

From born to made: technology, biology and space

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This paper is concerned with forging new links between geography and biology and technology by delivering a set of shocks to the meaning of accepted categories like 'nature' and 'technology'. To achieve these dual aims, the paper will double click on the icon 'intelligence'. 'Intelligence' prioritizes the *active shaping of environments*. It thereby allows space for the spaces of the world to themselves become a part of intelligibility and intellect as elements of distributed cognition *and*, as will become clear, pre-cognition. The paper argues that such a conception of sentience can provide a series of new perspectives, as well as a pressing ethical challenge.

key words biology geography technology process space ethics

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revised manuscript received 14 September 2005

Introduction

I want to begin this paper by calling on Justina Robson's (2003) book, *Natural History*. Therein, Robson tries to write a modern science-fiction fable about life and technology in which she conjures up a whole series of hybrid human–animal–machine forms of life, ending with an alien form of technology which has evolved into life and vice versa. The irony is, and of course Robson knows this very well, that all of these hybrids exist now, with the single exception that they have not always come together in single bodies easily narrativized, but are distributed. Similarly, her most alien form of life, a new material surface generating itself in many dimensions at once and called 'stuff', is a fusion of technology and organic life, which in many ways resembles most what is 'human' now in that it

is a technology and it is also people, indivisibly fused. You could not define it one way or another at any particular moment. It has no consciousness as you assume individuals must, nor does it have the insensible responses of a tool – but properties of both and also neither. It is intelligent, responsive, compassionate but it does not have an identity of its own, although it contains the fragments of many identities and is capable of creating individuals who could act and exist as ordinary people. (Robson 2003, 251)

Robson purposely makes no real distinction between different forms of matter: they can all have a kind of awareness or attunement and it is this move towards the notion of a world that is becoming more and more like 'stuff' that I want to tackle, by concentrating on forms of knowledge that are only now becoming possible – and their possible effects.

Robson wants to answer a set of questions in her book, and they are the same ones that many others also want to wrestle with, not least in the vibrant debates that currently circulate at the edges between the social sciences and the humanities and the sciences. They are: 'what is life?', 'what is human?', 'what is thing?' and 'what is intelligence?' On the whole, most participants in these debates have concentrated on the first three questions, but I want to argue that the last question is in many ways the most interesting, though it clearly cannot even begin to be addressed without straying into the territory of the other three.

In this paper, I want to argue that the world consists of a series of 'intelligencings', to use a rather clumsy phrase, intelligencings which vary substantially in their reach and understanding and interaction, and which have geographies we can and should map – 'infovorous' geographies that can and do teach us how to be, and that therefore have an important ethical dimension. In building this

argument, I want to consciously make links with and continue to build on an ecological-cum-ethological tradition that understood geography and biology as cognate subjects, but I want to do this by adding in the porous intertwining of technology, understood not just as an intermediary but as a vital component of understanding life itself. In other words, I want to redefine what is essential nature, and what the pursuit of that nature might be (Hampshire 2005) by understanding ecology as a 'cascade of parasites . . . roiling around inside each other's stomachs . . . medial organs grab(bing) hold of each other, gain(ing) purchase and insight by means of their particular capacities' (Fuller 2005, 174).

My argument is in four parts. To begin with, I shall address three of the different forms of sentience that can currently be found in the world: animal, human and thing. Then, I will argue that these forms of intelligencing are beginning to have more in common as a result of the efflorescence of a suite of 'understated' technologies which enable environments to become both extended and more active. In the subsequent part of the paper, I want to consider how we might work through the way in which these intelligencings cross with each other by understanding them as territories of instruction but working in the domain of bare life. I will concentrate, in particular, on how recent developments are producing a potential for new kinds of gathering of informed material by revitalizing a world that is often thought to be in danger of being crushed by abstract forces. In the penultimate part of the paper, I argue that one productive way of understanding these developments is as a new form of reading/writing the world, but in the pre-cognitive rather than the cognitive domain. In the final part of the paper, I want to begin to address the vexed question of ethics. Here, in line with my emphasis on intelligence, my argument is that we need to produce a politics of knowledge, based around boosting our ability *to teach ourselves to the world* (Wagner 2001) by emphasizing 'matters of concern' rather than 'matters of fact' and thereby enacting 'a wide range of transportable realities' (Law 2004, 9).

Throughout the paper, my main concern will be with how the *background of being* is changing. How the world is disclosed seems to me to be in a period of radical change. It is being added to. Moreover, this addition involves significant political stakes which in turn demand the formation of an ethics of intelligencing.

But, before I start, I need to make a number of points about intelligence. First, I take it that intelligence is not a property of an organism but of the organism and its environment. I want to move, therefore, beyond obvious organismal boundaries and towards the 'superorganismal' idea that organisms are integral with the world outside them as put forward by writers like Tansley and Whitehead (1920) in an earlier time. In Turner's (2000) phraseology, organisms are *extended*. They are extended in space as different territorial configurations with different effectivities and in time as different forms of process with different temporal signatures. In particular, Turner argues that there is no real difference between an organism and its environment. Organisms extend beyond the obvious integuments of their 'internal physiology' in persistent and systematic ways and adaptively modify their environment. Environments, in turn, can be thought of as a myriad of 'external physiologies' that have been adapted to act in roles as different as substitute or accessory organs, means of communication, or even microclimates. We now know that this process of constant bioturbation is a key element of evolution. Second, and following on, such a conception of organism has an explicit spatiality. Intelligence is a dynamic map of the way in which particular bodies are constructed. Different entities construct their bodies differently using different means of becoming and different locational anchors: for example, 'animals' can be foraging herds, or migrating flocks or hunting carnivores, each of which has their own distinctive geographies which are a part of what they are, including at what level of aggregation it becomes sensible to talk about a definable entity (Lulka 2004). Then, third, intelligence is about the capacity to lay out territories of intelligibility, environments which are predictable but which can also compel knowledge, can instruct, can teach, can make all manner of requests for significance. Environments are more than means of testing therefore. They are means of *learning*, of in-forming, if you like.

