CHAPTER 6: PERSONAL SIGNATURES IN ART

I: Introduction

An individual artist's personal signature is some (typically involuntary) aspect of their works which enables observers to recognize their authorship. The personal signature is a familiar phenomenon in the visual arts, and in other forms of art too. It is a special case of the "semiotic" (Ginzburg 1992), or "idiographic" (Allport 1942), approach of the humanities, wherein superficial and seemingly trivial clues act as signs affording some deeper knowledge of the individual human being concerned. This approach also characterizes diagnostic medicine--and psychoanalyis, too. So Freud remarked in *The Moses of Michelangelo* that "[the art connoisseur's] method of enquiry is closely related to the technique of psycho-analysis, [being] accustomed to divine secret and concealed things from unconsidered or unnoticed details, from the rubbish heap, as it were, of our observations" (quoted in Ginzburg 1992: 99).

   Freud's remark, here, was a specific reference to Giovanni Morelli, the man who was primarily responsible for the burst of interest in the personal signature that took place in the nineteenth century. As we'll see in Section II, heated public discussion--not to mention national embarrassment--ensued when he sought to attribute paintings and sculpture to one artist or another.

   The connoisseurs steeped themselves in the observation of works of art so that they could learn to recognize each artist's personal signature. Having recognized it, they tried to describe it--but they didn't try to explain it. Reasons for the existence of the personal signature, for the relative ease of recognizing it, and for the difficulty of describing it in explicit terms, are given in

Section III. Those reasons also explain why the personal signature is so hard to eliminate.

The early twentieth century saw a recoil from aesthetic concern with, and celebration of, the personal (Section IV). In that cultural context, some artists of the second half-century turned with relief to the impersonality of computers, and occasionally even tried to annihilate their own individual 'mark' (Section V). Nevertheless, and despite the abstract nature of the computer itself, it persisted.

That's not to say that it persisted always, and entirely. For example, the computer artist Harold Cohen, on seeing an image produced by his recent colouring program, confessed "I'd never have had the courage to choose *those* colours" (p.c.). His personal mark *qua* colourist, then, had not been faithfully retained. To be sure, many of the program's images did employ a colour-mix that connoisseurs of Cohen's previous work would recognize. Nevertheless, there had been a change: in his words, "a world-class colourist" (the program) had surpassed "a first-rate colourist"--namely, Cohen himself. Moreover, this had happened despite the fact that Cohen *had not* aimed to escape from his characteristic palette.

Unlike Cohen, the computer artist Paul Brown (whose work has been publicly exhibited since 1967) has been trying for many years--as yet, unsuccessfully--to eliminate his personal signature. Brown (with the author of this paper, among others) is now engaged in a project, described in Section VI, whose aim is to generate computer art, produced by line-drawing robots, that is guided by his aesthetic sensitivities but *does not* display his authorial hand.

But is that outcome in principle possible? Could robots developed (more specifically: evolved) under Brown's aesthetic guidance shake off his idiosyncratic style? Might they, perhaps, develop individual signatures of their own (and if so, how)? Finally, if they were to escape Brown's style,

could he properly take the credit for creating the artworks/products that ensue? Or should the robots be credited instead?

II: The Phenomenon of the Personal Signature

The existence of the artist's personal signature was already recognized, and being written about, almost four centuries ago. Giulio Mancini (1558-1630), an art collector and highly skilled diagnostic physician (to Pope Urban VIII), alerted people to it at a time when annual exhibitions of paintings were being held in Rome--and causing disagreement about the attribution of specific items (Ginzburg 1992: 207). Handwritten copies of his art-historical manuscript *Considerazioni sulla Pittura* were widely circulated, and he is now seen as an early "connoisseur" (Mahon 1947: 279ff.). But interest waned over the following years, and the topic fell into abeyance.

It made its comeback in the late-nineteenth century. At that time, the provenance of countless pictures and sculptures in both private and public collections was uncertain, or even unknown (Llewellyn 1997: 297f.). This was due to the many unrecorded sales and movements of artefacts since the fifteenth century, and especially to the unnumbered thefts and transportations that had taken place in Europe's wars--not least, the relatively recent Napoleonic wars. To make matters worse, many of the long-dead artists were themselves obscure, and some of the *written* signatures on the paintings were forgeries. Even those documentary archives of the great houses which still survived were often unreliable.

So the recently-founded national collections--such as the Louvre, stuffed with artworks gathered from the four corners of war-torn Europe, or even Prince Albert's Manchester exhibition of "Art Treasures of the United Kingdom" (1857)--were comprised of largely

anonymous treasures. Given the curators' desire to educate the general public about these artefacts, so as to laud European and/or national civilisation in general, this was doubly embarrassing. (It became triply embarrassing when the experts mentioned below repeatedly claimed to have discovered misattributions in the major national galleries of Italy, France, Germany, and Great Britain.)

The attribution of art, in these circumstances, was a pressing need. And it was undertaken by a new class of person: the connoisseurs. Men such as the physician (again!) Giovanni Morelli (1816-1891), and his disciple Bernard Berenson (1865-1959), mistrusted the labels--both names and dates--on the works displayed in the public collections. A signature, in the usual sense of the term, was unconvincing. So was an iconic sign (such as Albrecht Durer's initials). Indeed, they scorned all the written sources, from Giorgio Vasari's anecdotal *Lives of the Most Excellent Painters, Sculptors, and Architects* (1550/1568) to the weightier volumes written by later scholars of art. "Most of them", they felt, "blunt and paralyze our taste for a true living knowledge of art, rather than quicken and refine it" (Morelli 1877/1883: vi).

Instead, they insisted on direct confrontation with the artwork itself (the "true living knowledge") as the only way to appreciate art--or to attribute it reliably. And isolated episodes of confrontation were not enough: the art-appreciator must become familiar with the artist's whole *oeuvre,* and that of his stylistic brothers. Accordingly, the early connoisseurs travelled indefatigably all over Europe, seeking to identify regional schools and artists, and to attribute specific artefacts to one name or another.

They learnt from this experience that individual artists--lying within a given style or school--could be recognized by tiny clues in their work. The first to point this out was Morelli. In

artists' finished works (paintings, sculpture, and architecture), and especially in their drawings, he said, we can see the distinguishing marks--"the family features, both intellectual and material"--of the various regional schools of Italy, and of the individual masters within them (Morelli 1877/1883: 7). "For instance," he added, "their manner of arranging drapery, the way they indicate light and shadow, the preference they give to pen and ink, or to black and red chalk, etc.".

Using these clues, Morelli suggested attributions for paintings whose artists were unknown. And he offered many revised attributions, too. For example, with respect to two easily-confused masters of Ferrara, Cosimo Tura (c.1430-1495) and his pupil Lorenzo Costa (c.1460-1535), Morelli noticed systematic differences between the shapes of hands or of ear-lobes in their work (see the sketches in Morelli 1877/1883: 237f.). As a result, he argued that the attribution (to Costa) of a painting of St. Sebastien held in Venice was wrong: it was "an unmistakable work of Cosme [i.e. Tura]"-- *even though* it bore Costa's name. Similarly, he said, another famous painting thought to be by Costa was in fact done by his pupil Ercole Grandi--although he admitted that "[possibly], the composition of the picture comes from Costa, and only the execution belongs to Grandi" (p. 237). (His attributions were often complicated by the fact that the less important parts of the painting would have been assigned to apprentices: often, only the faces would have been painted by the master.) A third Ferraran canvas was ascribed by Morelli to Francesco Bianchi (1460-1510), *despite* the picture's 'posthumous' date of 1516, "which might have been stuck on at any later time, and which therefore I regard as apocryphal" (p. 240). The grounds for ascribing it to Bianchi were that "my eyes ... clearly recognise the master in the forms of the hands and ears, and the attitudes and movements of the figures" (ibid.).

Berenson, too, stressed the personal signature in discovering the artist responsible for an

artwork--especially those features which were painted/sculpted unwittingly and/or were difficult to imitate (Llewellyn 1997: 315f.). The most easily attributable features, he said, are ears, hands, drapery, and landscape. Next, come hair, eyes, nose, and mouth. And the least reliable--though still helpful up to a point--are the shape of skull and chin, human figures in movement, architecture, colour, and *chiaroscuro*. (Assuming that this is true, one might ask *Why?* Why are ears and drapery more 'personal' than chins and colour? A tentative answer is given in the next Section.)

