’Transduction: invention, innovation and collective life’

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Abstract for ’Transduction: invention, innovation and collective life’

This paper addresses the problem of representing technology within collective life. The flood of representations of technological innovation makes technical invention difficult to comprehend. Moreover, in important ways technological practices alter the conditions of representation. This suggests that the problem of representing technology needs post-representational understandings of invention and technical practice. Drawing on the work of philosophers Gilbert Simondon and Gilles Deleuze, the paper suggests that the concept of transduction, a way of thinking about how forms of relationnality emerge, provides one way of understanding how invention occurs and under what conditions it becomes representable. Through a range of specific examples, and through theoretical framework composed of critical theory, poststructuralist understandings of contingency, social and cultural studies of technology, the paper suggests some alternative ways of situating technical invention within contemporary collective life.

Transduction: invention, innovation and collective life

> A "happening in the world" is what needs to be understood. From time to time, and always in time, new forms emerge that catalyze previously existing actors, things, temporalities, or spatialities into a new mode of existence, a new assemblage, one that makes things work in a different manner and produces and instantiates new capacities. A form/event makes many other things more or less suddenly conceivable. (Rabinow, 1999, 180)
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> Every event, of whatever kind, carries conditions of anomaly. There is always a really-perceived miss in every context. ... No anomaly, no thisness: it's as simple as that. (Massumi, 2000, 190)

I: Introduction

Amidst shifts from representational to performative understandings of subjectivity and identity (Butler, 1997), from understandings of social power based on narrative or meaning to accounts based on operationality (Lash, 2002) or complexity (Urry, 2003), from accounts of knowledge based on epistemological authority to those based on event and relationality (Haraway, 1997; Latour, 1993; Stengers, 2000; Massumi, 2000;), it sometimes seems that technologies alone, surprisingly, retain a degree of solidity or substantiality no longer tenable elsewhere.

Both the *representation* and *representability* of technologies play a key role here. Technological change is consistently and emphatically represented in the form of new artefacts or objects, rather than practices, arrangements and ensembles. The focus is usually fixed on *new* and highly commodified objects such as digital new media or biotechnologies, rather than the processes or events which permit certain objects to materialise or solidify and not others. The representations of 'technological revolutions' that abound in popular science and technology mass media such as *Technological Review, Scientific American* and *Wired* almost exclusively concern State or corporate-

driven research. The areas designated for investment such as nanotechnology, electronic communications, biotechnology and biomedicine are seen as crucial in transnational contests over *innovation*. Programs of innovation often seek to limit or even thwart radical change or *invention,* especially invention by others (Barry, 2001, 213). Within this framing, technological change becomes normal and normative. It links forms of financial and State investment to ongoing technological innovation. Intense activity in corporate, military and university research laboratories, and financial speculation on technological innovations work on the assumption that technological imaginings can be successfully translated into saleable commodities, into things whose primary relation to persons will take the form of ownership. Indeterminacy associated with these innovations is quite often limited to market competition between competing products or providers. Relations between people and technology is figured according to norms of ownership and consumption.

In advertising, in popular science press, in funding programs and strategies, in security and management protocols, and in critical theory, technology figures as something that reduces, covers over and normalises contingent processes.[i] For instance, the National Missile Defence system (NMD) currently under development by the U.S. Department of Defence is predicated on a reduction of contingency in relation to long-range missiles fired by enemy rogue nuclear states. More generally, the representation of technology as reducing contingency renders unrepresentable other possibilities associated with technology.

This paper asks: does technology solely drive towards the reduction of contingency to naturalised norms? If recent theories of agency have sought to highlight how relationality, singularity and generativity come from *sites of unrepresentability* (associated with corporeality for instance)[ii], where do technologies stand with respect to that? Are there sites of unrepresentability associated with technologies? The concept of *transduction* introduced here addresses the problem of a post-representational account of technologies. It suggests a way of thinking about technologies processually, that is, as *events* rather than objects, as contingent the whole way down, rather than covering over or reducing contingency. Drawing on the work of philosophers Gilbert Simondon and Gilles Deleuze, it proposes that both normalising and generative

capacities of technologies can be understood as a process of *individuation,* as an ontogenetic process which results in individuated things, and which involves both ordinary and singular events. Much of what is represented as the 'new' is in fact the capture and containment of the processual mode of existence of technology.

