Embodiment, constraint and the creative use of technology.

John Pickering, Psychology Department, Warwick University, UK

Franz Brueggen, the Dutch recorder virtuoso, once brought on stage a collection of instruments old and new. He contrasted a modern plastic recorder with a very old one made from ivory. He said the modern one was beautifully made it's tone was excellent and the keys, pads and so on functioned perfectly, making it easy to play. Playing the ivory recorder was, by comparison, rather difficult. It was quirky, its levers were crude, the holes and bore uneven and it was more susceptible to temperature and humidity. Asked which he preferred to play, he said "Oh the ivory one, it's got such character!" It turned out that what he meant by 'character' actually came from the physical characteristics of ivory. The excellence of the modern instrument was partly due to the technology of producing and working with plastic. However, while this produced a technically superb instrument, it also robbed it of some the character it might had had if it had been made from something less docile. For Breuggen the character of the old flute was due to its having retained the expressive intentions of its maker. The instrument was a physical trace of the decisions the craftsman had had to make to get a long narrow bore with side holes in the right places in just that piece of ivory, with its particular shape and variations in density. It was also the product of the technology available to him and of his own skills, expressed in his embodied relationship with the tools and materials he used. The outcome was an instrument that sounded as it did partly because of the creative judgement of its maker, partly because ivory can be worked in some ways but not others, and partly because of the technology available at the time.

Using embodied skills to work creatively within constraints is the theme that will be addressed here. The creative process is a negotiation of constraints while retaining an aim which, consciously held or not, allows the purposive but playful shaping of materials to be savoured and selectively explored. To introduce this theme, an account will be given of a shift in psychology and philosophy towards embodied treatments of skilled action, while some remarks about recent cultural trends will introduce a conclusion dealing with the use of technology in the arts.

The shift to embodiment.

The significance of the shift is best seen in its historical context as a contrast between what its from and what its to. It is from cognitivism, the paradigm that displaced behaviourism once the latter's

limitations became apparent. The principal limitation was the claim that human cognitive skills were due to the learning of stimulus-response associations. It became clear that such a process would have shortcomings as a general model for mental life. In particular there would be the problem of serial order, how to account for actions whose organisation went beyond mere chaining of stimuli and responses. The grammatical structure of language was a prime instance, something which human beings can demonstrably use. Indeed, language is occasionally proposed as the defining human characteristic.

Whether that is accepted or not it became clear that behaviourism could not give a plausible account of the origins of the ability to deal with meaning by serially ordered signs. A psychological theory powerful enough to address this issue emerged with a better understanding of the brain, developments in information theory and the contributions of Chomsky, Levi-Strauss and other structuralists. A new paradigm emerged around in the 1950's and subsequently consolidated itself into what is variously known as the information processing approach, cognitive psychology or, most broadly, cognitivism.

Cognitivism treats the mind as if it held symbolic representations of the world. The structure of those representation constitutes our knowledge of what objects and events are like. Mental operations, perhaps like those of a computer, use these representations to guide thought, action and experience. The identification of brain areas that seem to be the site of particular mental skills has lent strength to the idea that the nervous system might be divided into functional subsystems which could then be identified with known information processing operations, like storing, comparing and selecting. Cognitivism has been a productive research paradigm for some fifty years.

Now, while cognitivism may capture something of what mental life is like, it misses a fundamental point. This is how the operations and representations active at any limited period of time, what can be called the synchronic aspects of cognition, came to be what they are. This is a diachronic question and hence to answer it requires a genetic approach, in the sense of Piaget and Werner. Leaving such questions unanswered renders cognitivism superficial at best and vacuous at worst. This point was recognised by psychologists like Piaget and Reed as well as philosophers like Merleau-Ponty and Dewey. Mental life cannot be properly understood without an account of how it emerges, both ontogenetically and phylogenetically, from the encounter between the world and intrinsically active, exploratory and creatively playful mental beings.