Berenson went beyond Morelli, however. The art-historian Nigel Llewellyn credits him with a remarkable aptitude for finding memorable phrases for expressing the particular aesthetic qualities of different artists. Commenting on Benozzo Gozzoli's work in the Louvre, for example, Berenson ranked him as a "mediocre" artist but an admirable "anecdotal illustrator", whose "rare facility of execution, but also of invention" awakens our childishness and our love of fairy-tales (quoted in Llewellyn 1997: 313). This, one might say, is the personal signature at one remove: not the actual marks on the canvas, but the spontaneous psychological response that they evoke in the viewer.

Indeed, Berenson made a point of distinguishing the material form, or "morphology", of the artwork (Morelli's prime focus) from its "spirit", or "quality". And only a few, he believed, are capable of fully appreciating that: Berenson specifically rejected the rational-scientific leanings of Morelli, insisting rather on the connoisseur's aesthetic subjectivity, his personal taste and judgment. Clearly, that opened the way for lengthy--sometimes interminable--discussions, and highly subjective biasses, concerning disputed attributions.

These discussions were rarely good-tempered. Despite his avowal that "To bickering and strife

I am a declared enemy", Morelli rarely bit his tongue when criticizing his opponents (1877/1883: vi-vii); and Berenson's waspish arrogance is legendary. Connoisseurs in general regarded (regard) themselves as a cut above the rest of us--not to say a neo-Romantic elite. To praise an artist was, in effect, to praise themselves. But our interest here is not in the often vituperative disputes over this or that attribution, where the reputations of the competing connoisseurs, and those of the public and private collections, were at stake. Rather, it is in the notion of the personal signature (the set of "family features") itself.

As a way of bolstering art appreciation, as well as aiding attribution, the concept rapidly gained ground toward the close of the nineteenth century. One reason was that it fitted well with the philosophy of Romanticism. Artistic creativity, on this view, is a special faculty gifted to an elite, possessed only by a few individuals. Indeed, their very individuality (like the individuality of languages and of entire cultures, recently argued persuasively by Wilhelm von Humboldt--1836; cf. Boden 2006: ch. 9.iv), was itself a focus of celebration for the late-nineteenth-century art lover--and, of course, for the artists themselves. To recognize, and value, someone's personal signature was to engage in such a celebration.

A second reason for the rapid acceptance was that the new concept appeared to be grounded in good empirical evidence. Morelli himself compared the "dreary dilettantism" of most art critics with his own careful connoisseurship, which sought to "attain a real Science of Art" (1877/1883: vii). Sir Henry Layard agreed, declaring that Morelli's work was "the most important contribution ever made to the history of art,... which has succeeded for the first time in resting research on the authenticity of Italian paintings on solid scientific grounds" (quoted in Llewellyn 1997: 309, my trans.). And despite the embarrassment involved, the owners of art collections were usually persuaded by his meticulous comparisons and well-informed arguments. Of the

fifty reattributions which Morelli proposed for items in the Dresden gallery/museum, for instance, fully forty-eight were accepted by the director (Llewellyn 1997: 308).

As these discussions proliferated, and not least because of Berenson's influence, interest spread from distinctive marks (such as ear-lobes) to overall stylistic features that could be recognized, but not necessarily itemized. One painting would have the 'feel' of one artist, another the 'feel' of another. Careful visual comparisons might be highly persuasive, of course--but no definitive stylistic check-list was available.

The concept of the personal signature eventually spread into literary criticism (and musicology) too. Indeed, Dr. Johnson (1781) had already mocked two of the family features of John Donne's poetry, its linking of hugely heterogenous concepts and its display of erudition: who but Donne, he had asked scornfully, would have thought a good man is a telescope? In the twentieth century, detailed accounts of the rhetorical styles of different authors were fairly common. For instance, Christopher Ricks (1963) defended the subtleties of John Milton's Latinate syntax and epic similes against T. S. Eliot's complaint that Milton's poetry was dry, clumsy, over-erudite, and "an influence for the worse, on any poet whatever....an influence against which we have to struggle".

Nevertheless, the emphasis in literary studies was rather different from that in the visual arts. The attribution of (published) poems, prose, and drama is typically straightforward, so that the 'need' for the new concept was less pressing. Accordingly, discussions of the individual characteristics of the texts were often enmeshed with discussions of the authors as individuals: the personal signature became confused with the personality signature. This was driven by two assumptions: that to understand a written text properly one should know about the personality

(and biography) of the author, and that paying close attention to the texts would provide clues to the author's personal psychology.

Both those assumptions would be questioned in the early twentieth century. For example, C. S. Lewis specifically rebutted them (Tillyard and Lewis 1939). One does not have to understand the poet, he said, in order to understand the poetry. Nor does one need to rely on the commentaries of the literary critics (shades of Morelli, here). All one needs to do is to focus closely on the text itself. Lewis was not alone. This period saw a modernist reaction against Romanticism in literary criticism, leading eventually to the postmodernist declaration of "the death of the author" (Barthes 1968/1977) and Jacques Derrida's claim for the supremacy of the text alone: *"il n'y a pas dehors texte".* On this view, not only are the author's biography and personality irrelevant (as Lewis had intimated), but so is his/her intention in writing the text concerned.

The anti-Romantic revolution affected the arts in general. If poetry and prose were being depersonalized, painting and architecture were depersonalized too--a point to which we'll return in Section IV.

However, if the postmodernists weren't interested in the fact that the work of individual artists carries their own 'mark', they didn't actually deny it. How could they? By then, it had been established beyond doubt. The personal signature is a real phenomenon--but why?

III: The Psychological Sources of the Personal Signature

If we want to understand the nature of artistic creativity, we must ask why personal signatures exist. Is it merely because of egoism and self-advertisement? Consider, for instance, Alfred

Hitchcock's artistic conceit--the pun's intended (but see below)--of playing micro-parts in his own films. But Hitchcock's films are recognizable to film buffs even without his fleeting appearances in them. So perhaps there are deeper reasons why artists are not stylistically anonymous?

We don't need to succumb to the Romantic myth of the individual genius in answering such questions. For creativity is a feature of intelligence in general, possessed by every normal human adult (Perkins 1981; Boden 2004: ch. 10). Possibly, the Shakespeares, Mozarts, and Picassos of this world have some extra capacities that are denied to the rest of us. But if so, these might be rather 'boring' to those of a Romantic cast of mind. A larger short-term memory, for instance, might underlie Mozart's capacity to hear a symphony 'as a whole', or Charlie Parker's ability to improvise jazz combining unusual complexity with unusually long-sustained simplicity (Boden 2004: 274f.). It's more likely that the artists remembered in the history books have the same cognitive skills as ordinary mortals, but employ them better--and are driven by much more pressing motivations.

The personal signature, as we have seen, is a concept developed by critics largely in order to distinguish individual artists *within one and the same school.* In other words, it is focussed on exploratory creativity (Boden 2004: 1-5, ch. 4). In exploratory creativity, the artist (or, for that matter, the scientist) adopts a culturally-accepted style, or conceptual space, and works within its rules/constraints to generate new structures. Creativity in general is the production of novel *and valuable* ideas, and since the style in question is culturally valued the individual structures generated within it will very likely be valued too. Only if the rules are broken, or if the artist's idiosyncracies outweigh the stylistic virtues, will the new artwork be dismissed as worthless.

(Sometimes, of course, the rule-breaking art is valued precisely because it is stylistically different. And sometimes, an initial judgment of 'worthlessness' is only temporary. Even Picasso's artist-friends dismissed *Les Demoiselles d'Avignon* when they first saw it, leading him to keep it hidden in his studio for several years; but today, it is widely seen as one of the most important paintings of the century.)

That last suggestion may seem paradoxical: if exploratory creativity is grounded in a predetermined style, where do "the artist's idiosyncracies" come in? In other words, how can the artist both remain true to the style and put his/her own personal mark on it?

The answer lies in the fact that although the style is predetermined, its individual instances are not. A style is merely a general schema. It's a set of--largely tacit--rules, guidelines, or constraints that actively shapes the artist's work, and which therefore informs each example of it. But no artistic style lays down *exactly* what is to be done. If it did, the execution of individual works of art would be determined in every particular by the style itself. (Morelli pointed out that the personal signature resisted even the one-to-one stylistic tuition given by the masters running the Renaissance studios--Llewellyn 1997: 308.)

(One could say much the same about a musical score, or the script for a play. To be sure, these are specific works of art, not general artistic styles. But the similarity, here, lies in the fact that neither the score nor the script determines precisely how the piece is to be interpreted or performed. The instrumentalists or actors, the conductor or director, must make countless decisions that are not prefigured in the text. It follows that different performances of one and the same work may vary hugely. Indeed, it is not only the original authors who have their own personal signatures: the performers do, too--think of Glenn Gould and Rosalyn Tureck playing

Bach. Moreover, these signatures arise for comparable psychological reasons: see below.)