Another way of putting this is to turn to Simondon's account of overcoming hylomorphism, the form-matter model so common in Western thinking (Mackenzie 2002) (equally plausibly, recourse could be made to Whitehead's (1968) critique of misplaced concreteness, that is Newtonian science's tendency to construct ideally isolated objects as the basis of knowledge). For Simondon, hylomorphism is a 'model of the genesis of form as

external to matter, as imposed from the outside like a command on a material which is thought inert and dead' (Simondon, cited in Fuller 2005, 18). In contrast, Simondon counterposes the process of individuation, whereby materials produce their own capacities of formation in relation to the environment around them and the affordances that it offers. This focus on a dynamics of combinatorial production is similar to Deleuze and Guattari's (1987) notion of the machinic phylum in which forces, capacities and predispositions intermesh to make something else occur, and to complexity theory's notion of self-organization. Indeed nowadays it has become routine to mesh the two together (cf. DeLanda 2002; Parisi 2004), with the threshold into self-organization being crossed when what might be a motley bunch of cells or components becomes something else. Just as in the natural world, so in the technical world, there are a series of more or less temporary settlements driven by what it is possible to combine. These settlements often appear to be standard objects but they too are susceptible to constant change and mutation.

Three requests for significance

In this section, I want to briefly consider three different kinds of sentience, pointing up their qualities and biases and spatial ranges and how they add up, in order to begin to understand the new developments that are now going on. I will want to argue that current technological developments mean that human intelligence is gradually becoming attuned in different ways which mean that we can start talking about what the stuff of stuff consists of.

I will begin with animals because I want to illustrate the sheer range of different kinds of intelligence that currently inhabit the world. The problem, of course, is that, as Derrida (2002) has pointed out at length, 'animal' covers a very large range of different kinds of affects, sufficient to make it possible to question the very category itself. 'Animal' is clearly not a satisfactory descriptor, a judgement only strengthened by its association with all kinds of 'petishism' (Marks 2002) – the tendency to 'polish an animal mirror to look for ourselves' (Haraway 1991, 21), perceiving the 'good' qualities of animals as reflections of our ideal selves and projecting the 'best' human attributes onto animals.

Thus it is clear, to begin with, that animals live in what are often radically different *umwelten*; think only of the sonar of the hunting bat and its prey,

the moth, the ultraviolet light seen by birds, the infrared light seen by insects, the acute sense of smell of dogs, the electric and magnetic fields to which some fish and a few other animals are sensitive, the changes in air pressure that birds can pick up (Wynne 2004). And so on. And this is to ignore the way in which some animals have evolved senses that allow them to impinge directly into other *umwelten*, as, for example, in the case of the owl's auditory system which is specialized to the noises of its prey. Then, animals are bound up with different and diverse spaces, from the enormous territories covered by the whale or the albatross or many migratory animals to the mid-ranges of many carnivores to the micro-spaces inhabited by many insects (Clubb and Mason 2003). They also live in very different times, in terms of metabolic rates, reaction times and forms of foresight, lifespans and memories. Finally, they have widely differing degrees of individuation and social complexity, from herd, hive and swarm forms that are probably best thought of, at least at certain emergent times, as collective organisms through animals that have proto-social systems (such as dolphins or elephants or many primates) to animals that spend much of their lives alone. Further, it has become clear that at least certain animals display quite high internal degrees of variability; they may even have developed forms of social complexity that have characteristics that are 'cultural', though this is still a matter of very considerable dispute (de Waal and Tyack 2003).

In other words, animals exist in spaces and times which mean that the relation that they have to the things in an environment may be radically different from ours and each others (Hauser 2000). As von Uexküll (1945 1953) showed many years ago, there is no single world in which all living beings are situated.

The fly, the dragonfly and the bee that we observe flying next to us on a summer day do not move in the same world as the one in which we observe them, nor do they share with us – or with each other – the same time and the same space. (Agamben 2004, 40)

Rather, there are a series of 'worlds-for'. But this does not mean that these worlds-for do not relate. Of course they do. Take the spider and the fly. The threads of the spider's web are exactly proportioned to the visual capacity of the fly – the fly cannot see them and flies towards death unawares. Though the two worlds of the spider

and fly may not communicate, still they are exactly *attuned* to one another.

One argument commonly made is that there is not much difference between animals and humans and especially certain kinds of animals and humans. Usually, some form of genetic continuum is posited (for example, that a chimpanzee is genetically closer to a human than to a baboon) or a salient genetic fact is paraded, such as that we share 98.4 per cent of our DNA with chimpanzees (and probably even more with bonobos), or, alternatively, evidence of tool-using, and even secondary tool-using, behaviour or elementary understanding of linguistic cues or even the existence of proto-mathematical skills in at least some animals is mustered. Certainly, one of the key findings of research over the last 20 years or so is that animals are more rational than was formerly thought (that is, they have more cognitive and pre-cognitive capabilities), while humans are less rational than was once thought (that is, they have less unique cognitive and pre-cognitive capabilities that are able to be used as a sign of supremacy over animals). In particular, we now understand that 'instinct' does not equate with non-cognitive: an animal can have a genetic endowment that makes it behave in a particular way, but it is also able to reflect on that behaviour.

