Artistic intuition meets technical ingenuity: the unique contribution to Digital Art History of 1960's computer art pioneer, Desmond Paul Henry (1921-2004)

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Abstract: It is thanks to the artistic intuition and technical ingenuity of a Philosopher, Desmond Paul Henry, that a series of three innovative drawing machines (1961-71) were constructed from WW2 analogue bombsight computers. His drawing machines' unconventional *modus operandi* not only made for a very special bond between Henry and his machines, but also firmly establishes their transitional position in Digital Art history, spanning as they do what has been termed the pre-war (WW2) Industrial/Mechanical Age and the post-war Electronic/Digital Age (Popper, 1993).

1 INTRODUCTION

In the early 1960s, the computer-based drawing machines created by Desmond Paul Henry caused quite a stir in the press with dramatic headlines such as "Art by electronic brain", (*Manchester Evening news*, 30/08/1962) and "A Robot draws the Doctor's Pictures" (*Evening Herald*, 30/08/1962). Henry even demonstrated his first drawing machine on the BBC's first programme in the 'North at Six' series. In 1963 he was to have featured in *Life* magazine but the assassination of President John Kennedy replaced the planned article. Interest in his drawing machines culminated in his inclusion by Jasia Reichardt in the I.C.A's seminal art and technology exhibition of 1968, *Cybernetic Serendipity*.

Following this, apart from the pioneer status afforded him in 1990 by the Cambridge Encyclopaedia's entry on 'Computer Art', Henry became one of its "quietest pioneers" (Ricardo, 2013). That is, until in 2005 Elaine O'Hanrahan, Henry's youngest daughter, completed her contextual MPhil thesis (JMU), much of which forms the basis of this paper and of the desmondhenry.com web-site created in 2007.

Since then, interest in Henry's pioneering work in the field of *early* Digital Art, known in the sixties as Computer Art, has gone from strength to strength. Examples of his machine-generated art now feature in significant collections at the V & A and in the Anne and Michael Spalter collection. Henry has entered art history text books (OUP, Brazil) and is included on university courses as far flung as Monash in Australia and Carnegie and Mellor in the States. In February 2014 there were 57,000 art and philosophy related entries to Henry on the world-wide web. A resurgence of interest in the last ten years or so in the early beginnings of Digital Art has encouraged the inclusion of Henry's machine-generated images in significant **exhibitions** [2] and recent major **publications.**[3]

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2 HENRY THE ARTIST IN THE 1950s

By 1960, Henry, a veteran of the Normandy Landings of 1944, had become a lecturer in Philosophy at Manchester University, all the while continuing to develop his skills as a mainly self-taught artist who excelled in the development of experimental mark-making techniques born out of a spirit of wartime resourcefulness (Henry, 1999-2000). For example, whilst serving with the British Liberation Army he developed a unique "finger-rubbing technique" (ibid.) using office supplies of duplicator ink and soot. Following the war he developed a photo-chemical technique inspired by his access to plentiful free supplies of blitz-damage light sensitive photographic paper (ibid.). It was pictures based on the latter techniques (Fig.1) which won him first prize in 1961 in a local art competition, organised by L.S. Lowry in conjunction with Salford Art Gallery.

Figure 1. *Untitled*, 1961. Photo-chemical technique on light-sensitive paper, duplicator ink, tea bag residue, baby cream.

[2] *Digital Pioneers* (2009) V & A, London; *Drawing with Code (*2011) DeCordova Museum, Boston, MA; *Desmond Paul Henry: Manchester Pioneer of Computer Art*, (2011), MOSI, Manchester; *Digital Art (R)evolution* (2013), Dédée Shattuck Gallery, Westport, MA.

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3 HENRY THE MACHINE-ARTIST: 1960s

It was when Lowry, in his capacity of competition judge, visited Henry's home and saw his first drawing machine in action (Fig.2), that he insisted Henry include some machine-drawings in the competition prize: a one-man show at London's Reid Galley on Cork St. scheduled for August 1962. This was to run concurrently with another solo Henry exhibition at Salford Art Gallery consisting solely of machine-drawings. Henry called this Salford show: "the world's first one-machine show," (Henry, 2003). Both these solo shows of 1962 involving machine-generated art pre-empted by some years the first 'computer art' shows of those more familiar digital art pioneers: Nake, Nees and Noll.