The indeterminacy in style, *any* style, is one of the reasons why creative thinking is unpredictable. (Others are explored in Boden 2004: ch. 9.) For, no matter how austere and strict the artistic style may be, there are always choice-points at which *either x or y or z* must be done. In addition, there will be choice-points at which *x* can be done in one of many (unspecified) ways. In other words, stylistic artistry is guided by both menus and constraints--neither of which are fully determinate. Perhaps the style allows for relatively few alternatives at a certain stage: that is, perhaps the choice-point concerned has relatively few degrees of freedom. Even so, it is up to the individual artist to decide which one is selected.

Occasionally, the artist makes the style so simple, and so highly explicit, that the room for individual variations at the choice points is severely limited. Perhaps the best example of this is the American artist Sol LeWitt. Not only did he write down formulaic rules for composing his wall drawings, which usually consisted of many straight lines (sometimes, as many as 10,000) positioned at specified distances from each other and/or drawn for a specified number of minutes), but he trained his assistants to execute these instructions in a particular way. He even halted the construction of one of 'his' pieces at the Tate gallery because he felt that the execution of his faxed instructions by the Tate's staff (which they had assumed was utterly straightforward) was unacceptable. He sent out two of his own staff from New York to do the job instead.

This example shows, however, that even "severely limited" stylistic choice is not the same thing as *zero* choice within that style. Indeed, LeWitt (1971) himself acknowledged this. He recognized that "The artist must allow various interpretations of his plan", and that "There are decisions which the draftsman makes [in interpreting the artist's plan], within the plan, as part of

the plan.... The draftsman's contributions are unforeseen by the artist, even if he, the artist, is the draftsman." In short, even the most rigorous style requires host of detailed decisions to be made, for each of which there is more than one acceptable outcome.

In principle, every such decision could be made randomly. In practice, very few--if any--are entirely random. Consider Mozart's and Haydn's dice-music (O'Bierne 1968), for instance, or Bryan Johnson's (1969) novel *The Unfortunates.* (This was published as twenty-seven separate sections in a box, to be shuffled before being read: only the opening and closing sections were fixed.) In all these cases, random decisions are made (by the performer or reader), either by shuffling or by throwing a die. However, the personal signature of the artist-creator informs most or all of the candidate components. (So if Johnson was attempting to kill the author even before the author's death had been officially announced by Roland Barthes, he failed.) Similarly, the two alternative endings provided by John Fowles for his novel *The French Lieutenant's Woman* were equally written in his idiosyncratic style, even though it was left to the reader to choose which one to prioritize.

The prime reason for the existence of the personal signature is not that authors consciously wish to stamp their own mark on their work. Admittedly, they may do this up to a point--and were especially prone to do so during the Renaissance and Romantic periods. But even then, they did not adopt every tiny personal mannerism deliberately. Moreover, the personal signature of the various masters is recognizable even in mediaeval art, whose aim--despite the occasional cheekily idiosyncratic gargoyle--was to glorify God in a culturally accepted way rather than to draw attention to the originality of the human artist/craftsman.

In other words, the personal signature is not primarily a matter of the author's intention. So

Hitchcock's self-conscious little cameos are not true exemplars of the class. (In fact, they were inserted partly to encourage filmgoers to pay attention to the *visual* structure of the film, something which was not typically done in those days.) Rather, the signature is a consequence of the fact that the human mind is finite. We employ the same types of choice, whether 'stylistic' or idiosyncratic, in comparable cases because *it is more economical to do so,* in terms of the information processing involved. Once a certain choice has been made--the shape of an ear-lobe, for instance--it can be employed as a mini-schema: that is, as a conceptual constraint and/or a motor habit. As such, it can be followed automatically, precluding further deliberations.

That phrase "further deliberations" may be misleading, since even the initial choice may be made unwittingly. For example, in first deciding how to depict an ear-lobe (where highly mimetic portraiture is not in question) a painter may simply sketch a plausible form and leave it at that. Admittedly, they will probably have had training in how to draw human heads; but the evidence of individual variation reported by Morelli suggests that the masters (the trainers) did not lay down precise rules for ear-lobes. In other words, ample stylistic space was left for a strong personal signature to emerge there.

By contrast, some thought would normally be given--by both master and pupil--to choosing the shape of the eyes or mouth. For these facial features are naturally (sic) interpreted by us in terms of the personal characteristics of the man or woman whose face it is. (Borrowing Berenson's vocabulary, one might say that this has to do with the spirit of the work as well as its morphology.) We are not interested in what shape the Virgin Mary's ears were, nor in how they are represented in a painting. But we woulld dearly like to know what her eyes and mouth looked like, and we care quite a bit about how they are depicted, because they carry visual communications about the sort of person she was and about her emotional state at a given

time--in a *Nativity* or a *Pieta,* for example. Even in a style (such as Renaissance religious painting) wherein the depicted person's individual psychology is not the main point at issue, inappropriate messages from the eyes and mouth would be troubling.

This may explain Berenson's discovery that the best clues for attributing a painting to a particular artist are the (personally insignificant) ears, hands, drapery, and landscape, while the (personally meaningful) hair, eyes, nose, and mouth are less helpful. As for the least helpful of all (namely the shape of skull and chin, human figures in movement, architecture, colour, and *chiaroscuro),* these may have been regarded by the leading master of the school/s concerned as sufficiently significant, in aesthetic (not personal) terms, to be included *within the style,* so allowing only a few degrees of freedom for individual choice.

Economy of information processing, which explains the repeated use of schemas (both cultural-stylistic and idiosyncratic), also influences the occurrence of one particular thought rather than another--for instance, a particular poetic image, or a visual detail in a painting. Jerry Fodor's (1983: 104ff.) pessimistic claim that creative thinking cannot be scientifically explained, because *any* concept can be inferentially linked to *any* other, is true only in the most tortured sense. Given time, one can indeed find an associative pathway between any two ideas. (Many answers have been suggested, for instance, to the Mad Hatter's unanswered riddle, "Why is a raven like a writing desk?") But life's too short, and most situations are too pressing, to do so in every case. Accordingly, one's thoughts are guided by assessments of *relevance.* This is clearest in the case of linguistic communication, but it applies also to the visual arts.

In a nutshell, "relevance" can be defined in terms of a cost-benefit analysis, weighing effort against effect (Sperber and Wilson 1986). The more information-processing effort it would take

to bear *x* in mind in the context of *y,* the more costly this would be: and high cost gives low relevance. The more implications, regarding things of interest to the individual concerned (such as Mary's mood and personality), that would follow from considering *x,* the more effective it would be: and high effectiveness gives high relevance.

The suggestion is not (paradoxically) that we pre-compute just what effort and effect would be involved in considering this or that concept/belief before picking the most economical one. Rather, it is that psychological mechanisms--exceptionless, involuntary, and unconscious--have evolved which have much the same result (Sperber and Wilson 1986: 155-171). For example, our attention is naturally (sic) caught by movement, because moving things are often of interest. (Think tigers!) Similarly, even the newborn baby's attention is preferentially caught by human speech sounds. In general, current sensory input indicates relevance--and is used, *without* conscious inference, to interpret potentially ambiguous sentences (such as "Put the blue pyramid on the block in the box").

But besides being built into our sensory systems, relevance recognition is built into our memories. Similar and/or frequently co-occurring memories are easily accessible (that is, highly relevant), because evolution has seen to it that they are 'stored' together in general schemas. Such schemas include artistic styles, and artists' personal signatures too. If relevance were not so important in our mental economy, Morelli's connoisseurship could not have arisen: there would have been no stylistic or personal regularities for him to study.

That is not to say that every school of art, or every artist, seeks relevance in the same degree. Different schools, and different individuals within them, adopt cognitive strategies that vary in the measure of cost or benefit--that is, of relevance--they attach to a given conceptual 'distance'.

A conjunction of images that is acceptable in a surrealist painting would not have been acceptable in fifteenth-century Ferrara. Representational art in general demands greater relevance (i.e. requires less effort in computing meaningful associations) than surrealism, Dada, or fully abstract art.

Indeed, surrealism and Dada, and caricature too--which all use recognizable imagery/objects in unrealistic or culturally unfamiliar ways--require more than one level of interpretation. The first ('literal') interpretation of the artwork is implausible and/or incoherent: a second-order interpretation, often involving assumptions about the artist's knowledge and intentions, is needed. In short, many decisions are required, from both artist and audience, about what is--what possibly could be--relevant. That is why such genres are more psychologically taxing than paintings of smiling cherubs or fluffy kittens.

