

Art after Computing

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Abstract

The computing revolution has had multiple impacts on the arts. This paper follows three related strands of techno-cultural development relate to the interactions between computing and arts practices over the last quarter century. The first strand, aesthetico-theoretical in nature, is recognition of the radically new kinds of cultural practices made possible by real time computing (especially interactive practices) and the complementary recognition that new modes of performative and relational aesthetics are called for. The second strand concerns the tacit or covert incursion of ideologies of computing into arts practices and the possibility that such ideologies may have had the pernicious effect of devaluing or disenfranchising, or simply rendering invisible or irrelevant, traditional practices and values which themselves may have been inadequately or poorly explicated. The third strand tracks the collapse of the cognitivist and simplistically Cartesian worldview around which ‘good old fashioned artificial intelligence’ (GOFAI) and cognitive science were framed, and the emergence of situated, embodied, enactive and distributed paradigms of cognition.¹

The argument of this paper is that these strands can now be woven together in the contemporary possibility that ‘post-cognitivist cognitive science’ (PCCS) might offer a new way of speaking about, and validating, the embodied and situated intelligences of the arts, which might both correct the relegation of the (plastic and performing) arts to second-rank intellectual status, and provide ways of considering the performative/embodied nature of the arts of real-time

¹ ‘GOFAI’ was coined by John Haugeland in his *Artificial Intelligence: The Very Idea*, (1985), MIT Press.

computing, leading to more a satisfactory theoretico-aesthetic corpus.²

Introduction – a braid of three strands

This paper takes an heterogenous overview of technological changes over the last twenty-five years, and their impact on the arts. I deploy a hybrid historical/theoretical approach which engages both material and socio-cultural and intellectual histories. I follow a three-stranded approach, looking at the impact of the technologies themselves and the rhetorics reified in and surrounding the technologies. The three strands I identify entwine themselves over the last quarter century in complex ways.

The first strand is the rapid development and diversification of digital and computer based arts and cultural practices. I begin by discussing, in broad strokes, technological changes over the last twenty-five years. New technologies have supported the development of new and hybrid practices, not least the entire realm of interactive cultural practice based on real-time sensing and computing.

The second strand is the effect of computational appliances and the rhetoric they inhere and are immersed in, upon traditional arts practices. New technologies have changed the ways traditional practices are pursued and perceived. Simultaneously, the cognitivist paradigm was carried, on the backs of computer commodities, into popular culture, and into the artists' studio. By this mechanism, Cartesian dualist thinking has been retrogressively reinserted into practices and discourses whose traditions and paradigms of practice implicitly reject them.³ It is therefore important to elucidate the commitments of the 'computationalist world view', and to examine the ways in which these might enhance or conflict with the

² A previous draft of this paper was presented at the Alice Kaplan Institute for the Humanities, Northwestern University, 20 October 2010.

³ Philip Agre has eloquently discussed this 'imperialising' of computational discourse, and the complexity of these 'borderlands' where communities engage in the merging of computational techniques and previously non-computerised practices, in his 'Towards a critical technical practice – lessons learned trying to reform AI.'

‘practice-worlds’ in which computers have been deployed.

The third strand is the radical changes in theories of cognition over the same period. To understand this strand we must first examine the philosophical commitments of the cognitivist/computationalist view of cognition, its double influence on notions of human cognition and on notions of intelligence in computational systems. In an ironic historical turn, as the cognitivist paradigm was carried into far-flung territories of popular culture, it was simultaneously under some stress at its center, in the worlds of AI, robotics and cognitive science. Over roughly the same quarter century period, in response to the crisis of the the cognitivist paradigm, and the perceived failure of its explanatory power, new conceptions of brain, body, mind and world began to take critical hold and new avenues of research opened up in neuroscience and cognitive science.

The culmination of this three-stranded braid is the proposal that these new conceptions of mind and cognition, I argue, offer new critical purchase upon and new modalities for the discussion and understanding arts and cultural practices in general, and digital arts practices in particular. This culmination has itself three aspects:

- a re-evaluation and re-valuing of arts practices, a way of discussing traditional practice which helps us understand embodied intelligence as intelligence per se, and thus corrects some of the excesses of dualist academic epistemologies;
- a new aesthetic-theoretical context for interactive and digital practices;
- a way to rehabilitate conceptions of intelligence from the excesses of cognitivism, which in turn suggests a reconsideration of the hegemony of the symbolic in the academy.