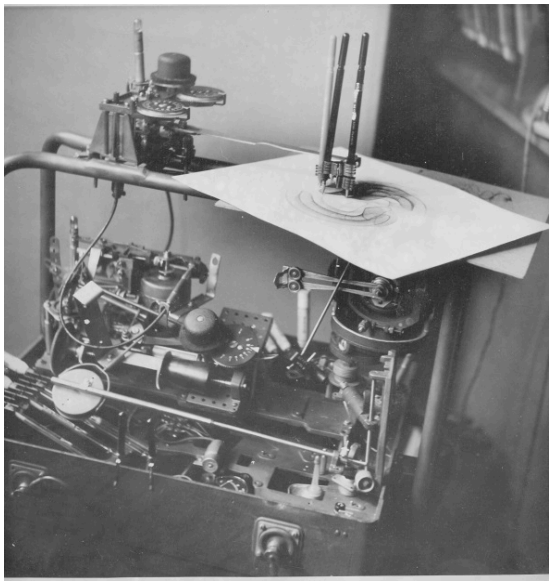

Figure 2. Drawing Machine One (1961-62)

4 HENRY: PROPHETIC EXPONENT OF ART AND TECHNOLOGY COLLABORATION.

The enthusiastic response to his machine-drawings in the press during the early 1960s confirmed to Henry that they represented "a foretaste of a new era in the history of the visual arts"; they heralded a veritable "revolution in art" (Henry, 1962). These were prophetic statements to be sure, but prior to *Cybernetic Serendipity* in 1968, Henry felt his was very much a 'lone voice' since he worked in comparative artistic and scientific isolation (Henry, 2003). Writing in 1964, Henry proposed the establishing of known centres of research to "facilitate the inception of a new phase of fruitful positive co-operation between art and technology". This was written two years *before* E.A.T (experiments in art and technology) was officially established in the States in 1966. As confirmed in his last recorded interview of 2003, Henry knew nothing of E.A.T.

5 HENRY'S INSPIRATION: THE BOMBSIGHT COMPUTER

The drawing machine which so impressed Lowry in 1962, was the product of an inventive mind fuelled by two life-long passions for both art and technology. Henry's series of three semi-automated drawing machines of the 1960s were in fact both inspired by, and based around, analogue bombsight computers, originally used in bombers to calculate the accurate release of bombs onto their target. The bombardier entered information on height, air speed, wind direction, and bomb weight into the computer which then made the necessary calculations for when best to release the bomb load.

Henry purchased his first army surplus analogue computer as early as 1952. For *nine long years* he admired the graceful convolutions of its inner workings before ingeniously converting the bombsight itself into a drawing machine capable of capturing on paper the bombsight computer's gear trains, cams, integrators and differentials in motion: "And then when you see the components dancing, it had the aesthetic fascination of watching a ballet dance" (Henry, 2003). Henry cleverly re-distributed the bombsight's units so that when linked to servo-motors, the movements of an extended drawing arm bearing pen(s) were harmoniously synchronised with a moving drawing table (ibid.).

6 THE ORIGINS OF HENRY'S TECHNICAL 'KNOW-HOW'

It was thanks to his wartime experience (1939-46) of automatic fire-control technology serving as a member of R.E.M.E (Royal Electrical and Mechanical Engineers) that Henry was able to perform this feat of engineering, using only what instruments and components he happened by chance to have collected in his Manchester workshop. It was in the army that he had become familiar with fire-control predictor systems in anti-aircraft guns, which Henry explained were the 'mirror-image' of those he later found in the bombsight computer, since with the guns the target is moving and with the bomber the target is stationary. Henry acquired this specialist knowledge despite the fact his wartime role at R.E.M.E had been as a technical clerk responsible for ordering spare parts and not as a mechanic. Nevertheless he did manage to sneak into the workshops from time to time and unofficially lend a hand (Henry, 1999-2000). It was precisely the wartime development of automatic fire control technology that prepared the way for post-war Cybernetics and the digital revolution which followed.

7 DIGITAL COMPUTERS OF THE 1960S

In 1960 Henry was well-aware that the bombsight computer represented 'old' wartime technology and was quite different to the then new digital computers like the Ferranti Mark 1 developed during the post-war period at Manchester University. Such computers of the time existed only in large corporations and institutions and it was thanks mainly to the experiments of programmers-turned-artists (Darley, 1990) that their graphic potential began to emerge, as with the Art and Technology movement in the States. It was these early experiments which would then lead to more commercially based computer graphics of the 1970s and 80s.