The world offers opportunities for action and also presents constraints as well. Minds have evolved to exploit the former and overcome the latter, and in doing both, the structure of mental life emerges as the world become more tractable. To ignore this dialectic and to approach the mind as something that could be fully understood by some disembodied snapshot of the mind at a particular time, giving a formal inventory of operations and representations, as the more arid forms of cognitivism do, is to miss the process wood for the structuralist trees.

By contrast, embodied treatments of mental life take account of its short and long term origins, both of which lie in situated action. The assumption is that what any cognitive being knows about the world, and about how to act within it, is only known because they have particular sorts of bodies and live amid the particular conditions to which they are adapted. This remains true of human beings even though they are a special case in many ways since they are uniquely reflexive, able to make themselves an object within their own mental life. They use language and, most importantly for what is being discussed here, more than any other species they are situated in historically contingent circumstances and encounter a world shaped by human culture.

Like any other species, they initially act towards that world using innate resources, but to a far greater extent than other species these are rapidly enhanced by resources available from the cultural environment. These special aspects of the human condition notwithstanding, the embodied approach treats mental life, in all its aspects, from the preconscious and innate to the learned and, potentially self-conscious, as primordially derived from bodily action within a given set of circumstances.

To try, in the spirit of cognitivism, to distil some essence of mental life, some formal platonic set of pre-existing principles, is an exercise in misplaced concreteness. Mental life is not formalisable. It is fluid, circumstantial, adventitious and intrinsically open. It is bound up in what Whitehead called the creative advance of nature. Bound up with this creative advance is the encounter between an active cognitive being with a particular set of embodied skills and a series of situations that provide opportunities for action. In the human case, some of these are dictated by the situation more or less directly while in others actions are freely chosen after some deliberation.

More directly than Whitehead perhaps, Merleau-Ponty and Dewey provide the philosophical framework within which the shift from cognitivism to embodiment can be interpreted. Merleau-Ponty regarded embodiment as mysterious, although not unknowable. Bodies themselves are inherently ambiguous and necessarily expressive. They are situated at the unique nexus of action-

inviting objects and activity-expressing subjects. What we perceive in the world is constrained by the actions we would take towards it. There is no disembodied subject nor a pre-given world. Phenomenologically speaking, what exists is that which is encountered by perceivers bent on action. This stance allies Merleau-Ponty with Dewey and with Lackoff and Johnson in the project to transcend Platonic idealism in order to make philosophy the inquiry into active being-in-the-world.

Dewy, in seeking to move philosophical inquiry out from the shadow of Plato, took an intrinsically evolutionary, pragmatic stance towards knowledge.   Truth was not ideal or pre-given but discovered in purposive action. Finding truth was the nature of creative work, in the broadest sense. Creative work could, for example, include how a child learns to crawl as well as how a sculptress makes a form. For Dewey, effective learning through expressive action was not the gradual approximation to an ideal form or proportion.   It was effective because, like good science, it opened up creative possibilities for novel ways of perceiving the world and for acting towards it.

In his work with Matisse and with F M Alexander, originator of the 'Alexander Technique', Dewey investigated how the actual physical acts of painting, singing and simply moving were themselves the vehicle for opening up spaces into which creative action could flow and from which original paintings, postures and states of mind and body could emerge. Like Merleau-Ponty, Dewey sought to ground creative consciousness in movement and in the active perception of a world which, far from exemplifying Platonic ideals, was unpredictable, open, and itself a source of novelty. It is this central concern that unifies his interests in child development, the post-impressionist painters, the Alexander technique and the thermodynamics of living system which otherwise might appear over-inclusive and *ad hoc*. His approach, like the other pragmatists, was founded on the belief in the productive openness of the world and the role of consciousness in engaging with this openness to shape actions and direct growth by discovering the consequences of those actions. It was all pretty much one to Dewey whether that growth was of an individual's physical or cognitive skills, of a painting, or even of a physical system in which the conservation laws might appear to place an impassable barrier to real novelty.