This application of PCCS to the arts is not a one-way street: the engagement of these practices within such discourses brings rich and complex examples and

case studies to post-cognitive cognitive science.⁴ I close by enumerating some of the opportunities for practice and research which have thus opened up.

How did we get here?

An historically singular collection of technological developments occurred in the second half of the C20th, beginning, if you like, with the invention of the transistor, which led to a culturally explosive moment in the 90s. The miniaturization and mass production of microprocessors led to the rapid growth of a new industry, which in turn placed computational devices in the hands of many, in diverse contexts outside of the techno-scientific world. Rapid development and diversification of applications ensued in the context of blindingly rapid technological development. In short order we have seen the birth and popularisation of desktop multimedia, desktop publishing, interactivity, real-time graphics, 3D animation, immersive interactive environments, the internet, the world wide web, digital video, various classes of computer and net based gaming, online commercial and social networks and virtual communities. Through the 90s, a kind of technological vertigo was a fact of life. The learning curve of tools and technologies was often shorter than their presence on the market. A confusion of practices, rhetorics and transdisciplinary ideas characterised the period as people tried to make sense of this new context.⁵

Through the current decade (2000-2010) we have witnessed a clear historical transition, which we can usefully compare to the physical phases of, for instance, water. According to this metaphor, the historical process of the development of

⁴ Initiatives in this area are emerging, such as the (current) study of distributed cognition in choreographic development, by David Kirsh with the Royal Ballet Company.

⁵ See my *Desire for Virtual Space: the Technological Imaginary in 90s Media Art*. Ed. Brejezk, Thea et al: *Space and Desire. Scenographic Strategies in Theatre, Art and Media*. Zurich University of the Arts, ZHdK Zurich 2010. (In this I make reference to my previous writing. When I see this in other papers I find it irksome and it invokes suspicions of egocentrism. I therefore want to make clear that I am doing this specifically in this context because it is the first time my writing will be translated into Russian.)

digital technoculture has transitioned from a gaseous, undefined period (80s), through a flowing and flexible period (90s) to the current period of crystallisation. This crystallisation is evident in the technologies themselves and in their socio-cultural placement. Indeed, when such technologies find a socio-cultural niche and functionality this always puts the brakes on technological development, especially at the level of the interface, as marketing imperatives dictate that regardless of changes 'under the hood' the device and its interface must be historically continuous. Thus for instance, while automotive technology has changed radically - cars are now full of computers and even have electric motors - the basic topology of the control interface (dials, levers and pedals), seating positions and general physical configuration has remained fossilized and resistant to change for almost a century.

Inevitably, as potential professional and cultural applications of these technologies are confirmed (in provisional contexts such as the art world and youth subcultures), markets emerge. Certain functions and combinations of technologies become commodified and socially instantiated. A winnowing occurs and other forms go extinct. As capitalist economies of scale come into play, a technological 'chunking -up' inevitably occurs. Simple components are combined in increasingly complex and purpose specific ways which inhere specific notions of function and design (such as the false transparency of plug'n'play). These assumptions float on a sea of usually unenunciated and often unrecognised ideological and philosophical commitments.

The question of why an artist would want to explore or deploy computational technology in the process of artmaking doubtless has as many answers as there are artists. Likewise the work of technologists who have been drawn to realize, in some technological context, something they regard as 'aesthetic'. As anyone who has considered the field for any time will be aware, many of these positions are influenced by vapid popular technological rhetorics of convergence and

techno-utopianism, by dated notions of art, preoccupied with self expression and of 'art for arts sake' and by more or less sophisticated takes on the work of fashionable theorists. (see my 'Desire for Virtual Space'.)

It goes without saying that practice in the area has been inherently interdisciplinary. Some of the most interesting work has been produced by practitioners who possess a solid technical grounding in the fields they trespass into and also engage the styles and commitments of these fields. Moreover, any good interdisciplinarian must engage these fields vis avis each other, comparing methodologies, principles and cultural milieu. In the 'liquid' phase, such interdisciplinary training was generally hard won by by autodidacts. The academic component of the process of crystallisation is the progressive institutionalisation of a recognized range of learning and practices, which soon cease to be identified as interdisciplinary and become a discipline, heterogenous like any other.

