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Remembering the technological unconscious by foregrounding knowledges of position

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Abstract. In this paper I provide a description and preliminary analysis of the current 'technological unconscious'. I use this term to signify the basic forms of positioning and juxtapositioning which make up the basic 'atomic structure' of contemporary Euro-American life. Because of the potential vastness of the topic, I concentrate on just one form of positioning and juxtapositioning, namely the construction of repetition. The paper is in three parts. The first part provides a capsule history of how a very few templates of position and juxtaposition have become powered up into a capacious and effective background. In the second part of the paper I argue that in recent years the practice of these templates has been changing as a full-blown standardisation of space has taken hold. This standardisation is gradually leading to the crystallisation of a new kind of technological unconscious. In the third part of the paper I argue that the traces of this new kind of unconscious are taking hold in social theory as well, leading to the assumption of a quite different event horizon which can be thought of as a different kind of materiality.

> "There is a fertile dimension of emptiness which escapes the parameters of a 'natural' world or a language, from the point of view of experience."
>
> Depraz et al (2000, page 133)

Introduction: engraining anticipation

This paper is part of a more general attempt to provide an account of the *spaces of anticipation* that are found in contemporary everyday life, an account of how it is that environments of which we are a part gradually come to be accepted as the only way to be because, each and every day, they show up more or less as expected (Thrift, 2000; 2003). Such spaces depend upon the gradual construction of complex ethologies of bodies and objects, which are repositories of the 'correct' *positionings* and *juxtapositionings* that allow things to arrive and become known (Siegert, 1999). These very basic sendings and receivings of sociotechnical life—and the modest but constant hum of connection and interconnection that they make possible—have often been neglected. But it seems clear to me that as we move into an era populated by more and more objects whose raison d'être is precisely to hone such sendings and receivings so the task of understanding becomes far more pressing.(1)

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(1) This paper has had a long genesis because it has required the putting together of a number of different impulses. The first source is theoretical: understanding more about the somatisation of social norms in the form of prereflexive practice. I believe that various kinds of culturally inculcated corporeal automatisms—with their very different logics of sense—which result in practical anticipations of how situations can be performed are the chief forms of social power, yet they still remain remarkably little studied (compare Agamben, 2000; Bourdieu, 1999; Dagognet, 1992; Thrift, 2000). A second source is historical. For a long period of time, with my colleague Paul Glennie, I have been working on a history of clock time. Investigating that history has made me very sensitive to the role of mundane means of positioning and the way that that role has migrated out from the body to all manner of specialised and general objects. A third source is practical and consists of some prefatory work on mobile telecommunications and their probable patterns of cultural overcoding. In many ways, I take the use of these new forms of telecommunications as being precisely concerned with the reworking of anticipation. Then, the fourth and final source

It becomes far more pressing, too, because much of what we call the cosmological order is achieved through the simple positionings and juxtapositionings of human and nonhuman actants—positionings and juxtapositionings which have to be repeated over and over as particular spaces which assume specific competencies (Weiss, 1996). This powerful infrastructural logic which allows the world to show up as confident and in charge is rarely written about in and for itself (for an exception see Gell, 1992) and yet this 'emptiness' lies at the root of our being, producing senses of the rightness and wrongness of the world so fundamental that we find it difficult to articulate them or to consider that these senses could have been otherwise. But it is possible to find clock-faces in the 14th century that circuited counterclockwise (Glennie and Thrift, 2004); large parts of the world read from right to left (Goody, 1987); in the early days of the automobile, seats were not always arranged in a two in front and two behind formation; in Norway and Sweden washing up to the left or right of the sink can produce instant evaluations of worth (Linde-Larssen, 1996); and so on.

In other words, our conventions of *address*, of what will show up where and what will show up next, are often arbitrary, and they rely on knowledges of position and juxtaposition—sometimes tacit, but increasingly systematised—which lie at the base of Euro-American societies. When practice is established and runs smoothly without being perturbed by disruptive events, conventions of address sit there quietly in the background and "the fictional nature of organisational knowledges does not surface easily. Everything—objects, settings, routes, people—seems to be real, that is the way things properly are, provided with a sort of existential fixedness and ontological correctness" (Lanzara and Patriotta, 2001, page 965). It is, above all, this anonymous history of *knowledges* of position and juxtaposition which I want to search out, the familiar–unfamiliar knowledges of how human and nonhuman actants can be transported and aligned.

These knowledges do not belong to 'us' or to the environment. Rather, they have been coevolved, and so refuse a neat distinction between organic and inorganic life or between person and environment. As Ingold (2001, page 265) nicely puts it in regard to notions of the environment:

> "The environment of persons is no more reducible than is their organic existence to pure molecular substance. It is not merely physical, and it is certainly not blank. For example, the ground I walk on is surely a part of my environment, but in a physicalist description the ground, as such, does not exist; there are only packed molecules of carbon, nitrogen, silicon and so on. As Reed has eloquently put it, 'it is the earth on which we walk, and the soil in which we plant, that is relevant for us as perceiving and acting creatures; not the molecules discovered by scientists' (Reed 1988:111). The environment, in short, is not the same as the physical world as it exists and takes on meaning in relation to the beings that inhabit it (Gibson 1979:8). As such, its formation has to be understood in the same way that we understand the growth of organisms and persons, in terms of the properties of dynamic self-organisation of relational fields."