Likewise, in Lackoff & Johnson's 'Philosophy in the Flesh: the embodied mind and its challenge to western thought' the challenge is to address the mind as it really is, creatively enmeshed with the messy, contingent world.   Although they acknowledge a debt to Merleau-Ponty their approach in their approach is nonetheless are rather mentalistic. That is, they are more concerned with the role of embodied as the preconscious metaphorical basis for thought and language. They pay less attention to

the dialectic in which thought and language are precursors to action in adults while at the same time requiring action as a developmental precursor. Lackoff & Johnson trace the unconscious metaphors that underlie language to bodily actions and the likely emotional values that accompany them. Thus, the metaphorical uses of "up" and "down" generally refer to positive and negative affect respectively because when the body is upright we are more likely to be in good health, and in command of our situation. When the body is not upright for some reason, it is more likely to be associated with negative conditions like being ill, depressed or loosing a fight.

However, unlike Merleau-Ponty, Lackoff and Johnson pay surprisingly little attention to the material conditions that surround human action. They do not examine in much detail the interaction between bodily action and materials. Nor are they much concerned with the role of technology in shaping the material conditions of human action. But both shape and help to develop the human capacity for effective action and, in turn, for conscious creative work. It is to this issue the rest of this article will turn, with recent developments in technology in mind.

Digital technology in the creative process.

To look at creativity, as the interaction between technologically enhanced skills and the constraints of particular media, is in line with what both Merleau-Ponty and Dewey had to say about it. Looking at it in this way, rather than as the effort to approximate to Platonic ideals of perfection, has surely to be useful to creative artists as they incorporate digital techniques into their work.

From this perspective, and with an eye to Dewey's pragmatist inclinations, the role of digital technology can be considered more critically and with practical outcomes in view. To the extent that it merely amplifies what artists do already, it is enhancement rather than radical change. To the extent that it opens up new ways to create shapes, colours, sounds and movements it can play a more original role. Here, the notion of constraint is crucial. Developments in technology make new things possible while at the same time imposing constraints on what those new things can be.

When considering the technology of film and of the mass reproduction of images in general, Walter Benjamin observed that "technology detaches the work of art from tradition". By 'tradition' he meant more than just a set way of doing things. He was anticipating what sociologists now call a community of practice or what Bordieu calls the 'habitus' of a particular social group. Matisse and the other Fauves, for example, not only shared a set of painterly skills and knowledge, but also a common understanding and a set of objectives which made it possible consciously to depart from

the stylistic conventions of the day. The shared skills and values was perhaps what Benjamin meant by a tradition.

Now, if developments in technology, and digital technology in particular, mean that fine art can be produced and reproduced in radically new ways, the notion of a tradition in this sense undergoes a radical change. So radical perhaps, that it can be treated as a rupture or departure. The contemporary artist lives in a world that is rapidly becoming diffuse, fluid and protean. Games are played with identity-shifting avatars that inhabit virtual domains. These could be dismissed as comical froth until it is realised that these games are based on techniques used by designers, architects, logistics professionals and the military. The romance of our times is technological; the dystopian futurology of recent film and cyberpunk fiction is usually set amid global networks, humanoid replicants and autonomous robots with superhuman powers.

So what? Such fabulation is surely not something that need concern artists intent on depiction and expression? Not so. In fact, quite the opposite. The last decade has seen the rapid migration of digital technology into the arts. Representational, conceptual and performance artists have used it to play with space, time and authorship. Performance artists like Stelarc and Orlan are transforming the expressive properties of the body and transmitting them around the globe in real time.

Stelarc, for one example, aims to create a robotic arm, controlled by nerve impulses from his own body and from the bodies of others. Orlan, with rare courage, radically alters her appearance with repeated cosmetic surgery to raise consciousness of the degree to which the female body is seen as an object for manipulation. The operations and their effects are transmitted over the internet as they are carried out.

Both artists are making profound points about the use of, abuse of, and potential technological replacement of the body. Recall that for Merleau-Ponty the body had various necessary characteristics, one of which was expressivity, both as perceived and as used. That is, it is impossible for a human being to act or to see the body of another without expressing or attributing some emotional charge. Without this fact, the work of Stelarc and Orlan would have little or no impact. Technology, although it too comes with constraints, allows the expressivity of the body to be explored and exploited in new ways.