(Someone whose culture was innocent of art depicting cherubs and kittens, although familiar with babies and cats, would be able to interpret our chocolate-box pictures of them--though perhaps without recognizing their sentimentality. But certain artistic juxtapositions that would strike us as puzzlingly surrealistic might be immediately intelligible cultural commonplaces for them. Indeed, such "puzzles" can sometimes be solved by art-historical research. Scholars regularly point out that certain images, in certain contexts--a dove in a Renaissance religious painting, for example, or a bridge depicted on a Japanese ceramic--have some specific symbolic meaning, which the artist in question may have expected the viewer to understand.)

Similarly, different literary styles involve different levels of effort and/or different types of information processing in both author and reader. Our remarks about non-representational painting, above, are reminiscent of computational analyses of the use of irony, hyperbole, and

metaphor in literature (Sperber and Wilson 1986: 237-243). As for personal signatures, some of these are taxing, too. Milton's epic similes in *Paradise Lost,* and (ironically, given Eliot's scorn for Milton) the literary allusions in *The Waste Land,* make huge cognitive demands even on the classically educated reader. And, according to Dr. Johnson, only Donne would see a connection between a good man and a telescope.

In general, it is very difficult to say just what a given artist's signature consists in. Morelli tried his best, but was forced to supplement verbal concepts (such as "ear-lobe") with visual images drawn from the painter's oeuvre. Berenson had to rely on vague remarks about the "spirit" of the work. Dr. Johnson had to trust his readers' (tacit) ability to interpret his scornful remark about Donne and the telescope in the light of other, unspecified, aspects of the poet's verse. Indeed, as remarked above, the artist's personal style may be recognizable, but experienced more as a 'feeling' than as an itemized check-list. Even the artist himself may not be able to say what his signature is (this applies to Brown, as we'll see).

That is not surprising. Recognition in general rests on some form of parallel distributed processing (Boden 2004: ch. 6; 2006: ch. 12). The need to encounter a large set of different examples is as pressing for human beings as it is for artificial neural networks--hence Morelli's indefatigable travels all over Europe to see as many pictures as possible with his own eyes. But the recognition may be based more on 'feel' than on itemized featrues, because the nature of the class may be very difficult to capture in words.

On the one hand, there is usually no set of necessary and sufficient conditions that apply to every example within a given category: a Rembrandt, for instance. Rather, there are what Wittgenstein called family resemblances--and Morelli, family features. (Artificial concepts that

do have cut-and-dried conditions have been studied, but they are very different from concepts in everyday life: Bruner et al. 1956.) On the other hand, many of the perceptible features that contribute to the successful classification are not consciously identifiable. Even if (which is not always the case) one can visually pick out 'the Churchill nose', one cannot necessarily say just what sort of nose that is.

   The same is true of recognizing a dear friend's face. Indeed, to recognize a personal signature can be to experience a very 'human' form of aesthetic satisfaction. For the shock of recognition on encountering an unfamiliar picture by a much-loved painter, or an unfamiliar poem by a revered poet, can be comparable to encountering the artist himself. Morelli again, describing a portrait in the Borghese gallery painted--but not signed--by Giorgione: "The master's spirit met mine, and the truth suddenly appeared to me. 'Giorgione, it's you,' I exclaimed with emotion. And the picture replied 'Yes, it's me.'" (quoted in Llewellyn 1997: 295; my trans.). Insofar as art involves communication between one human being and another--sometimes said to be the very essence of art (O'Hear 1995)--this recognition of the hand of an individual person has *aesthetic* value, as well as being rewarding in a more general way.

   But as we have seen, the personal signature does not exist in order to prompt rewarding responses such as these. On the contrary, it satisfies the artist's psychological need to preserve his/her mental energy. Someone who paints a picture for the very first time will not yet have established a pattern; and someone who daubs oils on canvas on only half-a-dozen occasions in their lifetime may not do so either. But a committed artist, whether professional or amateur, with a body of work already accomplished will inevitably have developed an idiosyncratic style. (So a young artist may be praised for having "found your own voice".) This personal style may reflect their historical context, but it will be idiosyncratic nevertheless. It can cover both distinctive

choices at specific choice-points (ear-lobes, for instance), and a characteristic manner of making the many different choices allowed for by the overall style.

That does not mean that the personal signature is utterly rigid. Even the most tell-tale aspects of an artist's work will not be *precisely* the same on every occasion. As LeWitt (1971) put it, when discussing how his plans were actually executed, whether by himself or by others: "Each individual, being unique, given the same instructions would carry them out differently.... Even if the same draftsman followed the same plan twice, there would be two different works of art. No one can do the same thing twice." His comment prior to my ellipsis allows room for the existence of a personal signature, whereas his comments after the ellipsis imply that *even this* is variable to some extent. Hence, again, the need for perceptual recognition to be achieved despite the existence of partially conflicting evidence (or what connectionist AI terms 'weak constraints').

Possibly, the personal signature may change to some extent over the years. Despite some remarks about how the young Raphael's style differed from the mature version, Morelli seemed to think that it does not. He normally implied that the personal signature, once established, is unchangeable (1877/1883: 310f.; cf. Llewellyn 1997: 308f.). Whether that is true is an empirical question, answerable only by detailed art-historical study. In the (relatively rare) cases of *transformational* creativity, it must change to some extent, and may perhaps be exchanged for a radically different one. Are there any 'personal' aspects of Picasso's painting which survive despite the several transformational changes during his career? Or are there any 'personal' commonalities between Gauguin's Impressionist and Post-Impressionist canvases? If not, does stylistic transformation *always* involve abandoning an earlier pattern of idiosyncracies for a different one?

Let's agree, for the sake of argument, that--even within exploratory creativity--the personal signature may *change* to some extent. But, given the psychological need for informational economy, can it ever *disappear?* Can it, for instance, be shaken off deliberately? If artists wanted to avoid a personal signature, could they do so? And could they use computers to help them to do so?

Those questions are explored in later Sections. First, we must ask whether artists ever have wanted to do this--and why.

IV: The Flight From the Personal

In the visual arts of the early-mid twentieth century, certain movements consciously rejected the individualistic and expressive traditions of Romanticism. But instead of returning to a previous Classicism (as had happened in the seventeenth and eighteenth centuries), they produced new styles wherein the personal was subdued.

That's not to say that the personal signature disappeared. To be sure, explicit self-reference (like Hitchcock's) and transparently autobiographical detail were now avoided. But these new artists didn't attempt to lose their individual mark. They were just as happy--not to say eager--as their predecessors to produce work that was recognizably *theirs.* Without this broadly depersonalizing movement, however, the artistic goal of entirely eliminating any telltale signature would not have arisen. Even now, that goal is rare--and perhaps in principle impossible to achieve (see Section VI).

The modernists' flight from the personal was not merely a swing of the intellectual pendulum, wherein an older artistic style and/or philosophy is overturned largely because it has become

boring. Nor was it simply a matter of artists coming to believe that Romanticism is essentially trivial, 'mere' self-expression being unworthy of their efforts. Besides those two reasons for change, there was a third: the new art was associated with a positive fascination for technology in general, and for its industrial (mass-produced) uses in particular. In other words, fine art was reflecting broad cultural changes that were decidedly impersonal in nature.

The excitement aroused by industrial materials and processes of production began early in the century, with the Constructivists (such as Naum Gabo, Vladimir Tatlin, and Alexander Rodchenko). Most of them were based in Russia, or at the newly-founded (1919) Bauhaus school of design in Germany. Some worked in both places: Gabo, for example, left Russia in 1922 to live in Berlin, and lectured at the Bauhaus. In the 1920s, the architect Le Corbusier (1923) famously described houses as "machines for living": the notion that they might be cosy nests idiosyncratically furnished for individual people was seen as self-indulgent sentimentality. By the 1930s, Consructivism was spreading throughout Europe. (Gabo switched countries again, moving from Germany to England in 1935.)

These artists were adamant that art had a greater purpose than personal expression. For some of them, it played a dynamic role in the emergence of the Soviet socialist state. For many, it contributed to broadly egalitarian public projects: agit-prop, housing, the design of industrial clothing, and so on. Others, such as Kasimir Malevich and Wassily Kandinsky, saw art as having a transcendental or spiritual function, echoed (they believed) in the pure geometry of their abstract forms. The Dutch architecture-and-art group "De Stijl", at much the same time, also favoured an explicit geometrical purism. In general, then, the personal was being deserted in favour of the public and/or the impersonally abstract.