[(1)] continued
is political. I am interested in the kinds of ethical practice of joy and generosity which refuse a pure model of law derived from a supersensible realm, and which depend upon preconscious modes of intensity which must work in several registers at once (Bennett, 2001; Connolly, 1999; Thrift, 2003). In each case, I take it that space, treated as both an essential component of the functioning of these complex ethologies and a product, is a crucial determinant of what I want to get at as it both makes it impossible to work with the cruder renderings of the social which still characterise too much thinking, and also introduces an element of wildness into how we go about the mundane work of arranging arrangements.

In what follows, I therefore want to try to outline some of the knowledges and competencies concerned with position and juxtaposition, but I also want to go further. I want to claim that they constitute a 'technological unconscious' (Clough, 2000) whose content is the bending of bodies-with-environments to a specific set of addresses without the benefit of any cognitive inputs, a prepersonal substrate of guaranteed correlations, assured encounters, and therefore unconsidered anticipations.

In certain senses, one might understand this project as Foucauldian, but I want to drop down a level from where Foucault did most (although not all)[2] of his work. Using a distinction often employed in literary theory, my analysis will be of form rather than of genre. Knowledges of form are usually not regarded as subjective (though just as clearly they have subject effects) because they have no strong interpretive content. They are repetitive, empirical, bereft of intention. "For genre to exist as a norm it has first to circulate as a form, which has no ontology, but which is generated by repetitions that subjects learn to read as organised inevitably" (Berlant, 2001, page 46). In turn these repetitions offer up intelligibility and compulsion. "As the subject negotiates becoming orderly, the world promises that the subject's compliance will be valued and reflected in the social, such that a guiding law that seems to come from the subject can remain the general index of clarity where there is otherwise none" (page 50). They are, if you like, the equivalent to Genette's (1999) 'paratexts', or Lury's (1999) 'phatic imagery': means by which senses are synchronised (and synchorised) so that practice can take place.

Of course, knowledges of form require a vast apparatus in order to produce successful repetitions and consistent consistencies—drawings, text, numbers, symbols, prose, statistics, tables, charts, maps—which set out sequences and prime practice. Infrastructure has precisely to be *performative*, if it is to become reliably repetitive. Repetition is an achievement—and a method of achievement.

To summarise, my main concern in this paper is with the basic conditions of life, and especially with the style of repetitions that pertains at any point in history, the animated automatisms (Gehlen, 1980) that provide the stable ground for practices. Because I use the word automatisms it should not be thought that these repetitions are arbitrary. Neither are they spontaneous. Rather, they have been set in motion and their momentum, and a good deal of improvisation, keeps them stable. My argument is that we are currently seeing a shift in the basic conditions of life, a move of the 'social' 'atomic structure' from one model to another as a full-blown *standardisation of space* takes hold which is very similar in its ambitions and effects to the 19th-century standardisation of time. (Other writers have attempted to consider changes in these basic conditions of life, most notably Virilio and Derrida—in his later writings in particular—but, as I hope will become clear, I will be taking a slightly different tack.)

I therefore want to search out some of the key knowledges of position and juxtaposition that make up the 'technological unconscious'[3] and explore how they are currently changing, producing a new sense of how the world shows up. To this end, the rest of the paper is in three main parts. The first part provides a capsule history of how a very few templates of position and juxtaposition have been powered up into an 'atomic structure' producing a specific kind of technological unconscious with its own forms of compulsion and fascination. Such a history is necessarily very partial but hopefully it gives a sense of the vast agenda of research that is being opened up. In the second part of this paper, however, I want to argue that in recent decades the nature

[2] I am thinking here, especially, of Foucault's rationalising taxonomies.

[3] As I hope is now clear, this is an unconscious that should not really be thought of in terms of narrative at all. Instead it should be thought of as "desiring production, an assembling that is grasped in its effects" (Clough, 2000, page 61).

(or style) of these templates has been changing as new modes of hypercoordinated address have been invented, so that a new kind of technological unconscious is now being born which we need to grasp and understand. In the concluding part of the paper, I will then argue that the influence of this unconscious shows itself particularly in modern social theory, which now assumes an event horizon quite different from what has gone before, an event horizon which is still all too easily misrecognised as the same as what went before.

Addressing the world

In this section, I will provide some general notes towards a history of knowledges of position and juxtaposition that were increasingly constituted by that very knowledge. Such a selective approach is necessary, as the topic is potentially so vast. In order to narrow the orbit of this section even further I will consider only one of these knowledges (though arguably the most important), the knowledge of sequence in time, which, in turn, allows orderly and guaranteed *repetition*.

A large number of different institutions generated knowledges of sequence in time, the demands of one influencing the demands of the others. Of these institutions, arguably the most important was transport. The problems of supply of large cities like London and Paris led to the need to develop formal means of coordination of road transport such as the *timetable*: full regular timing of travel dates from early on. Thus, in England, returns from Elizabethan postmasters noted the time that the mail was received and dispatched (Brayshay et al, 1998) and quasi-timetables resulted. Though earlier publications like *The Carriers Cosmographie* (1637) and *The Present State of London* (1681) provided timetable information, the first national timetables seem to have been a later invention. For example, by 1715 the *Merchants and Traders Necessary Companion* provided a fully comprehensive directory of courier and coach services to and from London, listing over 600 services a week. These proto-national timetables were the precursors of the extensive train and bus timetables of the 19th century, which spread knowledge of timetabling across all sections of society and, in the guise of commuting, made the city into one vast timetable.[(4)]