8 THE DRAWING MACHINES: SEMI-AUTOMATIC AND INTERACTIVE

To use a digital computer in the 1960s for artistic purposes, the programmer had first to pre-conceive the desired graphic result and then write the programme which would produce the graphic effects on a plotter linked to the computer (Sumner, 1968). This was in complete contrast to a Henry drawing machine, which could not be pre-programmed nor store information. What's more, once the machine had been set in motion Henry was free to exercise spontaneous artistic intuition in directing the course of the drawing under production (Henry, 1999-2000). This kind of immediate interaction pre-empted later interactive features of digital technology by some twenty years.

9 THE DRAWING MACHINES AND THEIR 'MECHANICS OF CHANCE'

Furthermore, Henry's machines, unlike digital computers, were not precision instruments. Instead, Henry had only general, overall control and like Tinguely's *Metamatics*, they relied on a "mechanics of chance" (Peiry, 1997) whereby any 'faults' in their assemblage, such as a loose screw, could impact significantly on the final image with surprising results (Henry, 1999-2000). Like Tinguely, Henry was not a trained mechanic, but more of a highly specialised tinkerer.

10 THE MAN BEHIND THE DRAWING MACHINES

Henry welcomed this limited control over his drawing machines. This may have been in reaction to the rigidity of seven years of army life from the tender age of 18. After all, chance events had saved his life from V1 and V2 missiles on more than one occasion. He frequently quoted Leibnitz's philosophical axiom of "pre-established harmony" when seemingly by chance the right bolt or the right combination of events would come into play. For Henry, life was scattered with uncanny co-incidences, which he was always ready to exploit in a spirit of creative ingenuity (Henry, 2003).

Henry was only too ready then, to let his drawing machines, thanks to their mechanics of chance, remain unpredictable in terms of their graphic results. He described them as having the potential to "go crazy" if left unattended (*Daily Herald*, 30/08/1962). In his words, he liked to let them "do their own thing", to quote a common sixties idiom referring to individualistic human behaviour. He would even on occasion let the machine "decide" when a drawing was finished by waiting for the moment when the drawing paper would fall off the drawing table of its own accord! (Henry, 1999-2000). Henry welcomed the surprising and unexpected graphic results such idiosyncratic machines could produce. He was always "learning something new" from his machines (ibid.). Nevertheless, the possibility for interaction once a drawing was under-way, meant that Henry developed a close affinity with each drawing machine and its particular *sui generis* features and individual quirks.

In contrast to a Henry drawing machine, much later sophisticated computer imaging software of the 1990s would be accused by some of leaving no scope for " real-time intuition; there is no way the observer can influence the drawing just being made" (Van Emde Boas, 1993). Paul Brown, (1997, p.141) likewise felt that user-friendly computer imaging tools tell the user there is nothing new to learn and may well "cauterise creative development". Reffin-Smith (1997) was also concerned that such software limited the chance for "adventurous, dangerous and unconventional art" (p.108), which was exactly the type of art Henry's more risky machines allowed for.

11 THE DRAWING MACHINES' GRAPHIC EFFECTS: UNREPEATABLE AND PERSONAL

The machine-drawings, numbering some 800 in all , consist of an infinitely varied combination of repetitive single lines forming a host of abstract elliptical curves, some of which Henry would subtly and artistically highlight by hand or even on occasion insert tiny humanoid figures.

It was thanks to the chance relationships between the machines' mechanical components that Henry's machine-generated effects avoided those criticisms levelled at computer art during the sixties, namely that computer-generated art is impersonal, mass-produced, predictable and leaves no scope for artistic intuition. In stark contrast to these criticisms, each Henry machine-drawing is bound to be unique and unrepeatable owing to the erratic potential in the way the drawing machines functioned.

12 LINKS TO MATHEMATICS

His machine-drawings further bear the personality of the artist in that many images were subsequently hand- embellished in response to their suggestive features, some of which struck Henry as taking on "weird" organic forms (Henry, 1999-2000). This led him to compare them to what he called "natural form mathematics"' (ibid.) as he found described in the seminal works of Theodore Cook (1914), D'Arcy-Thompson (1917)and Ghyka (1927). In this respect Henry shared a similar interest in Morphogenesis (growth and shape in cell formation) to that of his much admired colleague, Alan Turing.

The unique combination of control and chance involved in his machines' graphic effects also inspired Henry to call them "Machine Pollocks" (Henry, 1999-2000). Following his introduction in 2002 to the book *Fractals*: *The Patterns of Chaos* (1998) by John Briggs, Henry coined the term "Mechanical Fractals" (Henry, 2003) to reflect the intriguing mix of regularity and irregularity and differing scales of self-similarity found in his machine-generated pictures and which make for their lasting visual appeal.