In my opinion, some of the most thoughtful technological art practices engage the intellectual challenges at these interdisciplinary nexi. The work of artists such as Paul De Marinas, Natalie Jeremijenko, Nell Tenhaaf, Catherine Richards or Chris Csikszentmihaly among numerous others, function as meditations upon or interventions into techno-cultural discourses. Such work, one might say, assigns a rhetorical function to the aesthetic in service of the discursive. But such practitioners would eschew the intentionally didactic, as this would betray a basic commitment of contemporary art practice – a commitment to an enlightened pedagogy of active subjective inquiry.

Over roughly the last twenty-five years then, computing has come into culture, and in a period of explosive development, they have co-evolved. While techno-utopian rhetoric of convergence is accepted uncritically in some quarters, for me, the image of a tsunami or a train wreck is far more illustrative than and image of

the untroubled confluence of two streams. It is a highly charged context, a veritable crucible, a hothouse in which a new technology, which inheres certain philosophical commitments, has collided with traditions of practice of utterly different ontological commitments. Over this period artists have played an active role, grappled with issues theoretical and technical, and have contributed to the development of the situation.

And where are we anyway?

I propose that this historical period is now over. Over the last decade or so, the material ground upon which 'media arts' is practised has changed substantially. The problem for practitioners on the 90s was usually that the technology didn't exist, or did not have the required capabilities. As such, the task of the artist was often to imagine and develop the technologies themselves, from relatively raw components. While onerous, this tended to ensure the synchronization of aesthetic goals with technical form. In this decade of chunked up purpose built technologies, this heterogenous complexity poses new problems for experimental arts practices in the field. The task is more to disentangle functionality from the sedimented imbrications of purposing, or at least to proceed with an awareness of such imbrications, such that plugging and playing can occur in relatively well informed way which does not create unintentional boobytraps for the artist's intentions.

The crystallisation of new techno-social milieu and techno cultural genres has a major impact on arts practices in the field. Cultural instantiation opens the way for new industries, career paths and college degrees. Entire fields of practice emerge (and die) within and upon these new, niche commodity devices – gamemodding, avatar building, smartmobs, flash animation for cellphones, geocaching applications for GPS capable PDAs. The line between techno-aesthetic inquiry and device specific application development becomes blurred,

as perhaps it should. The class of practice that in the 'liquid' unfortunately acquired the moniker 'new media' is now referred to in some quarters as 'Old School New Media' (As Edo Stern characterizes it).

I accept that there is a generational aspect to this line of argument – as many 'old school' video artists remain resistant to the digital, so a new 'old school' of first generation digital artists sense an historical shift which casts their goals and preoccupations in a yellowing light. And indeed, issues which that generation took to be worthy of aesthetico-theoretical pursuit - the gap between their aspirations and the capabilities of the technologies – were in part determined by the comparatively rudimentary and ill-formed technology at their disposal. It should be noted that this aesthetic pursuit itself contributed to the development of those technologies. Virtual communities such as Second Life and the diversity of multiplayer online games stand on the shoulders of the unacknowledged work of a generation of artists (including artists as diverse as Jane Prophet, Stelarc and Char Davies) who in a plethora of ways, labored to bridge the 'embodiment gap' by articulating various forms of animated avatars in various forms of online navigable virtual worlds.⁶ One can likewise draw the lines of mostly unwritten histories of artists' development of hypertextual and multimedia literature, vision-based interaction, social robotics, web-based systems and various genres of HCI and UbiComp.⁷ As these concerns have moved out of the rarefied and often ghettoized worlds of the computer arts community - like a grub turning into a butterfly - and have been transformed into industries, a great historical erasure has occurred. In a sense, the furious cultural maelstrom of the 90s which asked of computational technologies: 'What is this stuff?' and 'What should we do with it?' has been answered by capitalist historical process – it is for gossiping, for inducing sensational emotions, and for selling things, especially itself.

⁶ and who, in turn were elaborating the aspirations in 80s telematic art practices.