Equally, however, we are now coming to understand that there are differences between humans and other animals, what those differences are, and how these differences make a startling difference to the human *umwelten*, to the worlds-for that human beings assume exist. It is these differences that I want to concentrate on in this paper, though I shall also want to point to some of the new means of attunement of the animal and human world that are currently becoming possible.

The reason that these distinctively human differences are so important is because it becomes possible to 'learn not just *from* the other but *through* the other' (Tomasello 1999, 6) with the result that cognitive resources can be pooled and elaborated in ways that other species are not able to achieve. In other words, through a special kind of intelligencing, learning sticks and is able to be projected forwards in time.

I want to note five of these differences. First, and probably most importantly, 'interactional intelligence'. Human beings tend to have an inordinate concern with the implications of others' actions which dates from birth and before and which

almost certainly has a biological basis. This innate capacity for 'participatory thought' arising out of expressive-responsive bodily activities (Shotter 2004) can be thought of as a capacity to understand conspecifics as 'beings like themselves who have intentional and mental lives like their own' (Tomasello 1999, 5). It consists of a whole series of complexly linked behaviours including language (and associated sensibilities such as hearing that is acute precisely in the wavelengths that speech is broadcast in), face recognition, and general adaptivity to others that enable multiple simultaneous perspectives on and representations of each and every perceptual situation. In turn, this dialogical capacity allows us to do a remarkable thing, involving computational complexity that is still difficult to fathom, that is to work towards a joint coordination of actions with another human being, even when it is very difficult to say what we mean, within a very small number of steps (usually about four) in a very short space of time. Such a capacity involves an ability to make models of the other, read the 'intentions' behind action, make rapid interactional moves in the correct sequence, design actions so that they are perspicuous, and so on.

As Peirce and many more recent writers have been keen to emphasize, deduction and induction are relatively trivial human skills, of no great computational complexity: it is abduction or theory construction which is the outstanding characteristic of human intelligence. Abduction is the leap of faith from data to the theory that explains it, just like the leap of imagination from observed behaviour to others' intentions. While most explicit theories or abductions are wrong, our implicit ones about interactional others are mostly good enough for current purposes. (Levinson 1995, 254)

This process of inferential enrichment almost certainly skews our *umwelt* towards certain interpretations of how the world is. So, for example, we tend to find order where none exists, overdetermine explanations by seeking one all-explaining factor (because interaction requires single-solution thinking), assume that someone is watching us at all times, privilege animistic thinking by presuming that there must be an interactor in the inanimate world, and so on (Tomasello 1999).

In turn, this capacity of inferential enrichment is predicated on two other capacities. One is a very high degree of affective complexity arising out of concern with others' actions and an omnivorous set of senses which encourage 'range'. The affective palette that cooperative living demands means that

basic emotions like anger or fear have been progressively extended in to all manner of behavioural byways. Indeed, it has even been suggested that rationality and language have grown out of an ability to be so emotional. 'As the emotional brain developed, and we became more emotionally complex and sophisticated, more alternatives and choices arose in our interactions with others. This then required a capacity to think and reflect on our emotions, and this led to the development of the cortex, and in particular, the prefrontal cortex' (Gerhardt 2004, 35) which acts as a kind of control centre from which emotional reactions arising deeper in the brain can be modulated. The other, related capacity is a reliance on communicative movement arising out of the muscular make-up of the body and organs like the hand. As Gehlen writes,

much too little attention has been given to the ability of human beings to enjoy a wide range of possibilities for movement unknown among animal species. The combinations of voluntary possible movements available to man are literally inexhaustible, the delicate co-ordinations of movements unlimited. (1988, 120)

In a sense, human being is a whirl of movement-space. The development of a range of plastic and adaptable movements is key to human being – to the corporeal schema, to manipulation of tools and the environment, to communication, to expression, to disturbances of perception, and indeed to the whole sense of space (Vesely 2004). Just think of the enormous range of a comparatively simple gestural activity like pointing.

This sense of what the bulk of our thinking is oriented towards also suggests another aspect of human intelligence (Dreyfus 2005). That is conceptuality. Human intelligence is not necessarily linked to the world of tangible things. It has a projective capacity – imagination, theorizing, play, call it what you like – which allows it to point beyond itself to other entities and thereby generate *additional* concepts and conceive unobservable mental states which, in turn, provide it with high degrees of flexibility in both the physical and social realms. It enables human beings to construct

explanations for why we (and others) do what we do, and why the world operates in the way it does – an ability not present in other species. (Povinelli 2000, 339)

The consequence is that human being is not always constantly occupied with and in things but spends

a good deal of its time attempting to understand others in order to understand things:

to socially learn the conventional use of a tool or a symbol, children must come to understand why, to what outside end, the other person is using the tool or symbol; that is to say, they must come to understand the intentional significance of the tool use or symbolic practice – what it is 'for', what 'we', the users of this tool or symbol, do with it. (Tomasello 1999, 6)

The animal, in contrast, is to a much greater degree taken by things like food. It has less sense of such things as being-at-hand, as being disclosed. It is less able to suspend and deactivate its relationship with its specific disinhibitors so that it becomes *open to possibility*. It is more in a relation of enchantment-enchainment to the world (but see Krell 1992).

Finally, we must turn to the aspect of human being that is commonly hailed as distinctively human, namely tool use, and to simultaneously begin to address the place of things. If Heidegger was wrong about this (Nancy 2003), encouraged by his tendency to privilege human existence as the superhero that frees entities from the 'present-at-hand' realm, he was surely right about how we relate to tools. His account is familiar but it is worth reprising:

Heidegger demonstrates that our primary interaction with beings comes through 'using' them, through simply counting on them in an unthematic way. For the most part, objects are implements taken for granted, a vast environmental backdrop supporting the thin and volatile layer of our explicit activities. All human action finds itself lodged amidst countless items of supporting equipment: the most nuanced debates in a laboratory stand at the mercy of a silent bedrock of floorboards, bolts, ventilators, gravity and atmospheric oxygen . . .

