lewitt was concerned with the dialogue about signature. However he had an ongoing concern for quality control and it was not uncommon for him to dispatch his own in-house assistants if he was not convinced the local ones were doing a good enough job.[29]

Computational and Generative Art

In 1974 the Postgraduate School at the Slade School of Fine Art had obtained a grant from its parent institution, University College London (UCL), to purchase a computer for its Experimental Department (or EXP as it was known). The Data General Nova 2 had 16KB of 16-bit memory and a paper tape I/O. It was later upgraded to audiocassette I/O and then later (in 1977) to a 5MB hard disk with an operating system called RDOS (Real Time Disk Operating System). The head of EXP, Chris Briscoe, recently commented that the Nova was "*more like a piece of laboratory equipment than a modern day computer*"[30]. Malcolm Hughes, a member of the UK's Systems Group (that had been convened by Jeffrey Steele), was head of the postgraduate school and systems and conceptual theories were the dominant discussions of the day.

At the Slade I was one of a younger generation of artists, many of whom had been inspired to take up the computer after seeing Cybernetic Serendipity, who reinterpreted Lewitt's famous dictum. For us the machine was not a metaphor for a process – it was a process – we had access to a general purpose processing machine.

[28] Lewitt, Sol, 1967, op cit

[29] Brown, Paul, from a private conversation with the artist James Faure Walker – who had been one of Lewitt's assistants

[30] Brown, Paul, from an interview with Chris Briscoe in 2005.

And for many of us it was ideas emerging from computational theory like cellular automata and non-linear deterministic chaos that provided much of our inspiration. It was here, in the 1970's that the field we now call *Computational and Generative Art – or Code Art* – first developed. It was also here that one of the roots of the scientific discipline that Christopher Langton would later name Artificial Life first emerged[31]. At that time the Slade was one of the top three postgraduate institutions for the visual arts in the UK (with the Royal Academy and Royal College of Art – RCA) and it was possibly the only art school worldwide that had it's own powerful in-house computing facility[32].

Two of our visiting lecturers were Harold Cohen and Edward Ihnatowicz. Cohen was then, as he is now, working on his powerful artificial intelligence (AI) based system *AARON*. It was a top-down AI system based on principles of the Expert Systems that Cohen had become acquainted with whilst working from 1971 to 73 as a guest scholar and artist-in-residence at Ed Feigenbaum's AI Lab. at Stanford University. Cohen's success is in externalising his own creative behaviour – AARON exists as an independent system that autonomously produces 'genuine' Cohen artworks.

In 1970 Ed Ihnatowicz had completed *The Senster* for the Philip's Evoluon in Eindhoven in The Netherlands[33]. It was an interactive robotic sculpture driven by a Philips P9201 computer system with 8KB of memory. Throughout the 1970's he had a position in the Mechanical Engineering School at UCL and was a regular, often daily, visitor at the Slade that was just across the college quadrangle. Although Ihnatowicz, who died in 1988, remained forgotten by the art mainstream, he was remembered by science and is now held in high regard as a pioneer of artificial life and cognitive interactionism.

His earlier analogue interactive robot – *SAM (Sound Activated Mobile)* – had been exhibited at Cybernetic Serendipity in 1968 and influenced Jack Burnham whose book *Beyond Modern Sculpture* was published the same year[34]. In it Burnham proposed that the future for art was *life-simulation systems* – autonomous, self-replicating artworks that would exist independently and interact with humans. For many of us it seemed that a golden age was about to flower but ten years later it was clear that our dream was over. A sign that the formalist edifice that had begun with Cezanne and composed a major thread of 'high' modernism throughout the 20th century was crumbling came in 1970. That year, in New York, two major exhibitions were held. Jack Burnham's *Software* show was held at the Jewish Museum and was intended to draw parallels between conceptual art and theories of information such as cybernetics. The complete name of the show was *Software – Information Technology: Its New Meaning for Art* and it included work by a young architect called Nicholas Negroponte who would later found MIT's Media Lab. At MOMA resident curator Kynaston McShine's *Information* show was by contrast an

[31] Brown, Paul, **From Systems Art to Artificial Life: Early Generative Art at the Slade School of Fine Art**, in P. Brown, C. Gere, N. Lambert & C. Mason (Eds.), *White Heat Cold Logic: British Computer Art 1960 – 1980*, MIT Press, Leonardo Imprint, 2009

[32] About that time the RCA had a MITS Altair 8800 microcomputer system and Chuck Csuri was pioneering his own computer-based work at the Ohio State University but was working relatively independently of the art faculty.