There are three sections to the paper. Given the context I have just sketched, the first part describes the basic problem I'm addressing: that is, the *problem* of thinking about technology today. Briefly put, that problem is: how can we, whoever 'we' are, represent or think technologies, and how can we think them without 'substantialising' them as 'Technology', a mirage of fully operational functioning? The second part of the paper introduces the concept of *transduction* found in the work of Gilbert Simondon. It proposes some ways of thinking about generativity, eventfulness, anomaly and, in particular, processes of individuation, ways that leave open the possibility of understanding both technological normalisation and invention. The third part of the paper discusses some implications of thinking transductively in relation to technology. There, *technicity,* a conceptual elaboration of the transductivity of technology, suggests how the concept of transduction differs from or augments existing contemporary critical concepts of technology.

II: The problem of thinking about technology

With some notable exceptions such as Walter Benjamin, critical responses to technology, such as Heidegger, the Frankfurt School thinkers, and poststructuralist theory, maintain a radical separation, even an opposition between technological action and reflective or critical thought. Critical thought was predicated on the assumption that the conditions of perception, representation, conceptualisation and judgment are themselves separate or detached from the technological practices and contexts in which they were located. Such an assumption persists in much contemporary critical theory of technology (Feenberg, 1999; Poster, 1990) and in many attempts to regulate technology, ranging from advertising to government legislation.

Recent and influential critical approaches to the problem of how to think technology still depart from this assumption. For instance, Paul Virilio and Jean-Francois Lyotard's work on technology differs from each other in significant ways (Lyotard, 1991;

Virilio,1993, 1995, 1998). However, they share a common strongly felt presentiment that technology attacks both temporality and the body. Without wanting to overlook very significant differences between them, we could say that both see technology as corroding the very possibility of critical thought because it undercuts the possibility of clear and distinct representations of technology. In both cases, contemporary technology is conceived monolithically (rather than as *technologies*), and its dynamics are regarded as driven by a kind of implacable and virtually unswerveable logic that involves increasingly fine-grained and intimate syntheses of bodies, technical objects and time. These syntheses are seen as to a lesser or greater extent inimical to cultural life and critical thought. The specific objects of criticism here are so-called 'new media', that is, digital audio-visual communication and media technologies, information networks and infrastructures, and biotechnological processes and techniques that manipulate living bodies. For instance, in Lyotard's 'Can there be thought without the body?' (Lyotard, 1991), the processes of technologisation associated with informatics, material science, transport and genetics are regarded as so intense that thought itself appears as an almost inarticulable, unrepresentable possibility. Wanting to resist the severity, intensity and intimacy of this attack, they both search for a place from which to ground judgement or evaluation of technology. In both cases (although Lyotard's account in *The Inhuman* takes a very different approach) the question posed is: from what position can this attack or colonisation be politically or culturally resisted? Needless to say, if contemporary technology works so insidiously and invasively, any critical position becomes very tenuous by comparison. Critical thought loses traction. The separation between thinking subject and the object of thought, technology, evanesces.

Still more recently, the work of Bernard Stiegler (Stiegler, 1993, 1994, 1996, 1998) and some other deconstructive accounts of technology (Critchley, 1999; Beardsworth, 1998), posits an even deeper internalising of technology within thought. Working with the deconstructive concept of the supplement or prosthesis, Stiegler's account predicates 'the human' as existing in default, as constitutively lacking. Technologies, which are apparently supplementary to or added onto the human, turn out to be a constitutive part of it. Technology, particularly in the form of contemporary audiovisual, informatic

and biotechnologies, prove to be awkward and even unruly prostheses for their bearers. Technology constantly runs ahead of the meaning-making processes through which cultural life identifies and represents its own limits. At the same time, technical processes constantly cover over their mediatic and technical specificity. Stiegler regards technicity as a *historically materialised supplement* or prosthesis of the human. As a consequence, technology becomes almost unrepresentable because it subsumes or contaminates the very ground of representation thought.