⁷ See my *Bridging Two Cultures – towards a history of the Artist-Inventor*. In *Artists as Inventors, Inventors as Artists*, anthology of Ludwig Boltzmann Institute, Austria. Eds: Daniels and Schmidt. Pub Hatje Cantz. 2008

To cultivate discomfort

Yet I think we must resist our inclination to complacency resulting from our increasing comfort with and acclimatisation to our digital widgets, for the following reason: Some of the deep and fundamental questions remain undigested and subtle shifts (and not so subtle shifts) in practices and expectations are occurring seemingly unnoticed. I have been writing (etc) on this topic now for nearly 25 years. I feel there is reasonable cause for concern. The fact that this concern seems not to be widely shared is rather troubling.⁸ So let me try to enunciate just what I think is at stake. This is by no means a naively luddite sentiment, but a call for deeper analysis of a complex and far-reaching techno-cultural sea-change.

Two great fictions have accompanied the arising of digital technology. The first is the utopian rhetoric that the technology is so new and different that history is not relevant. The second is that computational technology is neutral and applicable to all walks of life. Regarding the first we should recall George Santayana's famous aphorism that *'those who cannot learn from technology are condemned to repeat it'* and simultaneously consider the work of social historians of technology such as David Mindell who wisely notes that *"Our computers retain traces of earlier technologies, from telephones and mechanical analogs to directorscopes and tracking to radar."*⁹

This observation affords purchase on the second fiction. Boolean logical operations instantiated in miniaturised electronics did not fall from the sky fully formed. They are the cumulative products of particular kinds of people with

⁸ I have been preoccupied with this theme since the publication of my *Simulation Digitization, Interaction: The impact of computing on the arts*. Artlink V7 #3,4. Art. South Australia, 1987.

⁹ *Between Human and Machine: Feedback, Control, and Computing before Cybernetics*. David A. Mindell (Johns Hopkins Studies in the History of Technology, 2004, p16).

particular training and commitments, ensconced in particular kinds of institutions in specific historical contexts. Recall for instance Paul Edwards work where he states: *“the historical trajectory of computer development cannot be separated from the elaboration of American grand strategy in the Cold War. Computers made much of that strategy possible, but strategic issues also shaped computer technology - even at the level of design.”*¹⁰ He continues: *“For two decades, from the early 1940s to the early 1960s, the armed forces of the United States were the single most important driver of digital computer development”*... *“Though most of the research took place at universities and in commercial firms, military research organisations such as the Office of Naval Research, the Communications Security Group...and the Air Comptroller Office paid for it.”*¹¹ The US military was demonstrably a major force behind computer development as the digital computer was utterly integral to the rhetoric and practices of the Cold War. The military not only funded it, but *“practical military objectives guided technological development down particular channels, increased its speed, and helped shape the structure of the emerging computer industry.”*¹² Thus the SAGE system and the related Whirlwind project inherited many of the characteristics of what was to become the PC. At deep and structuring levels (both technical and rhetorical), those agendas have shaped the machine which is now deployed for cultural purposes. It is as if we sent a swat team into battle with the best hairdryers and toaster-ovens money could buy.

There are differences of opinion as to the implications of this heritage. It is at least possible that the long-term entwinement of the development of computing with military agendas has left the technology with a particular cast which inflects everything we do with it. I have referred to this as the Trojan Horse syndrome.¹³

¹⁰ Edwards, Paul. *The Closed World: Computers and the Politics of Discourse in Cold War America (Inside Technology)* MIT 1997 p2

¹¹ *ibid* p43.

¹² *Ibid* p44.

¹³ see my *Experience and Abstraction*. *Fibreculture* online journal. 2008

http://journal.fibreculture.org/issue11/issue11_penny.html also in Spanish in *Experiencia y abstracción – el arte y la lógica de la máquina* (translation). In *Arte, ciencia y tecnología. Un panorama crítico*:

Such ideas are often shrugged off, but to me this shrugging itself smacks to me of history-denying industry rhetoric of neutrality and generality. The task of critical analysis of ideas reified on software and hardware is just beginning in new fields such as software and platform studies. At the level of interface, the very fact that we sit at a desk to use a computer is proof enough of the kinds of tasks it is designed for. The related question of whether this is good technology for making culture seems to have got lost in the scramble to be technologically current.

But my critique goes beyond identifying the (military) skeletons in the closet. The development of computing technology has occurred within the intellectual context of the discipline of Engineering, characterized by commitments to positivism, objectivism, and instrumentalism, to symbolic abstraction and Cartesian dualism. What more resounding reification of Cartesianism do we have than the pervasive hardware/software dual, an article of faith in computer science? It is worth noting that the rhetorical opposition of hardware and software is, on the material level, a fiction. But it is more sobering to similarly recognise that the Cartesian Dualism on which it is based, and which has structured western philosophy, is likewise a metaphysical notion without a shred of scientific evidence to support it.