In turn, these developments in transport generated other needs for sequential order, of which the most important was probably the expansion of the hospitality and retailing industry. Inns and taverns were built to clothe stagecoach routes, usually to a relatively standardised design, as means of passing bodies on from point to point. By the end of the 18th century, hotels had begun to appear: for example, the 60-bed Hôtel de Henri IV built in Nantes in 1788 at a total cost of £17 500, a tremendous sum of money at the time. In 1794 the first purpose-built hotel in North America was opened in New York, the City Hotel with 70 rooms. "Several other, similar hotels were built in other cities in the next few years, but it was not until 1829 that the first first-class hotel, Boston's Tremont House, with 170 rooms, was built. The Tremont innovated such features as private rooms, with locks, soap and water for each room, bellboys and French cuisine" (Gray and Liguori, 1990, page 5). The tourist expansion of the 19th and 20th centuries saw a further massive expansion of hotels and motels,

[(4)] Such sequencing was accompanied by a gradual rigidification of the system of transport as all kinds of rules and regulations, some of them physically incarnated, were laid down and as transport statistics and planning became commonplace. In France, for example, the right-hand rule for traffic was adopted in Paris in 1851, but general plans and the first traffic statistics date from the 1820s (Papayanis, 1996). In Britain, we can see the gradual introduction of rules that will allow traffic to be carefully sequenced and partitioned: white centre lines on the road (1931), and other white lines (1936), yellow lines (1956), white lines to mark the edge of the road (1966), box junctions (1996), and so on (Amin and Thrift, 2002).

producing a whole set of new sequencing techniques—reservation books, sliding blackboards, rack slips. Subsequently, the computerisation of the 1960s and 1970s allowed many of these systems to be automated.

Similar developments occurred in retailing. As shops and then department stores grew in number and complexity through the 18th century and into the 19th and 20th century (Glennie and Thrift, 1996) so they generated a need for all kinds of knowledge of—and tools of—sequence, from delivery schedules to formal order books, which still exist in automated form in the complex supply chains of today.

All these developments were mirrored on a daily scale. Personal coordination increasingly depended upon timetables which in turn led to the development of various textual devices as early as the 18th century. For example, the diary was, in certain senses, a textual analogue of the watch, a means of gridding everyday life via a calibrated narrative with its imperative to fill each dated blank space with observations. At the same time, the diary heightened skills of observation of everyday life as sequence, as the complications of the event now could be routinely noted down (Amin and Thrift, 2002). The diary went hand in hand with other items of textual comprehension like memo books, the making of 'minutes' by clerks, and the use of shorthand ('tachygraphy' or rapid writing) to produce a textual comprehension much closer to that of the present, which, indeed, begins to produce a different kind of present, but compressed and through the new possibilities now offered, opened out.

Alongside these more general developments, came other more specialised knowledges of position and juxtaposition. Though there are many of these knowledges, perhaps the most important and equally the most neglected them have been those emanating from armies and navies (and, latterly, airforces) (Giedion, 1998 [1948]). The word *logistics* is normally reckoned to date in its modern form from Jomini's (1992 [1836]) *The Art of War*, which set down 'logistics' as one of the six branches of 'the military art'. Of course, logistics had existed long before then; armies could not exist just on foraging and had to collect provisions together, and many armies on the move stretched over miles. But it is also true that modern logistics was probably born after that date, in the crucible of the US Civil War, when the industrial revolution, large spaces of movement, mass technologies of movement (including the railroad), and heavy casualties dictated the construction of complex knowledges of sequence, in order to supply basic items like water, let alone ammunition. There was even strict traffic-control discipline. By the First World War, logistics had become a major enterprise. For example, the British Army shipped 5 253 538 tons of ammunition (including over 170 million shells) to France (and, it might be added, 5 438 602 tons of hay for animals) (Huston, 1966; Mackinsey, 1989; Thompson, 1991).

As in civilian life, so the everyday life of the military was affected by the need for exact position and juxtaposition—in particular through the evolution of drill and similar rigid positionings of the body, which came to take up increasing amounts of time in most armies (Holmes, 2001): some of the drills developed by Maurice of Orange from ancients like Aelianus and Vegetius, which became general in much of Europe as a result of example and a series of books, can lay claim to being the first time-and-motion studies in their exact and exacting attention to time.

> "From Aelianus (the) key borrowing was the simple notion of training soldiers to move simultaneously in response to stylised 'words of command'. Aelianus had listed 22 different 'words of command' used by the Macedonians; but when Maurice's cousin and aide, Johann of Nassau, had analysed the motions required to handle a matchlock, he counted 42 distinct postures, and assigned a fixed word of command to each of them. A simpler drill, far closer to Macedonian precedents, was also

derived for pikemen, who were needed to protect the arquebusiers from cavalry attack during the rather lengthy process of reloading.

The practical importance of such pedantry was very great. In principle, and to a surprising degree also in practice, it became possible to get soldiers to move in unison while performing each of the actions needed to load, aim, and fire their guns. The resulting volleys came faster,—and misfires were fewer when everyone acted in unison and kept time to shouted commands. Practice and more practice, repeated endlessly whenever spare time allowed, made the necessary motions almost automatic and less likely to be disrupted by the stress of battle. More lead projected at the enemy in less time was the result: a definite and obvious advantage when meeting troops not similarly trained. This was what Maurice and his drill masters had aimed for; and once their success became clear, the technique spread to other European armies with quite extraordinary rapidity" (McNeill, 1995, pages 128 – 129).

