**HISTORICAL PERSPECTIVE**

The Contribution of Desmond Paul Henry (1921–2004)

**to Twentieth-Century Computer Art**

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This paper describes the series of three electronic drawing machines Desmond Paul Henry constructed during the 1960s from World War II analogue bombsight computers and which, by virtue of their inspiration, idiosyncratic modus operandi and analogue-derived effects, earn Henry a place as a British computer art pioneer. The abstract graphic results of these now-defunct drawing machines are presented as precursors to digital images.

**HENRY’S ARTISTIC CAREER: 1950s–1960s**

Desmond Paul Henry was a lecturer in philosophy at Manchester University 1949–1982 and a self-taught artist who experimented with improvised mark-making techniques born out of a spirit of wartime resourcefulness [1] (Figs 1, 2).

In 1961 Henry won first prize in a local art competition, organized by the North West UK artist L.S. Lowry (1887–1976) in conjunction with Salford Art Gallery, with a work that used a photochemical process he had devised. The competition prize was a one-man show in London (Ideographs, The Reid Gallery, August 1962) in which, on Lowry’s insistence, Henry also included drawings produced by his first drawing machine of 1961 (Fig. 3). This semiautomatic machine, like the two that succeeded it, was adapted from a wartime bombsight computer with the intention of capturing on paper the computer’s internal, electromechanical moving parts, which so enthralled Henry. The press responded with dramatic headlines: “Art by electronic brain” [2], “A Robot draws the Doctor’s Pictures” [3]. Henry demonstrated this drawing machine on BBC television during the first episode of a new local news series for the North of England (no copies of which still exist in the BBC archives) in September 1962. In 1963 Henry’s second drawing machine was to have been featured in Life magazine but the assassination of President John Kennedy replaced the planned interview with George Will.

**THE SOLOITARY PIONEER**

Ideographs (1962) ran concurrently with another solo Henry exhibition at Salford Art Gallery, consisting entirely of machine-drawings, which Henry incorrectly referred to as “the world’s first one-machine show” [4], reflecting his comparative artistic and scientific isolation. He remained unaware of the creative use of analogue computers during the 1950s by, for example, John Whitney Sr., Ben Laposky and Herbert Franke, whose graphic results, although not produced with a drawing point, are not dissimilar to Henry’s abstract curvilinear machine-effects. Henry was equally unaware of the 1960s Art and Technology movement in the United States.

Henry’s solo shows of 1962 did however preempt by some years the first computer art shows of the more familiar pioneers Frieder Nake, George Nees and Michael Noll. In 1962 and 1964 respectively, Manchester hosted two further solo Henry exhibitions of his machine-generated effects, corresponding to Franke’s definition of early computer graphics as “the making of line drawings with the aid of computers and drawing machines” [5].

Interest in Henry’s drawing machines culminated with the inclusion of Henry’s second drawing machine by Jasia Reichardt in the ICA’s seminal art and technology exhibition of 1968, Cybernetic Serendipity, which demonstrated to Henry that his was not a lone voice [6].

Upon the demise of his third drawing machine in 1971, Henry turned his attention to cameraless photography until making a fourth drawing machine in the early 1980s. In 1990 Henry was accorded pioneer status in the Cambridge Encyclopedia’s entry on “Computer Art” (p. 289), following which he became one of its “quietest pioneers” [7].

**HENRY IN THE 21st CENTURY**

In 2005 I completed a contextual MPhil thesis at Liverpool John Moores University (U.K.), and in 2007 launched <desmondhenry.com>. Since his rediscovery [8], Henry’s work has been linked to generative art processes [9] and his preoccupation with mechanical movement related to longstanding kinetic art traditions. Examples of Henry’s

**PROPHETIC EXPONENT OF ART AND TECHNOLOGY COLLABORATION**

As early as 1962 Henry was convinced that his computer-derived drawing machine represented “a foretaste of a new era in the history of the visual arts,” heralding a veritable “revolution in art” [11]. Jasia Reichardt also recognized the potential of the computer as a creative tool demonstrating “a radical extension in art media and techniques [that] . . . will increase the scope of art and contribute to its diversity” [12]. In 1964, two years before Experiments in Art and Technology was officially established in the States in 1966, Henry proposed the establishment of research centers to “facilitate the inception of a new phase of fruitful positive cooperation between art and technology” [13].

**INFLUENCES**

Henry’s drawing machines were the product of an inventive mind fueled by lifelong passions for both art and technology. In his youth, Henry, like the general populace, was infected by a sense of optimism and enthusiasm for technology [14]. Thanks to his wartime experience (1939–1946) with automatic fire-control technology, Henry was able to later convert bombsight computers into drawing machines.