The scientific or scientised disciplines have steadily tuned systems – epistemological and technical – for the distribution and elaboration of a worldview which validates modes of abstract symbolic representation. The arts have been utterly othered in this process by their commitment to unmediated (or non-semantically mediated) sensorial immediacy. The arts are discursively snookered. A commitment to the specificities of materiality has obviated any possibility of making a case within the regime of generalized symbolic abstraction. Hence the (modern) intellectual marginalization of art and artists.¹⁴

programación de formación La Ferla, Jorge (compilador), Buenos Aires: Espacio Fundación Telefónica. ISBN 978-987-24475-8-8 2010

¹⁴ Arts practices are, I would say natively, perhaps naively, phenomenological, as phrasing such as ‘stupid like a painter’, and ‘not very clever but good with his hands’ attest.

Now that we're here, what do we do now?

An ironic historical twist now offers us the opportunity to reconsider the question of intelligence, and thereby reposition arts practices within a broader notion of intelligence. The irony is this: Around mid-century, not accidentally contemporaneous with the rise of digital computing, a notion of intelligence emerged which came to be called Cognitivism (or Computationalism). This idea held that cognition consisted in the manipulation of symbolic tokens by logical rules, in this case in the brain. This Platonic conception was supported by the Physical Symbol System of Newell and Simon, which also provided the basis for Artificial Intelligence. Thus arose a Janus-headed thing, circular and self-reinforcing argument in which brains were held to be intelligent because they behaved like computers and computers were intelligent because they purportedly manipulated symbols in a way analogous to brains. These approaches had the odd effect of implicitly asserting abstract symbol manipulation as the culmination and the goal state of intelligence, as opposed to being part of the processes by which animals and people achieve things in the world. (This in a nutshell captures the difference between the mid-century cybernetic conception and the later symbolic AI conception of intelligence.)

A generation later, cracks were appearing in the edifice of AI, chiefly around the so called 'common-sense problem' (Minsky). The common sense problem arose because it became evident that computers precisely were not good at achieving things in the world. Hubert Dreyfus, applying a phenomenological critique, presciently signalled this crisis in his *What Computers Can't Do* (1972).¹⁵

¹⁵ What computers can't do: A critique of artificial reason, by Hubert L. Dreyfus (MIT 1972) updated as *What Computers Still Can't Do: A Critique of Artificial Reason* by Hubert L. Dreyfus (MIT 1992) A book which was roundly despised by most AI people. Stevan Harnad's paper on the 'Symbol Grounding Problem' (1990) addressed much the same territory. Oddly the matter is still being discussed in AI circles - see for instance <http://www.aaai.org/AITopics/pmwiki/pmwiki.php/AITopics/CommonSense>

During the same period, under pressure from the 'common sense' crisis, cognitivist ideas of the nature of cognition, and in particular the commitment to a thinly veiled Cartesianism, came increasingly into question. Over the succeeding two decades, new formulations of cognition have been presented, which in different ways have questioned the nature of cognition. Cognition is held not to occur (exclusively) in the head, nor in some immaterial space of logical manipulation of symbolic tokens. These approaches, in different ways, propose that cognition is embodied, integrated with non-neural bodily matter, or that it extends into artifacts, the designed environment, social systems and cultural networks. Such paradigms have arisen in neurosciences, cognitive science and the philosophy of mind, and include:

- the Situated Cognition of Lucy Suchman,
 - the Enactive cognition of Varela, Thompson and Rosch, and more recently Noe and O'Regan,
 - the Distributed Cognition of Ed Hutchins,
 - the Epistemic Action of David Kirsh,
 - the embodied Cognition of Mark Johnson,
 - cognitive linguistics of Lakoff, Fauconnier et al,
 - the dynamical and emergent approaches of Beer, Kelso et al,
 - the Neural Darwinism of Gerald Edelman,
- the biology of non-cranial and non-neural sensing and learning (such as work on cognition in the immune system), sometimes called psycho-neuro-immunology
- the postcartesianism of Antonio Damasio,
 - the Extended Cognition of Clark and Chalmers and more recently
 - the Cognitive archeology of Lambros Malafouris.