Heidegger shows that we normally do not deal with entities as aggregates of natural physical mass, but rather as a range of functions or effects that we rely upon. Instead of encountering 'pane of glass' we tend to make use of this item indirectly, in the form of 'well-lit room'. We do not usually contend with sections of cement, but only with their outcome: an easily walkable surface area. As a rule, tools are not present-at-hand but *ready-to-hand*. (Harman 2002, 18)

It is unequivocally the case, in other words, that human being is *tool-being* and that the process of tuning works both ways. As Žižek puts it,

it is meaningless to imagine a human being as a biological entity without the complex network of his or her tools – such a notion is the same as, say, the goose without her feathers. (2004, 19)

Indeed the 'biological' and 'technical' are inexorably linked in ways that are biologically determined. Take the case of the hand. The distinctive anatomical structures of the bones and muscles of the hand allow us to grasp the object world. They have developed in lock step with neural systems in the sensorimotor pathways, and the integrative and coordinative structures of the brain and spinal cord to bring the object world deep inside us. Indeed, it seems likely that the development of manual dexterity and brain size are co-dependent processes in human evolution (Tallis 2003). As importantly, tool-being allows both extension and cooperation. Tools very often require mimetic faculties to learn how to use skilfully, cooperation to use properly, and conversation to continually monitor, as well as to formulate appropriate identities (Hutchby 2001). We can also be sure that tool use is a matter of mutual attunement based on a useability which is attained through a process of historical genesis;

a technical object lies somewhere between a transient, unstable event and a durable, heavily reproduced structure. Its degree of concretization, to use Simondon's terms, is the technicity of a technology. (Mackenzie 2002, 14)

Finally, tool-being can only exist within a network of references and relays. It can therefore have a wide range of styles of thought focused on particular modes of individuation and is continually open to the emergence of new capacities which will emerge in concert with the material being worked (Mackenzie 2002).

This brings us to the last human characteristic, namely human ability to make and remake environments so that they can ask different questions and so provide new kinds of instruction: environments can be more or less articulate. This ability, in turn, allows us to move on to thinking about the world of things in more detail which is the final form of intelligencing that I want to address. For it might be thought that things cannot qualify as sentient beings, even if they are understood as environments 'forever *in action*, constructing in each moment the sustaining habitat where our awareness is on the move' (Harman 2002, 18). But I want to argue, first, that this is not necessarily the case and, second, that it is, in any case, becoming ever less so. To begin with, things have to be seen as 'wild' (Attfield 2000):

far from the insipid physical bulks that one imagines, [they] are already aflame with ambiguity, torn by

vibrations and insurgencies equalling those found in the most tortured human moods. (Harman 2002, 19)

Things enact themselves amidst the system of the world. Most particularly, it is crucial to remember that equipment is not effective just because it is used by people but also 'because it is capable of an effect, of inflicting some kind of blow on reality' (Harman 2002, 20). Then, following on, I think it might be argued that, of late, tools are beginning to take on more and more independent (or, perhaps better, forceful) capacities. Of course, as Heidegger pointed out many times, objects are mutually referential: behind each tool are legions of other tightly interlaced tools. Tools do not function as individual objects, but as distributed networks taking in a range of objects which act as manifold contexts. However, modern tool-being is changing its nature: it has a much greater capacity to influence the comings and goings of bodies than in the past because of the distributed networks in which it is caught up. And for four reasons. First, because we increasingly live in a blizzard of things which possess us as much as we possess them, generated by the fact that capitalism is 'an unreserved surrender to things' (Bataille 1988, 136). Yet this does not necessarily lessen things' alterity. They can still seem 'wild'. Second, because thought has increasingly been rendered more and more 'thing-like' so that we now seem to live in 'an indeterminate ontology where things seem slightly human and humans seem slightly thing-like' (Brown 2003, 13). In particular, the familiar antagonism between abstraction and concreteness does not seem to characterize the present time, as object networks formed from abstract principles increasingly seed concrete events. Third, because things are becoming more complex entities and are therefore beginning to take on, as distributed networks, many of the characteristics of intelligence often thought to be reserved for human beings and animals. Objects are becoming adaptive; within limited bounds some things can self-reproduce, can exhibit emergence, and so on (Tamen 2001; Dant 2004). Fourth, because they provide architectures which force intelligence. Rather as the need to have explicit bodily self-reference in order to get around in the canopy of forests likely forced primate evolution by producing a kinaesthetic self-concept (Povinelli 2000), so an array of things can reciprocally produce a practice of dwelling (Ingold 2002).

Three different means of making worlds (or sets of worlds), then. Of course, these worlds have always intersected. One thinks of the ways in which human intelligencing has been boosted by the prosthetic qualities of animals and things, by, for example, forms of domestication that turned out to have farther reaching effects on all parties than could ever have been imagined (Whatmore 2002). But I think that it is possible to argue that these worlds are converging at a peculiarly rapid rate at present, thereby producing a more attuned and 'informed' sense of materiality. To begin with, they are converging as a series of systematic knowledges are formed about them which are, in part, replacing or supplementing the tacit knowledges that used to suffice. Many of these knowledges are then migrating into software and other quasi-mechanical means of applying knowledge, thereby turning up in confirmatory ways scattered through and/or constituting new environments. Then, all kinds of conventions cut between these means of world-making. For example, more and more common representational formats are being put in place, particularly around picturing life and various forms of personhood, built around particular senses of narrative (Marks 2002; Dumit 2004). Then again, they are converging as nature and technology adapt and evolve. Thus, just as one instance, many animals are adapting to urban environments, as, for example, in the case of urban foxes that seem to be gradually developing different jaws as a result of scavenging for food from fast-food litter and dustbins rather than hunting live prey (Harris 2004). Meanwhile, technology is becoming more complex, and is taking on more active features; as a result objects are increasingly loaded up with adaptive features which, for example, allow them to communicate with other objects, read interactions, react recursively and provide various prostheses (e.g. means of producing additional calculation or memory) (Thrift 2004c).