**THE DRAWING MACHINES: THEIR INSPIRATION**

Henry’s 1960s drawing machines were both inspired by, and based around, what had been cutting-edge World War II technology: the bombsight computer, whose internal moving parts he described as “a veritable work of art in itself” [15]. Bombsights were analogue 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 that then made the necessary calculations for when best to release the bomb load.

Henry purchased his first army surplus bombsight computer in 1952. For nine years he admired the “graceful convolutions” [16] of its inner workings before converting the bombsight into a drawing machine capable of capturing on paper the bombsight computer’s complex arrangement of 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” [17].

For all his love of technology and science, Henry was never inspired to explore the graphic potential of digital technology, even though he would have had access to the Ferranti Mark 1 at Manchester University, which in 1952 Christopher Strachey used to produce one of the very first digital art pieces, in the form of love letters. Henry, on the other hand, expressed no interest in the opaque interface of the digital computer. What he relished above all was
observing the whole chain of cause and effect that the mechanical components of the bombsight computer afforded him [18].

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 [19].

**DRAWING MACHINE ONE**

In his letters to me [20], Henry described how in Drawing Machine One (1961–1962) (Figs 4 and 5), he redistributed the units so that, using only one servomotor, he perfected an original method of ensuring synchronicity and harmonization between the moving pen and the moving table. A wind-speed and air-speed integrator activated the pen or pens. The drawing paper lay on a table that rotated on a device for...
the correction of pitch and roll in aircraft. One servomotor sufficed since the pen movement alone was sufficient to move the drawing table beneath. The ball bearings beneath the table, together with a horizontal bar that would strike a long vertical spring and then rebound to strike a variably positioned stop, all combined to cause either the drawing table or the paper to shift, so as to produce changes in the patterns drawn by the pens. If the space between the spring and stop is enlarged so that the rebound is almost nonexistent, then the line drawing is formed by “non-rectilinear wanderings” of the pens. These effects, claimed Henry, are almost “totally random within the physical limits imposed by the nature of the machine construction” [21]. Henry initially used ballpoint pens, but by 1964 realized that prolonged exposure to natural light could cause the ink to fade; Indian ink in technical tube pens then became his preferred mark-maker. He sometimes hand-embellished these machine-generated drawings in response to their suggestive features.

**DRAWING MACHINE TWO**

Drawing Machine Two (1963–1967) (Article Frontispiece, Color Plate D and Fig. 6) was constructed from a Vickers version of a Sperry analogue computer, together with a switchboard from an RAF bomber and components cannibalized from the first machine. The original bombsight was kept almost intact. There were now two servomotors, one for directing the pens, the other for the drawing table. The “running in and out of phase of the relative rate of revolution” [22] of each motor occurred in regular or random sequences, producing regular or irregular patterns. These patterns were mainly obtained through a combination of varying degrees of table and pen oscillation that could be further enhanced by the positioning of clothes pegs attached to the drawing paper on the drawing table: “Any number of clothes pegs attaching the paper to the table’s circumference or attached solely to the paper itself, could be placed in any number of positions resulting in an infinite number of track variations of the paper” [23].

Henry would start the machine off and could intervene at any time to alter the course of the design: “Arrangements for the regular lifting and lowering of the pen (or pens), so as to interrupt what would otherwise be a unicursal design, are incorporated for use if required” [24]. This machine returned from the American leg of its tour with *Cybernetic Serendipity* in a state of total disrepair, in which it remains to this day.

**DRAWING MACHINE THREE**

Drawing Machine Three (1967–1971) (Fig. 7) was constructed to keep Henry happy while the second machine was away on tour with *Cybernetic Serendipity*. The bombsight was adapted to produce much larger drawings (72 × 50 cm) than the previous machines. It had two electrical gramophone servomotors that were allowed to drift in and out of synchronization and so produce “delectable variations” [25]. This effect could be amplified by slightly moving the speed controls. Unfortunately, in 1970–1971, due to excessive leverage weight at a critical point in its framework, the axle broke, and the machine was abandoned.

**THE DRAWING MACHINES: INTERACTIVE AND IDIOSYNCRATIC**

To use a digital computer in the 1960s for artistic purposes, the programmer had first to preconceive the desired graphic result and then write a program that would produce the graphic effects on a plotter linked to the computer. Cynthia Goodman calls this “passive graphics” [26]. Henry’s machines, by contrast, could not be preprogrammed nor store information; they represent an example of “active graphics”:...
Once the machine had been set in motion Henry was free to exercise spontaneous artistic intuition in directing the course of the drawing under construction [27].