[33] See: http://www.senster.com/ and http://www.dse.nl/~evoluon/senster-e.htm

[34] Burnham, Jack, **Beyond Modern Sculpture**, New York 1968

eclectic and idiosyncratic mix of conceptual formalism, linguistic & information theories and socio-political activism[35].

Despite the similarity of their titles these shows were very different in their context. In retrospect we can see that Burnham's homage to formalism was the final chapter of high modernism. And McShine's eclecticism was the opening chapter of a new paradigm for the arts: a paradigm that would find its name seven years later in the title of Charles Jencks influential book *The Language of Post-Modern Architecture*[36].

So the artworld did change but not in the radical way the artists and theorists of the emerging computational arts had expected. From our point of view it was just business as usual but with a different flavour. The gallery system had not been challenged and art was safely back within the frame and on the plinth. By the 1980's the artworld was being driven by humanities educated graduates who identified more with the eclecticism of McShine than with the focussed analytical vision of Burnham. They adopted the emerging theories of postmodernism and tended to be unfamiliar with – and deeply suspicious of – science, computing and information technology, which they identified with the growth in power of what would later became known as the military-industrial-entertainment complex. In these days of ubiquitous computing it's hard to remember that computers back then were rare and access to them was relatively difficult. Few of the new curators and theorists would have ever seen a computer and fewer still would have ever used one. For them computers were tools that scientists used to make weapons and other anti-humanitarian purposes. Artist's who used these systems were erased from the art world's memory.

To Infinity and Beyond![37]

The artists themselves didn't go away. Some repurposed themselves in the growing digital design and animation arena. Some sadly died. Other's pursued their work supported by a growing number of off-mainstream and mainly artist-run initiatives like the *International Society for the Arts, Science and Technology* (ISAST) and it's journal *Leonardo* (from 1968); the *Computer Arts Society* (from 1968); *Ars Electronica* (from 1979); the *ACM SIGGRAPH Art Show* (from 1981); the *Australian Network for Art and Technology* (ANAT – from 1987); the *Inter-Society for Electronic Art* (ISEA – from 1988) and many more. The development of this *international Salon des Refusés*[38] is in itself an interesting phenomenon but beyond the scope of this essay.

My own history over the period is perhaps of interest. In the late 1970's I helped design one of the world's first workstations intended for designers – the *Aesthedes*, at Bureau Claessens in the Netherlands. Then, with Chris Briscoe, we founded the UK's first computer special effects company – *Digital Pictures* – in the early 80's. By the mid 80's I was working as an academic entrepreneur setting up new computer

[35] Meltzer, E., **The Dream of the Information World**, Oxford Art Journal, Vol. 29, No. 1, pp. 115-135, 2006

[36] Jencks, Charles, **The Language of Post-Modern Architecture**, Rizzoli, NY 1977

[37] The inspirational words of Buzz Lightyear from the **Toy Story** movies.

[38] I first used this phrase in a Radio Interview with Roger Malina on "Arts National", ABC Radio National, 28 March 1990 and was later credited in: Malina, Roger, **Digital Art–Digital Cinema: The Work of Art in the Age of Post-Mechanical Reproduction**, Leonardo. Supplemental Issue, Vol. 3, Digital Image, Digital Cinema: SIGGRAPH '90 Art Show Catalog (1990), pp. 33-38

training programs for designers and animators in the UK, Australia and the USA. I was disappointed, but not surprised that during my 15 years as an academic I was rarely invited to teach in a visual arts area – my work was seen as anachronistic and on more than one occasion I was asked not to confuse the fine art students with my inappropriate ideas! Then in 1996 when my sons had both left university – I realized I no longer needed a regular salary to support them and I returned to my life as an artist. It was a good time to go back. Postmodernism was on the wane[39] and there was a growing awareness in the arts of the importance of historical continuity and formal structure – concepts that had been discarded by the postmodernists.