While these and related hybrid approaches vary and often disagree on details, they generally assert that we cannot meaningfully speak of intelligence as occurring inside the skull, connecting to the body and the world via mechanistic

sensors and effectors. On the contrary they assert that cognition is biologically material and embodied and discussing it outside such contexts is of dubious value. Furthermore, cognition is dynamic, it occurs in an ongoing temporal unfolding, a relational engagement with architectures, artifacts, tools, language, human (and interspecies) relationships and social systems.

We find ourselves at a curious moment when computationalist theories of cognition have been hoist on their own petard as it were, and new perspectives have come forth which offer the possibility of a significant reconfiguration of notions of cognition and intelligence. This, I would argue, is of substantial import for theorisation of cultural practices. We now have an opportunity to reexamine, reconsider and reevaluate cultural practices through the lens of these new approaches to cognition – and indeed there is a groundswell building in this area, which in some quarters is referred to as the ‘cognitive turn’.

The (rise of the) Cognitive Unconscious

These positions, taken together, imply a Kuhnian ontological shift. Such shifts are by nature, challenging and tend to polarise communities – some find such ideas easy and other find them difficult to embrace. So I will briefly elucidate, taking the notion of Cognitive Unconscious as elaborated by Lakoff and Johnson as a theme. One aspect of my argument for a conception of embodied intelligence is the acknowledgement that, as a result of cognitivist paradigms and the acceptance of introspection as a philosophical technique, we have come to privilege consciousness and ignore the obvious fact that we survive through acts of unconscious intelligence. Consciousness itself depends upon and sits atop an edifice of unconscious processes. The image of an iceberg is apropos, not simply because of its’ below-surface volume, but for the very image of the water surface, a surface that is permeable and fluctuating.

Hubert Dreyfus elucidated a process of learning in which tasks begin as explicit,

conscious and reasoned, and become increasingly automatic.¹⁶ Lakoff and Gallese have argued for the origins of concepts in sensorimotor circuits,¹⁷ and Lakoff and Johnson have argued that the method of introspection is of little value as we only have conscious access to perhaps 10% of mental/brain activity.¹⁸ Long ago, Lettvin, Maturana et al demonstrated that the frog's eye is far from a camera for the brain. The topological organization of rods and cones, neurones and synapses perform image analysis, that is, perception.¹⁹ Neuroethology is replete with similar evidence.²⁰ The picture that arises from all this is that 'intelligence' permeates the physical body, and non-neural tissues of all sorts partake in its circuits. Further, intelligence is enacted in ongoing temporal engagement with the world, a world that is 'always already' prestructured with the armatures of culture. And it is these armatures, from tools to town layouts to language itself, that bootstrap an infant mind into culture and provide a scaffold to be leveraged by the acculturated adult mind.

Embracing such ideas and applying them to a theorization of arts practices, in my opinion, holds a huge potential for the way we understand arts practices and their position on larger culture. For if cultural practices – be they dancing or throwing a pot – are the result of techniques learned in a Dreyfusian sense, then some large part of practice consists in intelligent judgements made below the level of consciousness, and indeed, this is precisely what Csikszentmihalyi identifies as the 'flow' state.²¹ That is not to say that such practices are entirely unconscious.

¹⁶ Dreyfus, Stuart E.; Dreyfus, Hubert L. (February 1980). A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition. Washington, DC: Storming Media.

¹⁷ Gallese and Lakoff. The Brain's concepts –The role of the sensory-motor system in conceptual knowledge. *Cognitive Neuropsychology* 21, 2005.

¹⁸ Lakoff, George, and Mark Johnson. *Philosophy in the Flesh : The Embodied Mind and Its Challenge to Western Thought*. Basic Books 1999

¹⁹ Lettvin, Jerome, Humberto Maturana, Warren McCulloch, Walter Pitts. What the frog's eye tells the frog's brain. *Proceedings of the IRE*, Vol. 47, 1959.