The infinitely many choices of dimension, distortion, paper-direction and combination of various patterns on the same sheet of paper provided the artist with a flexible tool for the production of drawings possessing a fineness that the unaided hand could not achieve [28].

This possibility for interaction meant that Henry developed a close affinity with the individual quirks of each drawing machine. Such immediate interaction preceded later interactive features of digital technology by some 20 years.

Furthermore, Henry's machines, unlike digital computers, were not precision instruments. Instead, Henry had only general, overall control and, like Jean Tinguely's Metamatics, relied on a "mechanics of chance" [29] whereby any "faults" in their assemblage, such as a loose screw, could impact significantly on the final image with surprising results [30].

Henry described his drawing machines as having the unpredictable potential to "go crazy" if left unattended [31]. He would sometimes let the machine "decide" when a drawing was finished by waiting for the drawing paper to spontaneously fall off the drawing table [32]. Henry, who was always "learning something new" [33] from his machines, welcomed their surprising and unexpected graphic results.

In contrast to a 1960s Henry drawing machine, 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" [34]. Paul Brown likewise felt that user-friendly computer imaging tools tell the user "there is nothing new to learn and may well "cauterize creative development" [35]. Brian Reffin Smith was also concerned that such software limited the chance for "adventurous, dangerous and unconventional art" [36], which was exactly the sort for which Henry's more "risky" machines allowed. The random processes in Henry's artwork production reflect "a constant journey of discovery . . . for beautiful unexpected images" [37].

THE DRAWING MACHINES: THEIR GRAPHIC EFFECTS

The machine-drawings, numbering some 800 in all, consist of an infinitely varied combination of repetitive single lines forming a host of abstract curves, similar in feel to contemporary work by Thomas Ruff and Jean-Pierre Hébert. Henry's machine-effects struck him as "weird" organic forms [38], which he compared to "natural form mathematics" [39] as he found illustrated in the works of Theodore Cook (1914), D'Arcy Wentworth Thompson (1917) and Matila Ghyka (1927). The unique combination of control and chance involved in producing his machines' graphic effects inspired Henry to call them "Machine Pollocks" [40].

Thanks to his machines' "mechanics of chance," their visual effects successfully avoid criticisms of sameness and predictability—nor can they be replicated, since no program was used in their creation. Henry's personality is further expressed in the way he would also sometimes subtly and artistically highlight selected lines by hand or even, on occasion, insert tiny humanoid figures or apply background shading effects. A similar contemporary development in digital art is the subsequent application of hand embellishments to digitally produced images.

Above all, Henry's "sensuous and captivating artworks" [41] act as the only permanent reminder of the "performative trace" of drawing machines that for ten years whirred away in the corner of Henry's Manchester study. British artist-engineer Jack Tait has recently succeeded (2014), using reverse engineering and Henry's written notes, in creating a drawing machine capable of producing visual effects very similar to Henry's machines. Tait's Homage to Henry Machine, however, does not aim to replicate in the same way the random elements of Henry's machines nor Henry's unique artistic intuitive choices both during the production process and in deciding which pictures to embellish, and how, and which to leave untouched.

CONCLUSIONS

In the Second Machine Age, World War II machines went beyond merely inspiring artists, by becoming legitimate, art-making tools in their own right. In 1969 Richard J. Land wrote, "The designation 'computer art' seems destined to remain attached to those art forms produced by a machine originally designed for other purposes" [42]. Land further states that the profusion of work that by 1969 fell under the heading computer art or computer graphics "almost precludes any one person surveying the field successfully" [43]. It is to this "profusion" that Henry rightly belongs. The part played by "trailblazers" like Henry [44], with his "pioneering work" [45] in anticipating the use of computers today in the field of digital graphic manipulation, may no longer be overlooked by students of art history.
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33 Henry [1].
38 Henry [1].
39 Henry [1].
40 Henry [1].
43 Land [42].
44 Brown [8].
45 Dodds [10].

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COLOR PLATE D: THE CONTRIBUTION OF DESMOND PAUL HENRY (1921–2004) TO TWENTIETH-CENTURY COMPUTER ART

D.P. Henry, Untitled, no. 500, Drawing Machine Two, 38 × 25.2 cm, black, blue and red biro on smooth white drawing paper; hand embellishments: black highlighting, single lines and background shading in ink; 1963. (© Elaine O’Hanrahan.) This image appears on page 50 of the exhibition catalogue for Cybernetic Serendipity (1968). (See article in this issue by Elaine O’Hanrahan.)