13 PRE-CURSORS AND SUCCESSORS

It is interesting to note a certain 'timeless' quality in the spirals and ellipses of Henry's machine-generated artwork, going back to even Neolithic times and ancient carvings on barrows and tombs. In Beck's all-encompassing book on spirals (2012) Henry's machine-generated effects appear in the same section as Archimedes, Pendulum Harmonographs and Lissajous Figures. Early pre-cursors include 18$^{th.}$ century Suardi's Geometric Pen (Adams 1813), the 19th. century Geometric Chuck as used in the

Ornamental Lathe (Holtzappffel, 1894) and Pendulum Harmonographs (Newton, 1909). Contemporary artists such as Thomas Ruff, Jean-Pierre Hébert and the 2013 winners of Prix Ars Electronica, Memo Akten and Quayola have all produced images consisting of repetitive single-lines, similar in feel to those graphic effects produced by a Henry drawing machine of some fifty years earlier. Elaine has even received requests for the *programme* that creates them!

14 THE PERFORMATIVE TRACE

These unique machine-generated drawings (Fig.3) are the only permanent reminders of the 'performative trace' of what were once very busy machines which for over ten years whirred away in the corner of Henry's study in Manchester, whilst he sat marking student papers at his desk. Today, eerily motionless, random machine parts are all that remain of these once vibrant machines.

Figure 3. *Untitled*, 1964.
Executed using Drawing Machine Two; Indian inks in tube pens on Fabtex paper; hand-embellished

15 THE ART HISTORY CONTEXT

Henry grew up during the 1920s and 30s during a period Banham (1960) refers to as the First Machine Age. This was a time when the general populace was infected by a sense of optimism and enthusiasm for technology (Ewald 1925-26); machines such as the motor car, trains and planes had entered people's everyday lives. This *zeitgeist* was not lost on the young Henry whose very first reading materials were boiler parts catalogues and whose father not only mended clocks for a hobby but enthused to his eldest son about the wondrous machines of the Industrial Revolution such as steam powered engines (Henry, 1999-2000). At the age of nine, Henry had written that he wanted to grow up to be another Leonardo da Vinci.

Art at this time was also inspired by technology, as reflected in the so-called *machine aesthetic* art movements like Italian Futurism, Precisionism, Constructivism and Kinetic Sculpture. In 1934, MOMA mounted an innovative exhibition called *Machine Art.* Here, machine parts such as springs, coils and propellers were hung on walls or perched on pedestals in the same way traditional art works would have been. All this was outside the young Henry's sphere of experience but it certainly would have struck a chord with him. Thirty-eight years later in 1972 he would call the bombsight computer's moving parts 'a veritable work of art in itself.'

Following WW2 according to Banham (1960) we entered the Second Machine Age where machines went beyond merely inspiring artists, but to becoming, with the dawn of the digital computer, legitimate art-making tools in their own right. That Henry's drawing machines belong to 'computer art' of this time there can be no question. In 1969 Richard I. Land wrote in an article for the journal *Leonardo* that "The designation 'computer art' seems destined to remain attached to those art forms produced by a machine *originally designed for other purposes"* (my italics), (Land, 1969, p.132). The digital computers experimented with by 1960's programmers-turned-artist, *were originally designed for logical computation* and Henry's drawing machines were based around the bombsight *originally designed to drop bombs accurately*. Since his re-emergence in the public eye Henry has been linked to generative art processes (Jones, 2014). His preoccupation with mechanical movement also relates him to long-standing, kinetic art traditions.

16 CONCLUSIONS

It must be remembered that for all his love of technology and science, Henry was never inspired to explore the graphic potential of digital technology, even though he had access to digital computers at Manchester University. He relished observing the whole chain of cause and effect that the mechanical components of his drawing machines afforded him (Henry, 1999-2000). In his words:

> "The mechanical analogue computer, was a work of art in itself, involving a most beautiful arrangement of gears, belts, cams, differentials and so on- it still retained in its working a visual attractiveness which has now vanished in the modern electronic counterpart" (Henry, 1972).

Throughout his life, Henry remained firmly attached to the mechanical bombsight computer, which not only reminded him of the pre-war machines he had so admired in his youth but also recalled what had then been the cutting-edge technology of his army years.

By steadfastly sticking to First Machine Age technology alone as a source of both his inspiration and methods, Henry's machine-generated art of the 1960s may be said to truly mark a transitional stage linking what Popper (1993) termed the pre-war Industrial/Mechanical Age and the post-war Digital/Electronic Age. It is to be hoped that Henry, this digital art pioneer, will remain a 'missing link' no longer.

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