²⁰ See for an overview, MacIver, M.A. *Neuroethology: From Morphological Computation to Planning*. The Cambridge Handbook of Situated Cognition, Robbins P. & Aydede, M. (eds). Cambridge University Press 2008

²¹ Csikszentmihalyi, Mihaly. *Creativity: Flow and the Psychology of Discovery and Invention*. Harper Collins 1996

John Sutton has argued for a subtle interplay of the conscious and unconscious, of automaticity, awareness, memory and introspection in playing sports, and if this is the case, such complexity is wildly enriched in arts practices, where there is intent on the level of conceptions of historical and cultural context, and of predictions of audience perception and reception, in addition to simply wanting to hit the ball well. ²²

If 'the body' behaves intelligently in direct sensorimotor engagement with the world, then the notion that intelligence dwells in the logico-mathematical manipulation of symbols in some immaterial Platonic idea-space comes under some pressure. And this itself might lead us to reflect on the valorisation of modalities of symbolic representation in our intellectual culture, modalities such as text and numerical expressions.

Conclusion

I have followed three parallel themes here:

The reconfiguration of arts practices under the influence of digital technologies. The utilisation and development of computer tools has brought forth a diversity of new practices has emerged involving attitudes, techniques, processes, media and devices due in large part to the implementation of machine based behavior rooted on real time sensing and computation. The task of designing such behavior calls for aesthetic and theoretical support largely absent from traditions of theorization in the (plastic) arts, for obvious reasons - until now, such practices have not had the capacity for ongoing dynamic change.

This more spectacular aspect has obscured another development which has received little attention - traditional practices have undergone significant change under the influence of computational technologies and discourses.

²² Sutton, John (2007) 'Batting, Habit and Memory: The Embodied Mind and the Nature of Skill', *Sport in Society*, 10:5, 763 - 786

The third theme is the reconfiguration of notions of cognition and intelligence under the influence of computational paradigms. Over the roughly half a century, we have seen the rise of computationalism, the failure of its explanatory power, and the proliferation of post-computationalist approaches to the subject. These latter, in my opinion hold the promise of new ways of thinking about arts practices.

Although the changes in computational technologies and paradigms are of huge popular interest and some attention has been paid to the question of cognition, some of the deep and fundamental issues remain undigested and shifts (subtle and not so subtle) in practices and expectations are occurring seemingly unnoticed. If my analysis is valid, then a range of new approaches and research areas now present themselves as agendas for theory and practice :

Postcognitive theories of mind and life. In the spirit of cybernetics and autopoietic biology, we can again think of intelligence as evidenced in successful action in the world, to see mind as biological, immanent in life, as opposed to a quasi-mystical transcendental phenomenon and discuss intelligence in a way that re-emphasises relationality, contextualized by embodiment and situation. This move redresses the excesses of cognitivism and builds conceptions of intelligence and cognition which more truly reflect the realities of intelligent human action in the world.

The reevaluation and revalidation arts practices through the lens of postcognitive conceptions of cognition and intelligence. To conceive of action in the world as constitutive of intelligence is an ontological shift with major repercussions for art theory which affords the opportunity to evaluate and discuss practices in the arts (and related areas) in terms of embodied and situated cognition. Such attention may also put some pressure on the academic bias of the academy which privileges knowledge encapsulated in abstract symbolic

terms.

Cultural ethnography and cognitive anthropology. If practices have changed rapidly, then there is a clear call for an ethnographic project in arts practices to examine the impact of computing on practices in the arts – to ask what has been lost, what new has emerged, and in general how has the ubiquity of computation affected practices – while such practices survive, at least in memory. This is not just a call of a nostalgic oral history. Such research can not only mark such changes but contribute to the development of culturally enriched theories of cognition.

Build a new aesthetico-theoretical corpus which is applicable to and explanatory of cultural practices in computational milieu. Although theoretical work on digital cultural practices has been appearing increasingly in the current decade – such as the work of Katherine Hayles, Mark Hansen, Lev Manovich and others, these tend to be rooted in traditions of literary criticism. Creative rationale and design methodologies related to new media modalities have received surprising little theoretical attention. While practice steams ahead, there remains a need to build theories of cultural practice relevant to cultural applications of computing and resulting complex dynamical processes. Development of discourses around the evaluation of aesthetic richness in multimodal media design, sensor utilisation, database coordination, interaction design, hypertextual strategies or the deployment of autonomous agents is needed in order to provide a theoretical grounding for discussing emerging digital cultural practices. Not simply to provide theoretical grist-for-the-mill, but to provide support for the development of aesthetically rich and theoretically sound digital cultural practices.

Simon Penny –October2010 -January 2011