Besides their suspicion of personal expression, many visual artists of the time reacted positively to manufactured artefacts. Among the earliest to do this was the Dadaist Marcel Duchamp, who introduced his industrial "Readymades" with *Roue de Bicyclette [Bicycle wheel]* in 1913. His most famous Readymade, sometimes described as the most influential work of art of the twentieth century, appeared in 1917: this was *Fountain,* a smoothly shining white-porcelain urinal submitted to--but rejected from--an exhibition in New York. In the 1920s, Duchamp supplemented Readymades by pieces 'manufactured' by his own hands. He worked on a number of motorised artefacts called "Rotoreliefs" (featured in his film *Anemic Cinema),* which could be seen either as *machines* or as *works of art.*

Similarly, in 1930, Laszlo Moholy-Nagy, who had worked alongside many of the expatriate Russian constructivists at the Bauhaus, completed his electro-mechanical *Light-Space Modulator.* Described by the artist as an "apparatus for the demonstration of the effects of light and movement", this was clearly an 'industrial' production. It mirrored the widespread interest in the clean, error-free--and, of course, impersonal--finishes that manufacture could enable. Many other artists of the period engaged with industrial methods to a greater or lesser extent. (Further examples included Fernand Leger, Hans Richter, Alexander Calder, and Viking Eggeling.)

These pre-Second World War artists directly influenced post-war developments such as the pan-European 'systems art' movement--and the transition within the arts from *object* to *process.* That transition occurred in the late 1960s, most evidently in the movement known as conceptual art (see Chapter 5 of this volume). Indeed, one contemporary artist/critic argued that it happened over a mere six years, from 1966 to 1972 (Lippard 1973).

Before that time, the artwork was typically perceived--and evaluated--as an object: a self-

contained artefact, whose significance might be self-contained but need not be. That is, the object would often point to something, and/or to someone (such as the person who had created it), outside it. Now, it was replaced by the process from conception to actualisation, where the object that may--or may not--result was evaluatively demoted to the status of mere end-product. ("Or may not", because some artworks consisted merely in a list of instructions describing a process that had not taken place, and probably never would. In other words, the art-making process was sometimes omitted, or anyway identified with the thought processes in the artist's mind.)

In many cases, there was also an implication that the process can be repeated (this was especially clear whenever the artist provided a list of art-making instructions). That further undermined the uniqueness of the object--and, by implication, the personal contribution of the artist who produced it.

This depersonalizing trend was epitomised by the work of LeWitt. He is well known for his statement that "the idea becomes a machine that makes the art", where "all of the planning and decisions are made beforehand and the execution is a perfunctory affair" (1967: 824). Once the plan has been chosen, he said, "The artist's will is secondary to the [artmaking] process he initiates from idea to completion" (1969: item 7). Indeed, he produced many 'remote' artworks, where he faxed instructions intended to be followed by anonymous people who, by following these instructions, would make the work using standard off-the-shelf materials such as 2-inch by 2-inch wooden strips. Despite his admission (cited in Section III) that every "unique" individual will carry out the plan in a slightly different way, Romanticism had clearly been abandoned.

In short, the object was no longer celebrated as a unique artefact, and the artist as an individual person had faded into the background. Earlier in the century, the abandoning of the personal had

simply been implied, by artists' adoption of 'industrial' processes and materials. By contrast, LeWitt and like-minded artists now made this anti-personal aspect explicit.

(Various puzzles resulted. If someone copies the instructions, buys some timber, and makes an artwork accordingly, have they created a *genuine* LeWitt? Or would it be a fake? If the artistic interest is in the idea that drives the process, there's no fundamental aesthetic distinction between original and copy. Nevertheless, in the commercial artworld the object made by the artist in his/her atelier still retains its status. Someone's 'copy' of the LeWitt is financially worthless, whereas the 'original' work has monetary--and aesthetic?--value, as do the instructions themselves. Indeed, LeWitt himself sometimes 'trumped' the conceptual integrity of his procedures, sending his assistants to the Tate to ensure the quality of the artwork as object: see Section III.)

The depersonalization that was happening in this period wasn't confined to conceptual art, although that's where it was most evident. Artists in the more traditional world of painting were using the then-new acrylic paints that enabled smooth, flat, areas of plain colour. They used straight-edge and masking tape to achieve 'industrial' finishes. And many painted the edges of their stretched canvases instead of framing them, in order to emphasize the abstract autonomy of the object--which self-referentially documented its own construction and *did not* stand in some semiological relationship to anything outside of itself. Moreover, the manner in which the paint was supposed to be free of any individual mark of the artist.

(Again, however, puzzles resulted. The French artist Yves Klein provided an interesting--and possibly apocryphal!--comment on the relation between process, signature, and object. He painted many canvases in his trademark *International Klein Blue.* When he first exhibited some

of them, he noticed that people simply scanned the show as a whole. So at his next show he put different prices on each canvas, to encourage the audience to examine them individually.)

V: The Compatibility of Computers

Given the cultural background described in Section IV, it is hardly surprising that modernist artists were a sympathetic audience--and that some were soon enthusiastic players, too--when computers arrived on the scene. Computers, after all, execute processes (sic) that are driven by abstract, formal rules, with--usually--not a person in sight. Indeed, computer art as a whole is sometimes termed *generative* art, meaning art that is generated by some impersonal and/or abstract process (see Chapter 7 of this volume).

Computers are mind-guided, to be sure--but at one remove. So they are only indirectly affected by factors concerning the economy of information processing in human minds. And, of course, they are immune to the motor habits of the programmer, and normally cannot develop any motor habits of their own. (As we'll see, certain sorts of robot may be exceptions to that.) The psychological basis for the personal signature, outlined in Section III, therefore disappears. Or, more accurately, it is pushed into the background. The aims and imagination (and programming skills) of the computer artist will always have idiosyncratic features, which may or may not be reflected in the computer output. But for those mid-century artists who already wished to obscure, or even escape from, their human individuality, it seemed that the very *impersonality* of computers might help.

(Today, that is still a very natural assumption. So much so, that three leading computer artists have recently felt the need to reassure newcomers to the genre that *if* they want to set their

individual stamp on the computer's behaviour, then they can. As they put it:

> As a designer working with generative processes [i.e. computer
>
> art/design] one may still wish to leave a recognizable mark on
>
> a creation. This may be achieved statically using fixed
>
> components with a trademark style [Hitchcock's cameos, again!]. *A more*
>
> *interesting way to achieve this is to ensure either that the*
>
> *organization of the artefact bears the stamp of its designer,*
>
> *or that its behaviour falls within the gamut of work typically*
>
> *produced by the designer.* Of course the designer may not be
>
> interested in producing a recognizable style, however the
>
> utilization of generative techniques does not preclude this
>
> option. In this sense, generative design still requires the
>
> skill and artistry that encompasses any mode of design
>
> (McCormack et al. 2004: 6.1, italics added).

We'll return to the issue of "the organization of the artefact [bearing] the stamp of its designer" in Section VII.)

Computer art began in the 1950s, although there was no public exhibition of it until 1965 (in Stuttgart), and no international exhibition until 1968 (Brown in press). Most of the earliest works weren't static computer-produced images or 'canvases', but machines with moving parts controlled by computers. In short, Duchamps' mechanical Rotoreliefs, and Moholy-Nagy's part-electrical *Light-Space Modulator,* were now upstaged by the more flexible kinetic art made possible by electronic technology.

In 1956, for instance, Nicolas Schoffer created CYSP 1--named for CYbernetic SPatiodynamism 1. An 'electronic brain' built by the Dutch electronics company Philips controlled the system and, in addition to its internal movement, CYSP 1 was mounted on a mobile base that contained actuators and a control system. Photosensitive cells and a microphone sampled variations in colour, light, and sound, so that (said Schoffer) it "is 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" (quoted from <http://www.olats.org/schoffer/cyspe.htm>, referenced 15/08/06).

Furthermore, Schoffer claimed that "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" (italics added). If the human artist is indeed "replaced" by some abstract, electronic, art, then surely the personal signature *must* disappear? (And, given the cultural attitudes sketched in the previous Section, perhaps all the better for that?) -- Well, maybe. But maybe not: see below.

CYSP 1 wasn't the only electronically-controlled mobile sculpture of the late-1950s. Others included Edward Ihnatowicx's SAM and *The Senster.* These impersonal, 'autonomous', artefacts were soon joined by others, such as Gordon Pask's *Colloquy of Mobiles,* and--in 1968--shown in the *Cybernetic Serendipity* exhibition at London's Institute of Contemporary Arts (Reichardt 1968). That exhibition, curated by Jasia Reichardt (at the suggestion of Max Bense, who had organized the Stuttgart show), was hugely influential in this nascent corner of the artworld. And general-purpose digital computers, as opposed to specially-built devices like CYSP 1 and *The*

Senster, were now arriving on the scene. In consequence, computer art became increasingly visible, with the Computer Arts Society being founded in 1969.