Thus, by the time that William of Orange arrived in England in 1688, he found "a small standing army which had considerable and varied experience of active service, which was well-enough armed and equipped, and which was trained to a system of drill and tactics as up to date as those practiced elsewhere in Europe" (Houlding, 1981, page 172. Helped by the circulation of a large military literature and especially drill books like Dundas's *Principles of Military Movements* and their accompanying crib cards, by the 18th century the practice of drill had become a carefully defined practice of bodily sequence right across Europe—and an essential element of battle (Holmes, 2001).[5]

During the same period, the military also put increasing emphasis on using soldiers' time profitably in tasks like field fortification: digging trenches, raising embankments, building redoubts, constructing bridgeheads, and the like. The approach was practical, as it was realised that "the elaborate mathematics and geometry of engineers were subjects too dry for everyone to relish; and indeed there was no need of handling the scale and compass [nor] of problems, nor tiresome calculations, in order to learn the art of putting all kinds of posts into a proper state of defence" (Houlding, 1981, page 224). But the upshot was clear: directed bodies involved chiefly in what were coming to be known as logistical activities.

[5] For example, so far as marching was concerned,

"The recruit was first taught to be 'master of his person', throwing off the carelessness of civilian carriage and adopting the stiff self-possession of military bearing. Next, having learned the simplest postures, he proceeded to the simplest of the evolutions—dressing to his front and flanks, and making the various turns on the spot. Instruction at marching now began; and the greatest stress was put upon marching. The techniques of movement became steadily more sophisticated as the century wore on, demanding precision, and basic instruction at marching reflected these developments. Until the early 1750s the recruit was taught only to maintain his proper posture and bearing, to take paces either 'long' or 'short', and to step out either 'quickly' when marching in column, or 'softly' when on parade, when manoeuvering, or when advancing in line and these times and distances were measured only against the scale of what was customarily practiced within each management. The mid-century was in most respects a watershed in the development of marching technique. Marching style—that is the manner in which the legs were lifted and put down—only assumed a regular fashion in the army at the mid-century, after 1748, with the adaption of the 'Prussian Step': taken from the stiff-heeled marching style introduced to Russia during the reforms of Frederick William I's reign, this was to be a notable innovation and was to remain the style after which British infantry performed linear drill until late in Victoria's reign. The Prussian step made for great precision at speed and indeed a rate of 120 paces per minute was considered, for the experienced soldier, 'nothing more than an easy walk'" (Houlding, 1981, pages 259 – 260).

> "Idleness, in effect, was banished from military life. This was a great departure from earlier custom, since waiting for something to happen occupies almost all of a soldiers time, and when left to their own devices, troops had traditionally escaped boredom by indulging in drink and other sorts of disruption. Debauchery was not banished entirely under the regime Prince Maurice and his imitators established, but it was usually confined to off-duty leave time" (McNeill, 1995, pages 129 – 130).

Though these are clearly only notes towards a more general history of knowledges of position and juxtaposition—what Gille (1986) calls the "maceration and purification" of space through a culture of interval—what is clear is that the goal was to produce a general configuration based on exact and countable sequencing which could roll over seamlessly into the future (as if to prove the point, some hotels now reserve rooms as long as eight years into the future). Everything would be in the right place at the right time.

Nowhere is this maceration and purification clearer than in the development of the modern system of address. The history of address is a long one, of which England's history is only one example. There, streets seem to have been named for as long as there have been towns. For example, there are dozens of known street names from Saxon London. Although large and imposing houses, churches, inns, and the like were named in medieval times, it seems likely that other dwellings were located by street names, by prominent landmarks—and by asking the way. More organised address systems (especially numbering of houses) seem to have come about on the back of more organised delivery systems. This numbering seems to have been done by the Post Office and by compilers of town directories. For example, in Bristol in 1775, Sketchley's first directory did attempt to number all houses but, significantly, it was felt necessary to explain how this was done. Though we cannot be sure, it seems unlikely that most houses would have displayed numbers at this time: postal deliveries were still made to a named householder. Even by the turn of the 19th century, numbering was still rare and order (in militia lists, ward rate books, etc) was achieved without explicit numbering. The mix of name, number, and so on persists for a surprisingly long time buttressed by the tacit knowledge of routes and places held in the bodies of those delivering mail and parcels.

But, the increasing scale of mass mailing systems (and especially the massive increase in business mail which gradually assumed about 80% of volume in most postal systems) gradually led to the introduction of mechanised sorting in the 1950s and to the introduction of postcodes and zip codes in the 1960s (Rhind, 1992). The example of the United States is the most obvious here. Zip (for Zone Improvement Plan) codes were introduced by the US Postal Service in 1963. By July 1963 a five-digit code had been assigned to every address in the country, which identified region (the first digit), further subdivisions (the subsequent two digits), and post office (the final two digits). Interestingly, and in contrast to the British postcode, there seem to have been no maps of zip codes: they were a purely categorical device. Then, in 1983, following the introduction of optical character readers able to read bar codes (see below), a further four digits were introduced (the zip+4 code), allowing the pinpointing of the address to a 'delivery sector' scale (such as the floor of an office block). Nowadays, of course, such addresses have become, through mass systems of marketing, their own rapidly burgeoning industry, intimately connected to geodemographic categorisations of the population that announce new forms of commercial countability which are becoming as important as those of the state (Rhind, 1999).