Exploring means investigating limits, which in the cases of Orlan and Stelarc mean limits on what can be done to the body. Such exploration of embodied constraints is so extreme that it becomes

emotionally charged, even horrifying. By contrast, the lack of embodied constraint is what made early electronic music dull and lifeless. Jaco Pastorius, Luciano Pavarotti, Glenn Gould or Django Reinhardt, for some of many examples, are exciting because one can actually hear them exploring the limits of embodied constraint, pushing their techniques as far as they can. Electronic systems, with no need for dexterity or breath control, are dull by comparison.

The installations of conceptual artists like Dan Graham and Anne Dolven play with space, time and human action in ways that break the natural flow of events. Using the technology that now surrounds and intimately interacts with peoples lives, particularly urban lives, they present, re-present and manipulate events. These events often involve the people who view their work, and in doing so, expand our notion of fine art. In Benjamin's terms, they are detaching their work from conventional techniques of representation and hence diversifying the tradition. For example, in works by Anne Dolven the notion of portraiture is subtly challenged when one realises that what is on view is not a photograph but a video of someone keeping very still.

The notion of the single artist is challenged by works of assembly involving the massive archive created by the continual making, re-playing and re-assorting of video recordings. This is the stock in trade of reality TV, security organisations and the police. Our culture is now electronically retentive in ways that could hardly have been foreseen even twenty years ago. In the wake of the July 7th. attacks, video records of the bombers as they closed in on London, along with the thousands of pictures taken by the public, are a living art object, yet to be assembled.   Like the records of September 11th. attacks, they are destined for iconic status.

The resources now available to capture and edit digital images opens up a vast area for creative work. David Bailey's work with multiple images and works that were transmitted over the internet extends the ideas of location, assembly and reproduction as part of the artistic process. Cindy Sherman uses multiple representations of herself in different contexts, poses and costumes to play with the notion of identity. What can be meant by mosaic, *collage, object trouve* and *trompe l'oeil* are all under productive de(re)construction. Although it is text-based, the explosive growth of the Wikipaedia demonstrates the possibilities for expanding the meaning of collective authorship. The co-operation of many people in continually refining a body of information would have surely warmed the hearts of Enlightenment Encyclopaedists. If this can be done for texts why not for graphics and sounds? Given the increasing speed of the internet it could even happen in real time, perhaps as part of a performance.

The advent of autonomous agents also has intriguing implications for co-operative creative work. An autonomous agent is software with elementary intentionality. That is, it interprets its inputs and acts purposively towards them. It might, for example, act as an arranger of meetings for a group or keep a record of email exchanges or carry out instructions from brokers to buy and sell stock according to market conditions. Such systems have been in use in commerce and industry for some time. There is nothing in principle to stop them becoming involved in the production of works of art, much as Renaissance painters used to employ pupils. For example, one could imagine a team consisting of people and agents producing artworks in the style of, say, Mondrian.

Such examples inhabit the borderlands between science fiction and technological fact. This is an area for discovery through play. What has already been discovered has changed our culture, with the result that the past is not what it was and the future arrives sooner than it did. As digital techniques become naturalised within the artistic community, original ways of balancing creative possibilities with embodied constraints will be discovered and explored. The naturalisation of technology is more than just acquiring new skills. It is also a remaking of human consciousness so that we experience the world differently. Our perception of urban life is conditioned by the existence of the car. Our experience of getting old is conditioned by the existence of joint-replacement surgery and Botox. Our perception of parts of the world we've never seen is conditioned by television. The naturalisation of technology is not just, in Heidegger's sense, the 'disappearance' of the tool in the task. It is more, as McLuhan put it, that "We make our tools, then our tools make us."

Creative uses of Technology.

What, then, of the embodied action that is so central to the self-making of the human mind, according to Merleau-Ponty and Dewey, especially in the early stages of life? What, too, of the bodily metaphors that Lackoff & Johnson claim underlie the creative use of language? Does the technology that surrounds us from our earliest years distance us from the bodily origins of knowledge and cognitive skills? As this technology becomes naturalised and more mind-like and even sociable, perhaps cognitivism's view of mental life will prove to be more enduring and to offer more insight than a view based in embodied action?