That's not to say that it was accepted by mainstream artists and critics, for it was not. Indeed, in 1967 the editor of *ArtForum* rejected an art historian's article on the genre, saying: "I can't imagine ARTFORUM ever doing a special issue on electronics or computers in art, but one never knows" (Brown 2005: 3). Even in the 1970s, London's Slade School was most unusual, as a high-prestige 'traditional' institution, in offering postgraduate courses in this area (Brown forthcoming). Today, the area is still seen by orthodox critics as maverick, if not worse. (However, some of the early hostility has been replaced by welcome in post-modernist circles, due to the use by some computer artists of methods and metaphors drawn from artificial life--Boden 2006: 1.iii.b-d. One example is described in Section VI.)

Some of the first computer artists became involved partly because of their fascination with the then-new machines as such: "toys for boys", one might say. Others were drawn in by their interest in specific applications: the Slade "Systems" group, for instance, were especially intrigued by Martin Gardner's (1970) report of John Conway's mathematical "Game of Life". Yet others, such as Cohen, saw computer art as a way of helping them to understand their own creative processes.

But some turned to computer art precisely because, already influenced by modernism, they favoured impersonality. Ernest Edmonds, then a young painter fascinated by abstract structures, was a case in point (see Chapter 7 of this volume). So was Paul Brown.

Brown's desire to flee the personal was especially strong. As a twenty year-old art student, he was enthused by *Cybernetic Serendipity*. For besides the intrinsic interest of the various pieces

on show, the exhibition suggested to him that computers might be used to do something which, thanks to the modernist influences described in Section IV, he already wanted to do. Namely, not merely to create 'impersonal' works, but *to lose his personal signature* in doing so.

It turned out that this was easier said than done. One reason is that Brown himself, after forty years as a professional artist, still cannot say just what what his personal signature is. As remarked in Section III, recognising it and describing it are two very different things. Whatever it is, in Brown's case, it certainly is not a matter of a specific mark (such as a particular form of ear-lobe) recurring in his work. It is more a matter of an overall stylistic 'feel' that he cannot pin down in words. (More Berenson than Morelli, one might say.) Nor is it something which only Brown himself can recognize. Others too, who are familiar with his oeuvre, can often recognize a previously unseen 'Brown' just as instantly, and just as confidently, as Morelli was able to recognize an unfamiliar Giorgione in the Borghese (see Section III). Even his very earliest pieces (Brown 1977) have an evident visual kinship with his recent/current work.

He had hoped as a young man that the clarity with which art-making has to be defined if computers are involved might help him both to identify his signature and (by changing the generative rules) to lose it. Reasonable enough hopes, one might think. But no: even though all his art has been computer-generated since the 1970s, it still betrays its human author's individual hand. And this, even though he has deliberately aimed for authorial anonymity.

It appears, then, that if one wishes to use computers so as to lose one's personal signature, deliberate self-effacement in the hands-on practice of one's art is not the way to do it. Can some other way be found?

VI: Evolving Anonymity

Today, Brown is using computers in a new way in trying to achieve his long-standing artistic goal. An interdisciplinary team, with Brown as a leading member, aims to evolve line-drawing robots whose products are of some aesthetic interest (no more than that!), but which do not carry the telltale traces of a work by Brown himself.

The first obvious question to ask about this project, named *Drawbots,* is "Why evolve line-drawing gizmos, as opposed to simply designing (programming/building) them?" The second is "Why use robots, as opposed to computer graphics (i.e. programs for drawing images on paper or virtual images in cyberspace)?"

The answer to the first question is that if the line-drawing computer system has been evolved then, thanks to the many random mutations that will have taken place, it has *not* been prespecified in detail by the artist-programmer. Accordingly, there may (sic) be a chance of avoiding that individual's personal signature. Whether that "may" can, in practice or even in principle, be replaced by a "will" is the key point at issue.

As for the second question, the answer is that a robot, being a material object functioning in the physical world, can be affected not only by its program and/or internal design but also by unexpected--and perhaps serendipitous--events in the physical environment. Again, this offers a means by which the programmer's personal signature may be bypassed, or anyway diluted. (An early example of this sort of thing occurred in the 1970s, when the moving 'legs' of a kinetic sculpture--alias a robot--happened to scratch the wooden floor of London's Royal Academy. Although the RA was doubtless incensed, the sculptor, Darrell Viner, was intrigued. He was so "fascinated by the structure of the repetitive scratches and their relationship to cross-hatching"

that he went on to make artworks produced by comparable, though simulated, means--Brown forthcoming: 5.)

The "serendipity" in the physical events involved can even include cases where a radically new feature appears in the robot's behaviour. In a previous experiment done by a member of the *Drawbots* team, a population of robots evolved a new sensory capacity--not merely an improved sensory capacity--as a result of contingent, and previously unremarked, facts about the physical environment (Bird and Layzell 2002). That suggests the possibility that a fundamentally transformative change in the Drawbots' drawing-style might occur. If so, then presumably the new style would not bear Brown's individual mark, even if the previous style had done so.

There is a third obvious question also, namely, "What can it possibly mean to talk of *evolving* robots?" Very briefly (for more detail see Boden 2006: 15.vi-vii), designs for robots--both their 'bodily anatomy' and the detailed structure of their controller, or 'brain'--can be randomly mutated by a computer program, and the results compared for their success in achieving the task that the programmers have in mind. As in biological evolution, the most successful designs at each generation are selected for further breeding. (The testing/comparison is done in simulation; but every so often, the current best design is implemented in a real robot, to ensure that it does behave as the simulation suggests.)

The selection is sometimes done interactively, by a human being making the comparisons. At other times, it is done automatically by the program itself. This requires that a 'fitness function' be specified by the programmer, which the program can use to make the selection at each generation. (The fitness function itself may evolve, again either interactively or automatically.) As we'll see in Section VII, this fact is the Achilles' heel of the *Drawbots* research.

The Drawbots themselves are small wheeled vehicles carrying a retractable pen. And the task in the team's minds is line-drawing. By that is meant not drawing pictures that represent real things (as both stick-men and Renaissance cartoons do), nor even drawing geometrical designs, but simply drawing *lines ...* which can curve, cross, stop, and approach each other in myriad ways--and which may sometimes change in thickness too. Brown's hope is that robots can be evolved which will draw aesthetically acceptable lines *that do not exhibit his personal signature.* In other words, the fitness function/s to be followed by the robot should guarantee aesthetic acceptability but should not be so 'rich' as to express his personal style.

In principle, that would not preclude there being a telltale identifier, or quasi-signature (one can hardly say a "personal" signature), *produced by an evolved robot itself.* This would be a pattern that distinguishes its drawings from those of its siblings and close cousins. The evolution of such patterns is in principle possible because new performance details will follow from random mutations, and these details can be perpetuated provided that they do not compromise fitness.

Such details could include drawn patterns or line-features discriminated by the gizmo's visual sensors. Indeed, a robot might even develop particular motor habits, driven by motor circuits conserved in its 'brain' (see Section III). Suppose that a sudden movement, caused by a recently mutated motor circuit, led to a mark that was then selected (along with the rest of the drawing) by Brown. This might lead the motor circuit to endure, forming the basis of a future motor habit. That habit could be involved either in many different stylistic choices, or only in one (think of an overall stylistic 'feel' and of ear-lobes, respectively). In short, the general style that is selected via the fitness function could allow for idiosyncratic expression (alias signatures) by different robots within the same generation or lineage.

If the fitness function were to include measures of computational economy, the different robots might even develop quasi-signatures for much the same (psychological) reasons that human beings do. However, it is hardly likely that such patterns would arise as a matter of course, as they do in the work of human artists. For the root of the personal signature, as we saw in Section III, is the need for economy in information processing within a highly complex system--a criterion that does not apply in robots as simple as those being considered here.

Whether it is possible for the Drawbots to lose the stamp of Brown's individual artistry depends on a number of things. One is the extent to which Brown, or anyone else, can say just what his personal signature consists in. If he knew that, he would be in a much better position to try to avoid it. However, for the reasons given in Section III, he does not.

Possibly, the research may help him towards a better--if still incomplete--understanding of this. For in examining the various drawings made by the Drawbots, he will have to ask himself two questions: *Is it aesthetically acceptable?* and *Is it evidently a 'Brown'?* In answering that second question over and over again, as the drawing style mutates across the generations, and in posing it to colleagues with an appropriately practised critical eye, he may achieve a more explicit understanding of just what his own style is. (Then again, he may not.) But that could happen without his ever answering *No* to the second question. In that case, he still would not have 'lost' his signature, despite understanding it more deeply. Whether the increased understanding would enable him to dilute it, if not to shed it, in his (non-evolutionary) future work is an interesting question.