It follows that fragments of each of these intelligencings now crop up in the other's domain on a regular basis, making it possible to think of a more active and mutually implicated materiality in which 'practices of knowing cannot be fully claimed as human practices' (Barad 2003, 829; see also Thrift 2004b). It may not be 'stuff', but we certainly seem to be getting closer to an amorphous state in which human being becomes 'flecks of identity' (Fuller 2005) in wider ecologies of intelligence made up of many things.

Networks of intelligence

But this is only a first step. For each of these intelligencings is in constant interaction with each other. They do not exist singly or apart. This is, of course, a standard mantra of actor-network theory and many other relational approaches. But, as the work of von Uexküll shows, we should not believe that this interaction is taking place in one world. Rather it takes place in a whole series of worlds which are more or less attuned to each other and which have more or less resonance in and with each other (Lorimer forthcoming). Thus interactions may take place in one dimension (e.g. the character of the fly's visual acuity) or in none. They may produce new affects, or simply run alongside each other. Recently, a number of authors have tried to frame or phrase these attunements. For example, Latour (2000) has argued that the best way to see these interactions is as propositions, in the sense that one entity can be loaded into another by making the second entity attentive to the first. Another way of conceiving this interaction is as part of a more general metaphysics of becoming that

can help us to imagine the world before our knowledge of it. On the one hand, the metaphysics serves to put knowledge in its place, as just one part of an evolving cyborg assemblage, rather than as some kind of ethereal simulacrum of the whole thing. On the other hand, though not at all rich or detailed, the metaphysics helps us to imagine the thing itself, the world itself that knowledge is about: entities sporting, coupling, forming temporary unities, and so on. (Pickering 2003, 107)

What I think this shows is that there is a geographical project based around vital spaces understood as different ways of knowing the world which are, at the same time, ways of living the world. We might, I suppose think of this as a project of comparative ontogenesis in which the task is to investigate how different worlds are composed and interact with each other, rather as the spider and the fly both rely on each other (with the same in-built tensions!). There is a kind of biological metaphor/technological metaphor at work here, but it is not the universal phylogenetic tree. Rather, it is the network or fold: 'evolution is basically reticulate' (Woese 2004, 179).

But, having got this far, I then want to try to push a little farther by arguing that the surfaces of biology and technology are being interleaved in

ways which question what we mean by intelligence and which, in certain parts of the world, are starting to produce something rather like Robson's carpet of 'stuff' acting as a constantly-on background. Thus, on one side, the world formerly called 'biological' is being loaded up with all kinds of monitors and points of feedback and continuous monitoring and is being treated as a material surface. For example, animals are not just the object of more and more surveillance, ranging from the simple chipping of companion animals through to all kinds of complex ethological surveillance including GPS transmitters attached to smaller and smaller mammals and now birds, continuous video feed into sites which have previously been opaque to detection, and the representation of senses like infrared that we could not mark before. They are also increasingly thought of, in part no doubt because of this mediated interaction, as the focus of knowledges which are, in certain senses cooperatively generated (Hinchliffe *et al.* 2005). Something similar is happening in the human realm in terms of modern medicine, where it is now possible not only to write of 're-ordering life' through new systems of classification and measurement combined with technologies which make the clinical encounter more and more immediate, but also to open up more possibilities for cooperation between clinician and patient (Brown and Webster 2004). On the other side, in the world formerly called material, many materials are beginning to have characteristics which used to be reserved for life and biological material is being incorporated into the production of all kinds of things, from plastics to robots (Thrift 2004b). The result is that the realm of 'not-quite-life' is growing apace.

Some writers will want to call 'enough' on this mass miscegenation, seeing a threat to 'nature', 'human nature', and the world of the senses, that might lead to a general 'species suicide' (e.g. McKibben 2003; Habermas 2003). But, I do not believe that an authentic nature/inauthentic technology narrative is a viable one, a point that is only underlined now that crossovers that used to take place in the laboratory are becoming a part of everyday life and are producing new hybrid entities, not as singular bodies but as distributed environments, as autonomic physiologies which have re-organized human being, putting it together again as a skein of bodies, things and spaces. This process of reticulation is becoming so general that it is worth taking some time to consider it. The process

consists of six main elements, each of which is inter-related, and which are the twenty-first century equivalent of the laying down of pipes, cables and roads, but with an even more effective grip on human being because they pay more attention to establishing patterns of continually adapting pre-reflective *movement* which, it might be argued, actually chime rather well with the innate plasticity of human movement.