Other post-critical accounts move beyond an critical stance whose very ground is under attack by Technology. Rather than embracing the juggernaut image of technology, they analyse, usually by means of case studies of particular technologies within social cultural contexts, how the effects of technical performance, efficiency, speed and unstoppability arise. Studies of very specific technologies such as a failed inner-Paris mass-transit project (Latour, 1996), the practices and techniques of pre-genetic diagnosis of embryos fertilised in-vitro in assisted human reproduction, the difficulties of verifying the operability of intercontintental ballistic missile technology (Collins & Pinch, 1998), or the world-making practices of electronic, realtime share and derivative trading systems (Knorr-Cetina & Brueggers, 2000), insist on the site-specific complexity of their objects. Such accounts, produced in cultural, social and feminist studies of technology, displace the question of how to think technology generically or in relation to a generic term, 'the human', by asking: what counts as Technology in a given social or political nexus? That question is central to the social studies of science and technology (for instance Haraway, 1997; Latour 1993), but also in ethnographies of information and new media (Miller & Slater, 2000). Broadly speaking, such work regard technologies as enmeshed with competing social, historical, cultural, economic and political ordering processes. These ordering processes tend to render contexts predictable by setting up relatively stable networks for the circulation and reproduction of ways of communicating and acting. Technologies are particularly potent in mediating and stabilising contexts because they are not explicitly represented as political or social actors.

In these post-critical accounts, the critical interval between thinking subject and technological object disappears because human and non-human actors are entwined or

networked with each other. That disappearance is no longer catastrophic because the critical interval, the distance between subject and object, it is argued, was never really what it seemed to be. Their separation was an outcome of a failure to adequately represent technical mediations within social-political life. To the title of Latour's *We Have Never Been Modern* (Latour, 1993) could be appended 'We have never been human'. In the wake of this move, the problem of representing technology shifts and alters, and finally re-emerges in a transformed and distributed mode of existence. No longer is representation simply threatened or infiltrated by technology, technologies are actually under-represented in their specificity and situation. Such work effects a shift from the view of technology as an unruly object of regulative, critical thought to a more embedded contextual understanding of technologies as networks of humans, non-humans, spacings, timings, contexts, and imaginings.

However, three interconnected problems remain. First, if we admit the intensity and complexity of contemporary ordering and connecting processes in many domains (IT, media production and circulation, biotechnology, transport, etc), the question of how they can be understood other than through representational thought remains. I am suggesting that concepts of the events (singular and ordinary) can be order to articulate the contingency of these orderings.[iii] Clearly the problem of understanding generativity in relation to order is not specific to the problem of technology. As Elizabeth Grosz suggests, it applies to all political, cultural, economic, scientific and philosophical domains (Grosz, 1999, 16). Ironically, technological objects and practices are a hard case for event-based accounts of contingency in some ways, precisely because they are so caught up in the classificatory machinery of the 'new versus old' and because of the mesmerising effects of full technological operability.

Second, ways thinking of technologies as networks of social-material interactions rather than as simply reflections of human capacities *or* innately alien objects have been found. Yet the different *kinds* of relationality inhabiting these networks are still not well-articulated in certain respects. How do we differentiate, for instance, between singular and ordinary relations? Much technological practice constitutes channels of normalisation. Occasionally, something different occurs. (Michaels, 1993) writes of production and audiencing practices associated with Aboriginal satellite television in

Central Australia during the late 1980s. What looked like 'bad television' to many outside observers could also be understood as a singular articulation of kinship, identity and images when viewed from within. Put differently, how and when does technology end up on the side of normativity where it tends to stabilise social order and collective life rather than on the side of radical contingency and generativity?

Third, following on from this, the emphasis has been on accounting for the effects of technological performance in terms of ordering practices within contexts, even very broadly defined contexts such as 'the human'. Technology stabilises situations as contexts. Unstable or unpredictable linkages between contexts or between networks essentially remain problematic. What happens between contexts or at the interfaces between contexts? Are there *transcontextual* linkages which escape the contextual ordering-work and interactive stabilisation that we have become familiar with? For instance, do technical mediations such as clocktime constitute transcontextual events?

III: The concept of transduction

These three related sub-problems – the problem of eventfulness, differentiating kinds of relations, and resisting reduction to context – suggest the need for a different way of articulating the problem of technology. Prevailing concepts of technology in most cases regard technical objects and ensembles as exclusively oriented towards ordering processes. By contrast, the concept of transduction is a way of theorising and figuring things primarily in terms of relationality, as processes of recontextualisation and in terms of generativity. As a concept, it opens up ways of thinking about *metastability* or the openness of contexts to events. It also designates a style of thinking that involves following and participating in ontogenesis or individuation of things in a given domain.

1. An operation which modulates structures repeatedly

The sociologist Scott Lash has recently suggested the need to shift our understanding of collective life from a register of meaning and narrative to a register of operationality in order to engage with the actual power relations at work in information networks (Lash, 2002, 25). Operations concern structure. An operation changes a structure by altering relations. Put differently, it *modulates* a structure or changes the relations between elements of a set.