Another factor that will affect the likelihood of success in the project is the extent to which aesthetic acceptability can rest on relatively primitive visual features. "Primitive", here, means

both *simple* and *naturally salient.* For example, shininess (of satin, silver, polished ivory, lurex, chromium...) is relatively simple to discriminate, and naturally salient too. That's so for good evolutionary reasons, involving the fitness-enhancing nature of reflective expanses of water (Boden 2006: 8.iv.a). In other words, it's no accident that shininess is aesthetically appealing to a very wide range of individuals and cultures. Are there any features of line-drawings such as those the Drawbots could produce which are naturally attractive (and easily discriminable) in a comparable way?

For example, if the Drawbots were able to change pens, might they evolve a preference for the shiny lines left by a silver pen? They could do so, if their visual apparatus could discriminate shininess. To be sure, the robotics team would have to build reflectance into the fitness function: no robot 'naturally' prefers it. But reflectance is such an easily discriminable property, and so near-universally liked by human beings, that the team could not be accused of cheating were they to do that. (Some cultural groups positively avoid shininess, regarding it as vulgar; but that is irrelevant here, since this critical attitude has developed *precisely because* the liking for shininess is so very common.) Nor would putting silveriness into the fitness function result in drawings that display Brown's personal signature, for that (whatever it is) is not a matter of shininess.

It's easy to see that Brown's authorial mark does not involve shininess. What it *does* involve is less clear. Suppose it were to turn out that all the perceptible features favoured (via the fitness function) by 'aesthetically competent' Drawbots were relatively high-level and/or complex, with no 'natural' attractiveness for human beings in general. In that case, their drawings would probably be more specific to Brown's personal style. His project would have failed. However, "success" and "failure" here admit of several levels. In the language used above, Brown's signature may become more or less *diluted,* even if it cannot be entirely lost.

Among the naturally discriminable features that are already being considered by the *Drawbots* team are holes, line-crossings, and fractals (of varying complexity or depth). But why should one expect any of these things to be 'naturally' attractive?

Well, consider fractals, for instance. These are ubiquitious in Nature, both in living things and in environmental features such as rocks and coastlines. According to the 'biophilia' hypothesis (Wilson 1984), *Homo sapiens* has evolved to respond favourably not only to conspecifics and other aspects of our original ecological niche (the African Savannah) but also to living things and natural environments in general. If that's so, then fractals might well have some natural attraction for us.

That's merely an argument for plausibility. But there is also some evidence that fractals of a certain kind are spontaneously favoured in art as in nature--and even, as William Congreve said of music, that they can soothe the savage breast. Richard Taylor claimed, in the late-1990s, that Jackson Pollock's canvasses, far from being random splashes of paint, have specific fractal properties to which most viewers respond in a positive way, and by which his paintings can be distinguished from fakes (Taylor et al. 1999a,b). Specifically, people prefer those Pollock paintings which have a fractal dimension of 1.5 (his later paintings reach 1.8+). By comparison, people asked to choose between natural images (or between simulated coastlines) prefer a fractal dimension of 1.3. Taylor's claim aroused huge interest (e.g. Spehar et al. 2003), and was later followed by experiments showing that viewing Pollock's images can actually reduce stress (Taylor et al. 2005).

Taylor's early remarks about how to discriminate genuine Pollocks from fakes, have recently been challenged (Jones-Smith and Mathur 2006). One aspect of that challenge is especially

intriguing here: Katherine Jones-Smith reported that a careless doodle done by her showed the same fractal properties as those found in Pollock's work. She didn't ask whether the doodle had any aesthetic value. To the contrary, she implied that, being a thoughtless scribble, it did not. But if she had asked people whether they "liked" it, or whether they preferred it to some other mark (maybe one produced accidentally), she might have found that people ascribed some--albeit small--degree of aesthetic merit to it. If that were so, it suggests that a suitably fractal-favouring Drawbot might make aesthetically acceptable ('natural') drawings that don't show anyone's individual mark: not hers, not Pollock's, and not Brown's either.

VII: The Likelihood of Success--and What it Would Mean

The best way of estimating the result of the *Drawbots* project is simply to wait and see. Meanwhile, are there any specific reasons to suspect that it will succeed, or fail? And if it succeeds, would it follow that the creativity exhibited in the drawings of the newly-evolved Drawbots must be attributed to the Drawbots themselves, rather than to Brown? *'No signature, no creative authorship',* perhaps?

   As remarked above, the Achilles' heel of the project lies in the fitness function. This is true in two related senses, one philosophical and one psychological.

   First, if it is Brown who is continually deciding on the fitness function as the research proceeds then perhaps it is *his* aesthetic judgment, and also *his* artistic creativity, which is really responsible for the final drawings? (For shorthand purposes, let's ignore the creative role of the other human beings on the team.) Many philosophers would say that there is no "perhaps" about it, that *of course* Brown's creativity lies behind whatever aesthetic interest the Drawbots'

drawings happen to have. For they believe that it is in principle absurd to ascribe creativity, or aesthetic judgment, to any computer system--no matter how superficially impressive its performance may be.

Their belief typically rests on assumptions about one or more of four highly controversial issues, including intentionality and consciousness (Boden 2004: ch. 11). Accordingly, it can be challenged--though not definitively refuted. However, even if one were happy to reject their claim as a general philosophical position, that would not settle the question at issue here. For in the specific case of the *Drawbots* research, the human source of the fitness function is a distinct embarrassment for anyone wanting to grant all the creative credit to the computer.

This embarrassment would persist whether or not the project succeeded in its own terms--that is, irrespective of whether Brown's signature had been lost. For if the final fitness function were to exploit only what in Section VI were called "primitive" aesthetic properties, so that Brown as an individual artist had become invisible in the final-stage drawings, it would still be true that the aesthetic decisions involved in developing the fitness function were *such as are naturally made by human beings.* Brown's hand (judgment) would still be there--but functioning as the hand of a generic human being, not of a particular individual. (In terms of the distinction made in Section III, the fitness function would describe the general style, without imposing his detailed 'authorial' implementation.)

That argument would apply even if the robots' drawing style had shown a truly fundamental change: a new style (presumably, a 'non-Brown' style), as opposed to an improved style. We saw in Section VI that the physical 'embodiment' of the Drawbots makes it in principle possible for such serendipitous change to occur. By definition, the stylistic change would have been caused

by some unconsidered and/or contingent feature of the robots' physical environment. So Brown couldn't be credited with initiating it. But he could, perhaps, be credited with 'causing' it, since the incipient change will be maintained (and perhaps developed) only if it is approved/selected by his personal decision or by the fitness function already evolved under his direction. In such a case, Brown might be regarded as the creative spirit behind the final drawings *even though* he never foresaw them, and *even though* they are free of his personal mark.

What of the psychological question? Are there any psychological reasons to expect that Brown *will not* be able to decide on a fitness function that entirely avoids his personal signature?

One psychological consideration discussed in Section III was relevance. This issue is less obviously crucial here than it would be if Brown were trying to evolve robots capable of realistic representational drawings. If the Drawbots were intended to draw human faces, for instance, they had better include depictions of eyes, mouth, and even the (relatively less relevant) ear-lobes. And they had better *not* add horns, or wings. But if a tinge of surrealism were to be favoured (by Brown), then a horn-like protuberance appearing in generation 1,000 might be selected and 'shaped' so that recognizable devilish/goatlike horns were visible at generation 9,000. The same might occur if Brown felt that familiar myths about the Devil were relevant to the 'topic' of the drawings. In either case, Brown's own judgments about relevance would be reflected in the robots' behaviour, and--to the extent that these are idiosyncratic--so would his personal mark.

In fact, Brown has always been an abstract artist, so is not aiming to evolve 'representational' robots. Even so, issues of relevance--or rather, issues of what he deems to be relevant--may arise. Aesthetic acceptability depends in part on intelligibility. To be sure (and as already remarked), intelligibility may be more or less easy to achieve in differing artistic styles. But utter chaos will

satisfy nobody. In other words, one factor underlying judgments of aesthetic acceptability is the computational effort that is involved in comprehension. A 'messy' line-drawing (or doodle), for instance, may be unacceptable largely because its components *do not* appear to be mutually relevant. That is, they do not appear to be 'coherent', or to 'make sense'. (Perhaps there are no closed curves, suggesting bounded physical objects? And/or perhaps there are no T-junctions where one line stops as it meets another, suggesting occlusion of a line/edge by some other physical thing?) These judgments, as we've seen, are not usually conscious--and it may not be possible to make them conscious. It follows that it may not be possible for Brown to avoid them deliberately.