First, and most obviously, through developments like grid computing, environments are becoming ever more computationally intensive. Elsewhere, I have pointed to the effects of the population of the world with software coupled with general increases in computing power (Thrift and French 2002). In recent work (Thrift 2004c), I have been trying to outline what such a 'qualculated' world of continuous and ubiquitous calculation in endless loops will look like, and, in particular, what new capabilities and senses it will bring into being, such as extended reach or the kinds of effects produced by modern mood-altering drugs which depend on computation at every level for their genesis and examination of side-effects. Second, more and more of the world can be seen and heard and tracked through a combination of increasingly ubiquitous screens, sensors, cameras, and the widespread use of the radio spectrum, leading to mobile phones (now including screens), RFIDs and the like, devices which depend on a radio-active world (Thrift 2004a). Third, more and more of the world can be sensed and represented, from the micro to the macro. For example, very large amounts of life can be 'pictured', sometimes in real time and can be made available for self-fashioning. Thus, Dumit (2004) shows how brain scans become part of how people explain themselves: the image becomes lived as part of the person. It constitutes a new sense of what the real is because more and more things will come pre-identified. Fourth, more and more of the world can be named and continuously tracked and this naming will become constitutive, even when it may contain many inaccuracies and distortions. As one example, take the project to produce DNA barcodes which, in theory, will instantly identify every species on the planet on demand, which will, in other words, label every extant form of life. This project has been heavily criticized, not just on grounds of practicality but also for attempting to produce clarity where none exists (Holmes 2004). Yet it seems likely that, in time, these barcodes, with all their imperfections,

will become a new norm, not so much a gateway on to the natural world as a newly minted world. Fifth, more and more of the world can be remembered (Bowker 2003). The result is that issues like life-logging and digital curation are becoming important topics, as increasingly people record larger and larger amounts of their lives. Sixth, all of these developments take place within a world of constantly shifting spaces which presage a new, pervasive sense of location (Enge 2004). Through the intervention of GPS, GIS, geodemographics, and so on, mobile and constantly adapting spatial and temporal frames have been established which, as I have argued elsewhere, depend (ironically) on an absolute coordinate grid (Thrift 2004c). In turn, new kinds of socio-spatial interaction are able to be generated because so many actors can be easily located. For example, the crowds produced by large industrial cities are being supplemented and extended in a number of ways.

To summarize, new kinds of sensing have therefore become possible. Reach and memory are being extended; perceptions which were difficult or impossible to register are becoming routinely available; new kinds of *understated* intelligence are becoming possible. These developments are probably having most effect in the pre-cognitive domain, leading to the possibility of arguing that what we are seeing is the laying down of a system (or systems) of *distributed pre-cognition*, a development which I will address in more detail in the next part of the paper.

Making the world machine readable

To summarize the argument so far, we can begin to see the rise of a new layer of *active* object environments which constitute an *informed materiality* in which the activity of the world will be continuously mediated, threaded together and communicated at a very large range of scales and at the same time have added to it a new kind of theoretically charged vitality working in the same way that architecture also does (Vesely 2004). This will be a new kind of building, if you like, a process reality made up of *understatements*.

This understated building presages a new realism which intends to both extend and/or duplicate the world by anchoring more and more of what was regarded as 'human' in the 'environment' in the form of small cognitive assists but which are drawn on pre-cognitively. These cognitive assists, whose immense range I have laid out above, will aid

all manner of root human practices and especially, I suspect, the faculty of interactional intelligence: movement, location, the amount of information available at each moment, what counts as 'near' or 'local', and so on, each of these stand now for essentially theoretical notions of the world – of many kinds – being absorbed back into the warp and weft of everyday practice. Of course, what this process of 'expersonation' might mean in detail is much more difficult to predict. But whatever the actual case this 'stuff' is currently heading out from its Western urban core, like a large carpet, colonizing more and more of the world. The result is that what we count as matter has begun to change: new kinds of mattering are being born (Law 2004). This change is not total. It is currently hesitant and flimsy and parts of it can no doubt be reversed. But it seems to me that the general tendency is towards a world which is being supplemented on a permanent basis.

There are two ways to think about this new state of affairs. One is to argue that it constitutes a gross intrusion which is one further step on the road to a rationalized dystopia. The other is to argue that it simply adds in another layer of vitality, of 'not-quite-life', which will both punctuate each event with additional information and will link each event into networks with much larger spatial extent which are underpinned by particular forms of conceptuality. In time, as they coalesce, these developments may bring about a new form of augmented relationality in which technology acts as a constant accompaniment to biology and vice versa.

To understand this spatiality, I want to return to Heidegger. Heidegger, like many authors, tends to contrast a human originary spatiality of the disclosure of being with a homogeneous metrical space of objective and ideal absence intuited by consciousness (Vallega 2003). When originary spatiality is attuned, producing *perceptual* fulfilment, then all is right with the world. As Todes puts it;

The percipient's sense of the integrity of his perceptual activity is a sense of achievement, of practical self-composure, of having put-himself-together, integrated himself by his skilful practice. This sense is derived from the verification of his anticipations, which allows him to rest assured. It takes the form of an ease or, at best, grace, of poise and movement. He feels, at least momentarily, the absolute master of himself as practical agent. He is fully occupied with his sensible circumstances, but in such a way that he is thereby also fully occupied with a sense of himself as responsive percipient of these circumstances. (2001, 128)

What I am arguing in this paper is that this viewpoint is no longer possible: increasingly human originary spatiality has become not just accompanied but suffused by a metrical space made up out of an army of things which provide new perceptual capacities. In a sense, all are joined together in the domain of bare life in a reworking of the verification of anticipations made possible by an informed materiality.

In other words, we are moving into a new 'a-where-ness', one in which what was called 'technology' has moved so decisively into the interstices of the active percipience of everyday life that it is possible to talk about a new layer of intelligence abroad in the world, a layer of intelligence which is beginning to unite living things by virtue of giving them a boosted *bare life* (Agamben 1998; Thrift 2003) held more and more in common. Here we have, in other words, a biodigital politics in which 'the body is no longer determined by individual qualities constituting the difference between animal, human and machine' (Parisi 2004, 137).