It would be possible to portray the foregoing account—and what follows—as one based on a kind of Whiggish technological determinism, but this would be wrong. Rather, the recurrent play of knowledges of sequence should be seen as a set (or, perhaps better,

a series) of sociotechnical mediations constantly in genesis that stabilise the collective so that sequence becomes possible (Mackenzie, 2002; Simondon, 1992). That said, it is important to point out that not everything works and not everything turns up on time, to put it but mildly. But such discrepancy can often be formative (Lowe and Schaffer, 2000). So, importantly, knowledge of error and delay has itself been built into knowledges of sequence. For example, modern forms of sequencing have classically included waiting in queues (and the development of associated technologies such as taking tickets signaling position in an electronic queue) and, significantly, waiting itself has become the subject of a vast set of knowledges based on queuing theory and similar developments. Thus, delay can itself become a source of profit and other forms of advantage (Mackenzie, 2002).

Readdressing the world

In the world that has been developing since the 1960s, however, things have changed their character. What we can see is the evolution of new means of addressing the world based upon what is often called a 'track-and-trace' model. This model assumes an underlying *standardisation of space* which, at least insofar as it has become complex and extensive enough to take the variations of each milieu fully into account, is historically very recent. This new means of addressing the world can be said to have arisen from three different but related impulses which, taken together, provide a continuously updated, highly processed background which renders all sequences calculable. The first is the general availability of a series of technologies which can continuously track position—lasers, various forms of new information technology, wireless, geographical information systems, global positioning systems, and so on. The second is a series of formalised and integrative knowledges of sequence arising out of the general application of models drawn from logistics across a wide range of fields. As a formal field of study, rather than as a military 'art', logistics dates back to the 1940s and the applications of various operational research models to problems of inventory (storage) and distribution (flow), most especially in the context of the demands made by the Second World War. In the 1960s, logistics became bound up with systems engineering and an associated array of technologies like flow charts, life-cycle analysis, network analysis, including scheduling approaches like PERT (Programme Evaluation and Review Technique) and CPM (Critical Path Method), and so on. More recently, logistics has expanded again to become seen as an integral element of what production is, rather than as something subsequent to it (as 'distribution'). In turn, this has led to new means of production such as distributive manufacturing. The third impulse is new means of countability which have provided new possibilities of calculation (Thrift and French, 2002). For example, spreadsheets have allowed all kinds of calculation to be made concerning future time periods which would have been difficult and time-consuming or just plain expensive before.

These three impulses have in turn had three closely related results. The first has been a major change in the *geography of calculation*. Whereas 'computing' used to consist of centres of calculation located at definite sites, now, through the medium of wireless, it is changing its shape. Computing is moving into the environment as it becomes possible to connect up all kinds of computing activity (Dertouzos, 2001). This development stems from a series of changes. To begin with, the geography of computing is changing shape. From being centred and stable entities located at definite sites, through the medium of wireless computing, computing is moving out to inhabit all parts of the environment and users are able to be mobile. Computing can then become a part of everyday environments as there are no longer any restrictions on where computing devices can be located: they will be located everywhere in constantly shifting and adapting peer-to-peer networks.

This is the advent of 'ubiquitous', 'pervasive', or 'everywhere' computing. It follows that 'computing' will become more and more context dependent. This means that devices will become both more location aware, knowing where they are in relation to users and other devices, and able to interact, dialogue, and adapt to users and other devices. In other words, computing—understood as a network of devices—will increasingly be able to be appropriate to the situation (Lieberman and Selker, 2000).

The time of 'computing' is also changing. Through open Internet access, the computing environment will be able to run continuously. It will always be on hand to interact with users and will not need to be turned on and opened up prior to use. "Being always on, the net will be woven with the fabric of our lives" (*New Scientist* 2002, page 34). Computing will be a constant.

'Computing' devices are changing too. Through the advent of 'soft computing', better understanding of affect, and new kinds of human-centred interfaces, computing is increasingly adapted to and modulated by the user. It will increasingly second-guess the user, becoming a part of how he or she decides to decide. 'Computing' will therefore no longer be seen as a primary task but as a subsidiary part of many different practices, just as many mundane tools already are. Machines will be dressed with the information you want where you want it, in the industry parlance (Dertouzos, 2001). Increasingly, the assumption is that the user will be doing something else at the same time as doing computing. In other words, the computing device is there to augment rather than to monopolise attention, as in the case of wearables.

> "Rather than attempting to emulate human intelligence in the computer, as is a common goal of research in artificial intelligence (AI), the goal of wearable computing is to produce a synergistic combination of human and machine, in which the human performs tasks that it is better at, while the computer performs tasks that it is better at. Over an extended period of time, the wearable computer begins to function as a true extension of the mind and body, and no longer feels as if it is a separate entity. In fact, the user will adapt to the apparatus in the same way that we adapt to shoes and clothing to such a degree that being without them would make most of us feel extremely uncomfortable ..." (Mann, 2001, page 7).

Computing is also becoming more and more connective. The purpose of computing devices is increasingly to communicate not just with the user (through better interfaces like wearables) but with other devices. Thus, computing becomes a communication system in which more and more of the communication will be interdevice.

To summarise, computing is increasingly flowing out into the environment, becoming a part of how position is actually constructed. It will become a new kind of surface, fitted to activity-in-context like a glove is fitted to a hand. This will not happen immediately and it will be a good deal less smooth and perfect than visionaries would have it, but, in time, calculation will become a constant backdrop to everyday life, a part of it, not off to one side.