A closely related issue is the extent to which Brown can banish his own preferred schemas from the fitness function. (Compare: evolving robots to draw faces *without* eyes.) If he cannot, because these schemas are so deeply entrenched in his mind and experience, they will inevitably be reflected in the fitness function and therefore in the final drawings.

At that point, we come full circle to the issue discussed above in terms of "simplicity" and "naturalness". The more that the features favoured in the fitness function are complex, culture-based, and idiosyncratic to Brown, the less will the final-generation Drawbots be free of his personal stamp. If the Brown signature is preserved, despite all his efforts, that will be because he has found it necessary to build relatively 'rich' criteria into the fitness function. As we've seen, it is still an open question as to how rich the final criteria of aesthetic fitness will need to be. If they are all relatively simple, then Brown's creative inspiration may seem less important. At most, the fact that he is a human being will be relevant, not the fact that he is Paul Brown. (Any idiosyncratic 'signature' visible in the drawings might be attributable to the evolutionary vicissitudes of the robots themselves, as explained in Section VI.)

What if, contrary to all his hopes, Brown's personal signature *remains* still visible to experts (dare we say connoisseurs?) looking at the robots' drawings? In such a case, and *even if* one were willing in principle to grant creativity to some computer systems, it would seem bizarre to attribute creativity to the Drawbot. For we saw in Section II that the concept of the personal signature arose specifically in order to attribute a given work of art to one creative source (normally, one human individual) rather than another. The signature, in short, points to the person. This was recognized by the computer artists (quoted in Section V) who spoke of "the organization of the artefact [bearing] the stamp of its designer". Whether that telltale organization were deliberately designed, as they were assuming, or gradually evolved, as in the *Drawbots* project ('failure' here being supposed), it would point to one person: Brown.

References:

Allport, G. W. (1942), *The Use of Personal Documents in Psychological Science.* Social Science Research Council Bulletin 49. New York.

Barthes, R. (1968/1977). 'The Death of the Author', in S. Heath (ed., trans.), *Image, Music, Text* (New York: Hill and Wang), 142-148. (This essay was written in May 1968, during the Paris *evenements.)*

Boden, M. A. (2004). *The Creative Mind: Myths and Mechanisms,* 2nd edn., expanded/revised (London: Routledge).

Boden, M. A. (2006). *Mind as Machine: A History of Cognitive Science* (Oxford: Oxford University Press).

Boden, M. A. (2007), 'Stillness as Autonomy'. *CADE-2007 (Computers in Art and Design Education), Perth: September 2007.*

Brown, P. (1977), 'The CBI North West Export Award'. First published in *Page Sixty Two--Special Terminate CACHe Issue: Bulletin of the Computer Arts Society, Northern Hemisphere, Autumn 2005:* 12-13.

Brown, P. (2005), 'Editorial', *Page Sixty Two--Special Terminate CACHe Issue: Bulletin of the Computer Arts Socety, Northern Hemisphere, Autumn 2005:* 1-3.

Brown, P. (in press), 'The Mechanization of Art', in M. Wheeler, P. Husbands, and O. Holland (eds.), *The Mechanisation of Mind in History* (Cambridge, Mass.: MIT Press).

Brown, P. (forthcoming), 'From Systems Art to Artificial Life: Early Generative Art at the Slade School of Fine Art', in C. Gere, P. Brown, N. Lambert, and C. Mason (eds.), *White Heat and Cold Logic: British Computer Arts 1960-1980, An Historical and Critical Analysis* (Cambridge, Mass.: MIT Press).

Bruner, J. S., Goodnow, J., and Austin, G. (1956). *A Study of Thinking* (New York: Wiley).

Fodor, J. A. (1983). *The Modularity of Mind: An Essay in Faculty Psychology* (Cambridge, Mass.: MIT Press).

Gardner, M. (1970), 'The Fantastic Combinations of John Conway's New Solitaire Game "Life"', *Scientific American,* 223/4: 120-23.

Ginzburg, C. (1992) 'Clues: Roots of an Evidential Paradigm', in C. Ginzburg, *Clues, Myths, and the Historical Method* (Baltimore, MD: Johns Hopkins University Press), 96-125 and 200-214. Trans. J. and A. C. Tedeschi (Italian edn. 1986).

Humboldt, W. von. (1836). *On Language: The Diversity of Human Language-Structure and Its Influence on the Mental Development of Mankind,* trans. P. Heath (Cambridge: Cambridge University Press), 1988.

Johnson, B. S. (1969). *The Unfortunates* (London: Panther).

Johnson, S. (1781). *The Lives of the Most Eminent English Poets; With Critical Observations on Their Works,* ed. R. Lonsdale (Oxford: Clarendon Press, 2006).

Jones-Smith, K., and Mathur, H. (2006), 'Revisiting Pollock's Drip Paintings', *Nature,* 444 (Nov. 30):E9-E10 (published online 29 Nov.).

Le Corbusier [pseud.; i.e. C.-E. Jeanneret] (1923), *Vers une Architecture* (Paris). English translation (by F. Etchells) of 13th French edition, *Towards a New Architecture* (London: John Rodker, 1927).

LeWitt, S. (1967), 'Paragraphs on Conceptual Art', Artforum, 5(10): 79-83. Reprinted in K. Stiles and P. Selz (eds.), *Theories and Documents of Contemporary Art: A Sourcebook of Artists' Writings* (London: University of California Press), 822-826.

LeWitt, S. (1969), 'Sentences on Conceptual Art', Art-Language, 1: 11-13. Reprinted in K. Stiles and P. Selz (eds.), Theories and Documents of Contemporary Art: A Sourcebook of Artists' Writings (London: University of California Press), 826-827.

LeWitt, S. (1971). 'Doing Wall Drawings', *Art Now,* 3(2). Excerpts in (Lippard 1973), 200f.

Lippard, L. R. (1973), *Six Years: The Dematerialization of the Art Object* from 1966 to 1972 (New York: Praeger).

Llewellyn, N. (1997). 'Une Science du Regard: Les Connaisseurs', in E. Pommier (ed.), *Histoire de l'Histoire de l'Art: Tome 2 (xviii et xix siecles)* (Paris: Louvre), 293-325.

McCormack, J., Dorin, A., and Innocent, T. (2004). 'Generative Design: A Paradigm for Design Research', in J. Redmond, D. Durling, and A. de Bono (eds.), Futureground, vol. 1 (Melbourne: Design Research Society). Available as a pdf-file from McCormack's home page.

Mahon, D. (1947), *Studies in Seicento Art and Theory* (London: Warburg Institute).

Morelli, G. (1877/1883). *Italian Masters in German Galleries: A Critical Essay on the Italian Pictures in the Galleries of Munich-Dresden-Berlin* (London: George Bell and Sons). Trans. from German by L. M. Richter.

O'Bierne, T. H. (1968). 'Dice-Music Trios', *Musical Times,* 109 (1508), 911-913.

O'Hear, A. (1995). 'Art and Technology: An Old Tension', in R. Fellows (ed.), *Philosophy and Technology* (Cambridge: Cambridge University Press), 143-158.

Perkins, D. N. (1981). *The Mind's Best Work* (Cambridge, Mass.: Harvard University Press).

Reichardt, J. (ed.) (1968), *Cybernetic Serendipity: The Computer and the Arts.* Special issue of *Studio International,* published to coincide with an exhibition held at the Institute of Contemporary Arts, August 2-October 20, 1968 (London: Studio International).

Ricks, C. (1963). *Milton's Grand Style* (Oxford: Clarendon Press).

Spehar, B., Clifford, C., Newell, B., and Taylor, R. (2003), 'Univeersal Aesthetic of Fractals', *Computers and Graphics,* 27: 813-820.

Sperber, D., and Wilson, D. (1986). *Relevance: Communication and Cognition* (Oxford: Blackwell).

Taylor, R., Micolich, A. P., and Jonas, D. (1999a), 'Fractal Analysis of Pollock's Dripped Paintings', *Nature,* 399: 422 (one page only).

Taylor, R., Micolich, A. P., and Jonas, D. (1999b), 'Fractal Expressionism', *Physics World,* October.

Taylor, R. P., Spehar, B., Wise, J. A., Clifford, C. W. G., Newell, B. R., Hagerhall, C. M., Purcell, T., and Martin, T. P. (2005), 'Perceptual and Physiological Responses to the Visual Complexity of Pollock's Dripped Fractal Patterns', *Journal of Non-Linear Dynamics, Psychology and Life Sciences,* 9: 89-114.

Tillyard, E. M. W., and Lewis, C. S. (1939). *The Personal Heresy: A Controversy* (London: Oxford University Press).

Wilson, E. O. (1984), *Biophilia* (London: Harvard University Press).