I want to end this section by addressing the issue of bare life in rather more detail. As originally conceived, bare or simple life was, in effect, intended to describe what might be conceived of as an 'animal' level of consciousness, the simple fact of 'natural' living common to all living beings, that minimal level of consciousness at which life can still be maintained and experienced without cognitive consciousness (and therefore political voice). Now, of course, we know that bare life is in fact full to overflowing. It consists of the vast amounts of computation done by living things in order to simply keep functioning. In human beings, think only of two examples. One is the computation that is necessary to sustain the 'simple' fact of bipedal locomotion. In fact the embodied skills of footwork take up a very large amount of the body's computational attention – and, of course, vary in style substantially from culture to culture (Vogel 2001; Amato 2004; Ingold 2004). Another example is the aforementioned content of interactional intelligence. Much of the computation associated with this intelligence is done in just a few milliseconds and nearly all of it turns up before consciousness, even in human beings. Thus

most of what happens in what we call communication or relating happens too quickly, demands too immediate a response, to have an actual correspondence with any of the descriptions that might be made of its 'meaning'. The meaning of the expression or relational act, it is

generally assumed, happened earlier as 'intention' or will be recovered later as 'memory'. But of course the 'earlier' and 'later' moments of resolution or synthesis are subject to the same conditions of prospective or retrospective postponement as the original expression or act, as memory and intentionality are themselves but differential 'takes' on the same description. (Wagner 2001, 8)

So, we now know that what we call 'thinking' in human beings does not occur just in the brain but at a series of sites in the body. We also know that bare life does not just consist of slavish autonomic responses, of blind and unconscious 'vegetative' functions. In both animals and human beings what we see are all kinds of 'unrememberable but unforgettable' (Watt cited in Gerhart 2004, 15) cultural subroutines being laid down, most especially in the weeks and months after birth, subroutines that involve imitation, affective response, etc. In other words, bare life is the ground where the biological, technological and cultural collide, and where simultaneously the validity of each of these categories is constantly put under question.

But what is happening now is that bare life is increasingly mediated by things which slip in between its interstices, boosting it here, conditioning it there. The result is that 'humanity . . . has taken upon itself the total management of its own animality' (Agamben 2004, 77). In other words, humanity 'no longer preserves [its] own animality as undisclosable, but rather seeks to take it on and govern it by means of technology' (Agamben 2004, 80).

Notwithstanding the undoubted problems that come from Agamben's reading of technology and indeed biology (see Krell 1992), still it is clear that such a situation could be fraught with real dangers. Most particularly, it makes it difficult to keep events open, since they will have already been forethought: as a result, human beings might become puppets without masters. However, such a negative reading of the more and more explicit engineering of the event also depends upon interpreting technology as a constitutive other, rather than as a part of what it means to be human. If, instead, technology is taken to consist of a series of active mediaries in the Latourian sense, often placed in messy and circuitous conjunctions which only appear as smooth passages because so much of their work has been black-boxed, then maybe it is possible to think in a slightly different fashion. Perhaps, then, in turn, it becomes possible to think of historical parallels

with other comprehensive, distributed technological systems.

The most obvious of these parallels, I believe, is with the discovery of *writing* and the onset of literacy. Writing, and the skills of reading and general literacy that go with it, appears to us now as one coherent system, so near to us that it is hardly ever considered to be a 'technology', but writing only came into being as a comprehensive system through stuttering technological advance and the construction of all manner of slowly evolving institutions of responsive expression and it did not become general in most populations until the nineteenth century – indeed, given figures on global literacy, it is debatable if it is still an entirely comprehensive practice. But writing functioned mainly in the cognitive domain of imagination – as a means of framing time and space, as a set of mental and manual skills, as the means of producing all manner of new cultural modes, from lists to novels, as a new and fertile means of boosting imaginative capacities. Indeed it could and has been argued that it produced much of what we now call cognition. Certainly, it produced a quite different attunement to the world: the onset of this logocentric world has had global effects, producing new kinds of consciousness, new kinds of social and cultural structures, and new kinds of spatiality.

In contrast to writing, the new technologies function mainly in the milliseconds of the precognitive domain of perception (Donald 2001; Libet 2004). Not surprisingly, there is rather less cultural analysis of how this domain functions, but this does not mean there is nothing. For inspiration, we have to reel back to the nineteenth century and the very large amount of work carried out in psychology, and especially German psychology, on involuntary or reflex actions, on habit, as forms of unconscious inference. In particular, this work was picked up by early cultural theorists working on the impact of cinema. The work of Balasz, Kracauer and others, and of Benjamin on tactility, suggest that technologies of this kind function chiefly as a new surface to the world, adding new ways of touching and being touched, an *umwelt* in which novel patterns of corporeal habit and inference were laid down simultaneously through the power of new forms of sensation, a new kind of nervous system with its own forms of 'neuropolitics' (Taussig 1993; Connolly 2002).

What I want to suggest here is that we should see the knot of developments that I have outlined

as being similar in their effects to the technology of writing (and reading), but mainly taking place in the *precognitive* domain, in what used to be called the domain of apperception, where attention is brought to focus on an object (Crary 1999). The main effects in this domain of understatement will be on what is regarded as embodiment (for example, on our balance and poise), on the density of the field of perception, on what can be counted as local and near and reachable (as, for example, these technologies make *ex-ante* spatial links), on the amount of content that is immediately available to feed our imagination and, in general, on our sense of attunement to the world (including what significance we tend to give ourselves).