A second important result has been a change in the nature of the address. Increasingly, addresses are moving with human or nonhuman actants. Four different technological innovations that are both ubiquitous—and all but unnoticed—will serve to make the point.

The first of these is the humble bar code. The bar code is a crucial element in the history of the new way of the world, one which remains largely untold. Based on Morse code, the bar code was invented by Joseph Woodward and Bernard Silver in 1949 and patented in 1952. But it did not actually get used until the 1970s, in part because of the invention of laser scanners. In 1969, the Grocery Manufactures of America and the Natural Association of Food Chains met to express the need for 'an interindustry product code' and convened an ad hoc committee to pursue jointly a

uniform 11-number grocery product code.[6] In 1971 this ad hoc committee became the Uniform Product Code Council, predecessor of the present-day Uniform Code Council. On 26 June 1974 at 8.01am in the Marsh Supermarket in Troy, Ohio, a 10-pack of Wrigley's Chewing Gum marked the world's first commercial bar-code scanning. At first, use of bar codes was slow to take off. At the end of 1976 only 106 US stores were using bar codes. But this was soon to change. The addition of more and more stores, the expansion of bar codes out of the United States with the foundation of the European Article Numbering Association (EAN) in 1977 (changed to EAN International in 1992 to reflect its global reach) with its 13-number code which administers bar-code usage outside North America, and the adoption of bar codes outside the grocery sector, as a means of electronic-data interchange allowing computer ordering and invoicing for the warehousing industry, all stimulated use (Hosoya and Schaefer, 2001). To signify this expanded role, the Uniform Product Code Council became simply the Uniform Code Council (UCC).

Today, it is estimated by UCC and EAN that bar codes are used by 900 000 companies worldwide in almost 100 countries and these codes are scanned 5 billion times a day. The codes are used in almost every kind of transaction. They are used by the shipping industry to track and deliver packages, by the retail industry to track inventory and modulate pricing, and by the medical industry to tag patients and encode their information. And they are used extensively by the armed forces. For example, since 1995 the US Department of Defence has used product codes in many logistics processes.

Indeed, demand is now so great that the bar code is being extended. New electronic commerce initiatives are in train. Attempts to standardise product codes worldwide by 2005 are being instituted, with US retailers expected to be able to scan 13 digits by that date, and with a general expansion to 14 digits being planned worldwide thereafter. New symbols are also being worked on worldwide which can fit space-constrained products.

But universal product codes are not universal. They actually constitute only about half of bar-code usage in the United States. There, large agencies like FedEx, UPS, and the US Postal Service have constructed their own propriety bar codes to move mail and parcels. Since 1982, for example, the US Postal Service has printed a bar code on every envelope that goes through its system, signifying the address.

The second important form of innovation which is worth commenting on might be thought of as the computer equivalent of the bar code and that is the series of addresses that allow computers to communicate with each other. A good example is the .sig file. First invented circa 1980, probably on an online bulletin board like FidoNet, the .sig file is one of a number of network address systems, a short block of text that can be automatically attached to the end of e-mail messages, usually containing information such as the sender, job title, company name, telephone number, e-mail address, and various other digital sound bites. Little used to begin with, the .sig file is now becoming a kind of electronic business card, including graphics. In turn, the .sig file was used to produce one of the most successful business strategies—Hotmail—free web-based e-mail which attracted more than 12 million users in its first 18 months of use. Now owned by Microsoft, Hotmail currently has some 60 million subscribers.

The third innovation is the SIM (Subscriber Information Module) card, first used generally in the early 1990s and manufactured by a small group of companies

[6] The usual product code consists of a row of 59 black and white bars that vary in width, which make up the symbology of the code. Beneath these bars is a series of numbers called the standard—11 in North America and 13 in the rest of the world. The thickness of the bars and the distance between the bars define the number contained in the code.

such as GEMPLUS. The SIM card is at the heart of the modern mobile-phone industry. It is a small card which identifies the subscriber to the network, and contains a microprocessor which stores unique information about the subscriber including the telephone number and security numbers, plus a number of other functions (for example, memory space for telephone numbers and text messages). The SIM card functions as, in effect, a mobile address.

The fourth innovation, and perhaps in the end the one likely to prove the most powerful, is the RFID (Radio Frequency Identification) tag. Such tags consist of a microchip, and an antenna, sandwiched in plastic. Invented in the 1990s, these recyclable tags can be used to mark any kind of object. Their advantage is that each object can be identified separately, and can be given a unique identity and history, making them very different from bar codes, which can identify only relatively simple information on classes of object (for example, box of Shredded Wheat, $3.95). Also unlike bar codes, RFIDs can be read remotely, out of sight of a reader. The new generation of RFIDs are small (often less than one millimetre in area and a half of a millimetre thick) and can be read from 1.5 m from a passive array. Tags that signal actively can be read up to 6 m away from a passive array. Currently, tags are too expensive at 20 to 30 cents a chip (compared with a price of one cent for a bar code) to achieve this kind of circulation, but this situation is changing. There seems every reason to believe that they will reshape the practical conduct of life in a way that the bar code has only partly achieved. Thus, it is generally agreed that RFIDs will reshape supply chains by allowing all objects to be tracked as they are produced (by tagging the whole inventory and assembly process), transported to the point of sale, and even, in the future, tipped onto the landfill site (Ferguson, 2002; *Financial Times* 2002). RFIDs are also being linked to all kinds of sensors so that they can give continuous updates on the condition of the objects that they are attached to. And, in time, it is hoped that objects will be made proactive: the possibilities are being worked out at this very moment but the clear intent is to make objects that are able to react creatively to the situation they find themselves in by reading all the other RFIDs broadcasting in their immediate area. As a result, a kind of continuous informational ethology is coming into being.