Perhaps in recognition of this in 1999 I was awarded a prestigious New Media Arts Fellowship by the Australia Council for the Art and this enabled me to spend two years developing my practice. I spent 2000 as artist in residence at the Centre for Computational Neuroscience and Robotics (CCNR) at the University of Sussex in the UK. The CCNR is one of the world's largest alife research centres and they have a broad programme based on evolutionary and adaptive systems (EASy). I had been astonished, when I first contacted them in 1998, to learn that they knew about our pioneering work at the Slade some 30 years earlier! This was in sharp contrast to the artworld where very few remembered us, and fewer still would have been able to acknowledge or even comprehend our achievement.

I had been pursuing ideas I had formulated in the 1960's and 70's. Back then I had proposed that by making art using a symbolic language (like FORTRAN and Assember) I could remove myself significantly from the process and that the work might therefore have the potential to find its own identity: its own signature and life. It was a mistaken assumption, by the mid-1990's it was clear that signatures of life and its manifestations were very robust and could not be so easily challenged. At the CCNR I discussed this with my colleagues: if it was not possible to design an autonomous artwork could it perhaps be evolved using the techniques they were exploring in fields like evolutionary robotics? The result was the DrawBot project that we began in 2005 with funding from the UK's Arts and Humanities Research Council (AHRC). A detailed report on the project to date will soon be published[40].

We adopted the techniques of evolutionary algorithms. A population of simulated robots are evolved using Darwinian-inspired evolutionary pressures or fitness criteria. At some point a successful candidate evolves and their genome (a string of symbols) is transferred to a real robot – the phenotype – and tested. This process is then repeated until some desired behaviour results. The DrawBot project is of interest – and it's likely it was funded – because it employs qualitative rather than quantitative fitness criteria. So a major part of our work is involved with identifying criteria that were so basic that they wouldn't carry signature values. The project continues.

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[39] Jencks, Charles, **Critical Modernism - Where is Post Modernism going**, Wiley, 2007. Thirty years on Jencks acknowledges that postmodernism isn't a stand-alone ideology but a critical response to – and so a component part of – modernism

[40] Brown, Paul and Husbands, Phil, **Not Intelligent by Design**, chapter in Gardiner, Hazel and Gere, Charlie (Ed.), *Art Practice in a Digital Culture*, a volume of *Digital Research in the Arts and Humanities*, Ashgate, (2010)

Conclusion

I have written this essay to illustrate my belief that there is a constant and continuous theme that permeates the arts of the 20th and early 21st centuries. It begins with the formalist enquiries of Cezanne and his post-impressionist colleagues and leads inevitably to the emergence of artificial life as a joint art-science discipline. It continues to develop today despite the lack of support of an artworld that chose to align the arts with the fashion industry rather than with science. It is pointless to speculate what we might have achieved if those early postmodern theorists, curators and teachers had embraced technology back then, as they appear to do now. But the world is changing and new futures beckon.

Acknowledgements

I am an artist and not a scholar or historian. The examples I have used to illustrate my themes are by no means comprehensive but merely those that have most influenced me and seemed most relevant to the theme. So firstly my apologies, to all those I have omitted and also to my readers for having taken such a cavalier and personal approach.

This essay would not have been possible without my participation in two AHRC-funded projects. CACHe (Computer Arts, Contexts, Histories, etc…) ran from 2002-05 at Birkbeck, University of London and the DrawBots from 2005-08 at the University of Sussex. I would like to thank all of my colleagues on those projects for their input and support. They are: Margaret Boden, Phil Husbands, Ernest Edmonds, Charlie Gere, Nick Lambert, Catherine Mason, Mitchell Whitelaw, Simone Gristwood, Jon Bird, Dustin Stokes, Lincoln Smith, Sue Gollifer, Jon McCormack, Tony Longson, Bill Bigge, Rob Saunders, Martin Perris and Kyran Dale.

And finally: my grateful thanks to my colleagues in the Computer Arts Society and all those artists, historians and theorists who have shared their experiences about this remarkable period of history with me.

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