In turn, there is another way of framing this onset of new silent languages. This new world is one of not-quite-life but so close to the conduct of life that it is not-quite-inert either. In other words, what is required is a new category which is rather like the parasite (Serres 1980) – but in a symbiotic relationship – or perhaps more convincingly the microbe. These 'tiny masters of metabolism and movement' (Margulis and Sagan 2002, 204) form a subvisible world which is a crucial element of the larger worlds of which we are a part. Through the co-optation of strangers in mergers, fusions, incorporations, cohabitations and recombinations, microbes, whether viral, bacterial or eukaryotic, produce ever greater complexity, evolving in ways that extend far beyond the relatively uniform lifestyles and practices of animals and plants. Perhaps the new technologies of understatement are now taking on this role, present in different forms at almost every encounter and, rather like microbes, as likely to make more as less out of them. In turn, such a vision would suggest a new supplementary and teleoaffective spatiality which would provide an underlay to much of what we fondly call 'everyday' life.

Where the people are: by way of conclusions

What I have tried to outline in this paper is a new fabric of forethought, a new nervous system, coming into being in the world which has at least the capacity to extend environments and make them more articulate (that is, more willing to enter into unexpected connections, provide more expressive opportunities, foster more activity, generate more intermediaries, stand a better chance of being

complex, make more entities more active, etc.) or, equally possible, to make them inarticulate by closing all these characteristics down and making the world into a frenzied roundelay of accumulation of not very much at all. The point is that, in these early times, there is a political task to be addressed of producing vital protocols when remarkably few protocols are as yet set in stone and of imagining the new horizons and articulations of momentary enunciation. In other words the new knot of technologies *can and should* function as means of boosting responsive expression.

I hope that it is clear that I have taken a good deal of inspiration for this paper from particular forms of process or motion philosophy which stress a recursive metaphysics of association, and in particular the work of Tarde and then Latour, and Whitehead and then Stengers (2002) and Zubiri (2000 2003), and Bergson and then Deleuze and Guattari. That work is typified by several key characteristics. First, it earns its living from a relational theory of reality: it refuses to offer an implicit theory of substance existing independently from the relations in which it is involved. Second, it relies on a constructivism of a particular kind, namely a transcendental empiricism (or pan-experimentalism) in which construction never takes place in general but always in relation to a matter of concern and commitment, a lure to our attention which provides an intensification of feeling. Thus, due attention means 'becoming able to add, not subtract, means learning how to get access, not renouncing the possibility of access' (Stengers 2004, 5). Third, it understands reality as a series of complex composites based on an ultimate metaphysical principle of invention; 'the advance from disjunction to conjunction, creating a novel entity other than the entities given in disjunction' (Whitehead 1979, 21). Fourth, it argues that nature cannot be split into, on one side, a causal, objective nature and, on the other, a perceived nature full of so-called secondary properties like odours, sounds, enjoyments and values. And last, it insists that mode of existence and mode of achievement are always related: thus modes of interpretation literally matter.

This brief exposition is necessary because I want to end this paper by talking about the vexed question of ethics. I will give this topic much less consideration than it deserves but with good reason. I would think it impossible to dispute that all kinds of ethical dilemmas are surfacing or will surface as a result of these developments, and indeed they

should – once we find the sites where it makes sense to investigate these dilemmas. After all, in a sense, this new technological world is working directly into our unconscious, acting rather like a substitute for, or, more likely, an extension of, biology. But what I want to address instead is what the domain of ethics should actually be. My argument, briefly put, is that an ontological ethics requires that much more attention should be given to the responsibility of cultivating intelligence and invention, broadly conceived as environments that are made up of informed materials which maximize instruction (Wagner 2001). It is important to state that this kind of ethics which lies somewhere between uprightness in the face of the limits to knowledge and the hope of consolation to be found in an open reading frame (Rabinow 2004) does not preclude a concentration on other ethical moments like justice or equity. Rather, I see it as a supplement. In turn, this means at least the following ethical procedures should be followed by the new ecologies now coming into definition. In turn, applying these procedures should produce interesting environments that will not only matter but also provide a kind of consolation (Rabinow 2004).

- The world should be added to, not subtracted from. Invention should lead to the actualization of the virtual, rather than the realization of the possible. This is the principle of producing promise.
- The world should continue to be held to be multiple with all the consequences that flow from such a stance, and especially the need for constant ethical brokerage. This is the principle of 'relentless pluralism' (Thompson 2002, 186).
- The world should be kept untidy. It should have negative capability, or as Keats put it 'a man [must be] capable of being in uncertainties, mysteries, doubts without any irritable reaching after fact and reason' (cited in Wagner 2001, 254). This is the principle of messiness.
- The world should be free to display its spectacular and amazing performances through the sacrament of the expressive sign that can pass their energetic demands on. This is the principle of wonder.
- The world should be free to teach us. That means retaining difficulties, uncertainties, inaccuracies since mistakes are a part of the lesson, proof that the problem can still grip us. Indeed, one might argue that there is a pragmatics of error which is crucial in all of this (Wagner 2001). This is the principle of testing life.

None of these principles of an ethics of intelligence should be considered as remarkable. Indeed, it is possible to argue that they should be at the root of any geographical ethics worth its salt, but this is a geographical ethics composed for a posthumanist age. For what it is committed to is making more of the world, not allowing it to be reduced, but rather allowing it to be read and writ large.

For everything that accords with the values of what we call 'civilization', its cities and monumental architecture, its social classes and elaborate lifeways, its incredible technologies, mathematics and self-expression in the control and knowledge of writing and speech, amounts to an overdetermination of the containment of sense by itself. (Wagner 2001, 30)

Acknowledgements

I would like to thank Gail Davies and Nik Rose for their comments on this paper, as well as the three anonymous referees. This paper arises out of the context of the Embodied Intelligence group at Oxford University and I would particularly like to thank Chris Gosden, Beverly Lear, Alex Kacelnik, David Parkin and Steve Woolgar for their thoughts. A longer version of this paper which includes many footnotes and glosses, as well as an extended introduction, can be obtained from the author.

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