Thus, for example, it comes as no surprise to find that a number of currency printers and Central Banks—for example, the European Central Bank (ECB)—are now looking at the possibilities of RFIDs. Indeed, the ECB has a target of inserting RFIDs in all Euro notes by 2005. Of course, these tags have enormous potential to invade privacy, as almost anything will be able to be tagged (including illicit money and, no doubt, human beings: a Florida company has already developed a passive RFID chip compatible with human tissue). Indeed, given the possibilities of 'Little Angel' and other similar current surveillance schemes being powered up through use of RFIDs, the future is of considerable concern.

The third development is the growth of what is usually called in the mobile-communication literature hypercoordination or microcoordination (for example, Ling and Yttri, 2002). The developments in technology of the kind outlined above make it possible to track and trace human and nonhuman actants continually such that it is possible to produce levels of coordination that were not possible in previous times. Hypercoordination is distinguished by the quality of perpetual contact, whereby it is possible to be in continuous contact with actants, and by the quality of perpetual revision, whereby it is possible continually to recalibrate agreements to meet or deliver at a specific time and place. In other words, it is possible to coordinate and recoordinate at a distance or on an all-but-continuous, and continually adjusted, basis. In turn, hypercoordination offers up new possibilities for economic social and cultural encounters, of which the most important is what is often called 'planful opportunism',

a kind of just-in-time coordination (Perry et al, 2001). Encounters are able to be continually revised in a kind of intricate ballet of circumstances of the kind that used to have to be reserved for public meeting places like the street (Brown et al, 2001; Katz and Aakhus, 2002).

Courier companies like FedEx, which ships 3 million packages a day and uses some 3700 vans and trucks, 720 aeroplanes, and 47 000 couriers, are built on hypercoordination. Lastminute.com which matches last-minute supply of airline tickets, hotel rooms, package holidays, and the like from 8500 suppliers to demand from about 3.5 million subscriber users could not exist without hypercoordination, but neither could teenage mobile-phone owners continually using their mobile phones to meet their friends.

Thus what we see is a different kind of repetition, which allows things to show up differently with different kinds of opportunities associated with them. Through the application of a set of technologies and knowledges (the two being impossible to separate), a style of repetition has been produced which is more controlled *and* also more open-ended, a new kind of roving empiricism which continually ties up and undoes itself in a search for the most efficient ways to use the space and time of each moment.[7]

These developments are, I think, producing a new kind of embodied phenomenality of position and juxtaposition, one "made continuous with the properties admitted by the natural sciences" (Petitot et al, 1999, page 23), based on a background sense of highly complex systems simulating life because, in a self-fulfilling prophecy—as I have shown—highly complex systems (of communication, logistics, and so on) *do* structure life and increasingly do so adaptively. This new phenomenality is beginning to structure what is human by disclosing 'embodied' capacities of communication, memory, and collaborative reach in particular ways that privilege a roving, engaged interaction as typical of 'human' cognition and feed that conception back into the informational devices and environments that increasingly surround us (Dourish, 2001; Goffey, 2002). In turn, we can perhaps begin to see the bare bones of this historically new kind of technological unconscious appearing now even in mundane activities like playing with highly complex games software that is increasingly opaque to rule-guided order and depends on a kind of sensitivity to—and sensibility of—emergence, a kind of planful opportunism incarnate:

> "Take as example one of the most successful titles from the Nintendo64 platform Shigeru Miyomoto's Zelda: Ocarina of Time. Zelda embodies the uneven development of the late-nineties interactive entertainment. The plot belongs squarely to the archaic world of fairy-tales—a young boy armed with magic spells sets off to rescue the princess. As a control system, though, Zelda is an incredibly complex structure, with hundreds of interrelated goals and puzzles dispersed throughout the game's massive virtual world. Moving your character around is simple enough, but figuring out what you're supposed to do with him takes hours of exploration and trial and error. By traditional usability standards, Zelda is a complete mess: you need a hundred-page guidebook just to establish what the rules are. But if you see that opacity as part of the art then the whole experience changes: you're exploring the world of the game and the rules of the game at the same time.
>
> Think about the ten-year-olds who willingly immerse themselves in Zelda's world. For them the struggle for mastery of the system doesn't feel like a struggle. They've been decoding the landscape on the screen—guessing at causal relations between actions and results, building working hypotheses about the system's underlying rules—since before they learned how to read. The conventional wisdom about

[7] In turn, of course, this explains the rapid growth in touring events such as concerts or rapid events like conferences. The new patterns of position and juxtaposition and the knowledges that sustain them provide new resources for sequencing.

these kids is that they're more nimble at puzzle solving and more manually dextrous than the TV generation, and while there's certainly some truth to that, I think we lose something important in stressing how talented this generation is with their joysticks. I think they have developed another skill, one that almost looks like patience; they are more tolerant at being out of control, more tolerant of that exploratory phase where the rules don't all make sense, and where few goals have been clearly defined. In other words, they are uniquely equipped to embrace the more oblique control system of emergent software. The hard work of tomorrow's interactive design will be exploring the tolerance—that suspension of control—in ways that enlighten us, in ways that move beyond the insulting residue of princesses and magic spells" (Johnson, 2001, pages 176–177).