This is unlikely to be the case. Although technology is important for adults is less so for infants even though the world of the infant too is influenced by it as any other areas of life. In the world of infants and young children the body is still the primary instrument of knowing and active.

Embodied engagement with the world remains the fundamental means of creative discovery, no matter how much time is spent with technologised toys or in front of screens.   Thus, if some of the scenarios imagined above are to have any creative significance, perhaps technology will need to be used in ways that retain something of the child-like, embodied and playful character of the early development.

Technology is used creatively when it does more than merely amplify or accelerate what can be done without it.   Walter Benjamin realised that technology would have a profound impact on how works of art are perceived, but he had less to say about how it might effect how they are produced. Of course, what technology has enhanced beyond measure is not the production of works of art but the military, agricultural and civic resources that have characterised leading civilisations down the ages.   The arts reflect this, in the sense of depicting it, but the technology of depiction is not at the leading edge. Indeed, why should it be? No civilisation ever enlarged its empire by use of fine art. However, now, with the latest phase in the evolution of technology, there is more reason than ever to think that it can play a significant role in creative work.

Technology has evolved as the sources of power, in both the physical and political senses, have shifted.   When muscle power dominated, technology concerned making the materials and machines to harness it. In the era of heat engines, technology turned to extracting and moving material on a massive scale that muscle power simply could not manage. Machines rapidly outstripped human physical skills so completely, that it transformed society. Now, in the post-industrial age, what Baudrillard calls the age of the code, technology concerns itself more with information than matter and mental skills are increasingly exercised by machines.

In this progression there is a move away from embodiment. Paradoxically, it is this that opens the way for the creative use of technology. Computer based technology now deals with the models and symbols that underlie things ranging from the sequencing of DNA to the control of airliners. It is not a replacement for embodied skills but it can work in an intimate, complementary relationship with them. There is nothing that is directly creative or expressive in this at present but there is every reason to think that technology like this could also be used in producing shapes, colours, sounds and movements in ways that blend the powers of computers with the natural expressive resources of the body.

This would go beyond the work of artists like Peter Latham, who use computers to create structures by means of genetic algorithms. Fascinating as this is, it reduces the role of the artist to selecting

between what the computer produces. What would be far more significant, in real creative terms, would be systems where the actual embodied skills of artists could be expressed through computer systems in ways that led the artist on to new ways of seeing or manipulating their subject matter. If technology allows what an artist does to be done in a novel way, it may open up news avenues of creative expression, so long as the technological means being explored has some characteristic constraints of its own.

Here one recalls the pictures of Matisse drawing by means of a stick. Dewey, in his work with Matisse, was interested in how the artist actually interacted with the media that he used. If the differences between brushes held in the hand and tied on a stick were merely side effects of having to paint on the ceiling then there was not much of significance in it. If, however, Matisse was experimenting with ways to depict and imagine, then Dewey was interested. Similarly, if technology is merely to overcome physical constraints, then it is of less interest than if it opens out new possibilities for expressive action, even if those come, in turn, with their own constraints. In which case those technological systems that would hold some creative potential are those which introduce a discontinuity in the way the creative impulse emerges into the world rather than just a linear extension.

Were this to become possible, and it will, the shift to embodied treatments of cognition would be a significant guide to how to design and to use such systems. The shift prompts psychologists to realise that mental life is attached to embodied action in far deeper ways than we had suspected. Lackoff and Johnson have revealed the bodily origins of metaphorical, that is creative, speech. Merlau-Ponty and Dewey saw in the creative act the discovery of the possibilities inherent in situations, materials and techniques. So, if technology merely produces a simulacrum of the real world, or simply amplifies what artists do anyway, then it will lead to little more than exact but dull artificial music or technologically superb but characterless plastic recorders. The glittering prize would be the electronic equivalent of the ivory instrument; a system that does not so much remove constraint from the creative process but allows embodied skills to be expressed in radically new ways.