Conclusions: on topological complication

In this conclusion, I want to argue that these new conditionings of position and juxtaposition—and the new event horizon that results—go part way to explaining the emergence of social theory of a particular kind. Recently, writers like Turner and Rojek (2001) have argued for a "robust political economy of social organisation" which can combat some of what they see as the excesses of a more 'decorative' approach which focuses on "aesthetic and technological revolutions" (page 199). But at least some of the work I think they want to excoriate on both the theoretical and empirical levels strikes me, especially in its emphasis on a dynamic iterability, as exactly about trying to articulate the new technological unconscious of a world of performative infrastructures. If that is even partly the case—and I think that it is—then we can see many of the authors whom the 'decorative' approach takes to task as actually attempting to describe a historically new situation and the skills and competencies that are needed to cope with it: a new kind of political economy of social organisation, if you like, but operating at the molecular level.

Butler is a good example. She is known for her notion of performance which problematises the body as 'imaginary matter' (in which the body and unconscious fantasy, matter and the image, are indistinguishable). Butler "relocates the matter of the unconscious to the interval between repetitions" (Clough, 2000, page 120) so that, as she (1991, page 28) puts it,

"If every performance repeats itself to institute the effect of identity, then every repetition requires an interval between the acts, as it were, in which risk and excess threaten to disrupt the identity being constituted. The unconscious is this excess that enables and contests every performance, and which never fully appears within the performance itself."

Butler's notion of performance suggests that bodily matter is dynamic, more an event or a matter of temporality. Butler is drawing on Derrida here, and relating the unconscious repetition compulsion to a différance or pure repetition. Butler therefore argues that the unconscious should be located "within a signifying chain as the instability of all interability" (1991, page 28). The unconscious, therefore, "is not 'in' the body, but in the very signifying process through which that body comes to appear; it is the lapse in repetition as well as its compulsion, precisely what the performance seeks to deny, and that which compels it from the start" (page 28). Thus, as Clough (2000, page 120) puts it, "by drawing the unconscious back to differance, Butler allows for a more general unconscious than the Freudian and Lacanian unconscious. But this rethinking of the unconscious presumes the deconstruction of the psychoanalytic configuration of the imaginary, the symbolic and the real."

Deleuze provides a similar kind of analysis of iteration, in that repetition must, for him, pursue something open, even within a framework in which scenes may appear to move past as frozen and immured. Not everything is brought back.

> "Exchange implies only resemblance, even if the resemblance is extreme. Exactness is its criterion, along with the equivalence of exchanged products. This is the false repetition which causes our illness. True repetition, on the other hand, appears as a singular behaviour that we display in relation to that which cannot be exchanged, replaced, or substituted—like a poem that is repeated on the condition that no word may be changed. It is no longer a matter of an equivalence between similar things, it is not even a matter of an identity of the Same. True repetition addresses something singular, unchangeable, and different, without 'identity'. Instead of exchanging the similar and identifying the Same, it authenticates the different" (Deleuze, 1990, pages 287 – 288).

In each of these cases, and no doubt in more (for example, some of Derrida's recent writings on the gift and on new forms of technological text such as e-mail), what I think we can see is the attempt to 'disclose and touch' (Marks, 2000) a world of planful opportunism, a world in which 'true repetition' occurs, but in part *because* exact exchange has been achieved. As a result, new senses of sense become possible built on the new frames of anticipation and forms of memory that can show up and be touched in and by events now. And perhaps this should come as no surprise. For example, Derrida's and Deleuze's models of thinking as an open system were heavily influenced by systems theory (see Johnson, 1993) and it would be possible to argue that the connected world we now live in has been built upon the loops and whorls of systems theory and that their work shares some common epistemic forebears.[8]

Let me come to an end with a speculation concerning the vexed topic of resistance to, and subversion of, this generally unconscious order. For what seems clear is that resistance and subversion become a different matter. Take the example of the address. Through history, materials and people have resisted the exigencies of the address in numerous ways, most often by seeking various forms of anonymity. But it seems to me that we need to think much more seriously about what might constitute resistance and subversion of the address under the new track-and-trace model. One thing seems certain: old-style notions of 'getting lost' in space through random dérives, as in situationist texts, seem increasingly like an artefact of another age. Getting lost will increasingly become a challenging and difficult task, what with wearable jackets, in-car navigation, and the like. Further, many actions will be tracked on a fairly continuous basis. It may be that this means we will have to get much better at harnessing the energy of moments by attending to a much greater degree to the minutiae of performativity (Thrift, 2000). (Already, it seems as though the pure thrill experience of bungee jumping and the like has become a new way of getting lost.) On the other hand, modern complex systems are so overdetermined that in their interleavings all kinds of gaps are likely to be found in which new kinds of 'excursions' can be coaxed into existence. If things are showing up differently, we can do different things too, energetically opening up the new order of being. As the direction of attention changes, so perhaps, we make a change in the direction of our attention, sensing possible emergences and new embodiments.

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[8] The emphasis on genetics as a form of knowledge of sequencing could be added in here, especially given Derrida's affinity to the work of Jacob and Monod. In turn, methods of analysing sequence from genetics are now making their way into the social world (see Wilson, 1998).

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