What is transduction? A transduction is a kind of operation. It is an operation in which a particular domain undergoes a certain kind of ontogenetic modulation. Through this modulation *in-formation* or individuation occurs. That is, it involves a domain taking-on-form, sometimes repeatedly. In transductive processes, two different orders of scale come into relation. Simondon describes the process as follows:

> This term [transduction] denotes a process - be it physical, biological, mental or social - in which an activity gradually sets itself in motion, propagating within a given domain, by basing this propagation on a structuration carried out in different zones of the domain: each region of the constituted structure serves as a constituting principle for the following one, so much so that a modification progressively extends itself at the same time as this structuring operation. ... The transductive operation is an individuation in progress; it can physically occur most simply in the form of progressive iteration. However, in more complex domains, such as the domains of vital metastability or psychic problematics, it can move forward with a constantly variable step, and expand in a heterogeneous field (Simondon, 1995, 30-31).

A relation links zones within a domain between which no previous communication existed. That process of in-formation (that is, an open-ended taking-on-form) rests on or inherits something *pre-individual*. Transduction names a process of individuation of what was pre-individual (or in Deleuze's terminology, *virtual; (*Deleuze, 1994)). Individuation produces *transduces* individual things in their thisness and in their singularity. Through transduction, a domain structures itself as a partial, always incomplete solution to a relational problem. Not all domains are always by themselves capable of further individuation, but all can be seen as resulting from transductive individuations.

As examples here, we could think of the invention of reggae 'sound systems' during the early 1970s in West Indian parts of London. In his study of subcultural style, Dick Hebdige wrote of the sound system:

> The 'sound-system', perhaps more than other institution within working-class West Indian life, was the site at which blackness could be most thoroughly explored, most clearly and uncompromisingly expressed. To a community hemmed in on all sides by discrimination, hostility, suspicion and blank incomprehension, the sound system appeared to represent, particular for the young, a precious inner sanctum, uncontaminated by alien influences, a black heart beating back to African on a steady pulse of dub. (Hebdige, 1979, 38)

Because reggae music was virtually exiled from radio airwaves, it 'could live only in and through the cumbersome network of cabinets and wires, values and microphones which make up the 'system'"(39). A collective individuation or identification through the 'steady pulse of dub' relied on collective relations running through the 'system'. A similar example might be found in the ensemble of turntables, DJ's 'scratching' techniques and record collections, sound systems, microphones, and MC's rapping brought together in Bronx in the late 1970s as 'hip hop'. In both examples, the relations which emerge between different zones of the domain involve propagating structures and in-forming processes (Ogg & Upshal, 1999).

2. A relation which individuates things

The conceptual problem here is how to think about how individuation occurs without basing it on the existence of separate substances that contingently come into relation. If we think about the relationality as simply bringing different types of things actors or agents into relation, as connecting things up, we run the risk of treating those actors or things as pre-constituted substances or types that contingently happen to come into relation. By contrast, the notion of transduction sees the relationnality as primary.The entities are themselves secondary in relation to the individuation occurring in the given domain.

How could individual things be understood as effects of relationality? By beginning from the relation. Brian Massumi writes:

> Call the openness of an interaction to being affected by something new in a way that qualitatively changes its dynamic nature relationality. Relationality is a global excess of belonging-together enabled by but not reducible to the bare fact of having objectively come-together. Relationality cannot be accounted for by the objective proper ties of the actual ingredients in play considered as discrete elements. It cannot even be reduced to the interactions that might logically be predicted according to those proper ties. (Massumi, 2000, 191)

Where does this global excess of belonging-together come from? It comes from relationality between zones of the domain. While Simondon's account of transduction does not map point for point onto Massumi's definition of relationality, Massumi's reference to the 'global excess of belonging-together' does resonate with Simondon's emphasis on the necessity of engaging with the ontological import of the pre-individual.

The paradigmatic case of transduction for Simondon is the process of crystallisation. Crystal formation is a physical individuation (Simondon, 1992). It is a process set in motion within a domain by singular conditions such as the presence of impurities or a change in temperature. When the temperature drops, for instance, the solubility of dissolved molecules changes. A trigger for crystal growth, such as temperature change, does not impose the shape or form of the crystal. As a crystal grows, the structure of the domain – the solution – changes. The faces of the crystal act as sites of further crystal formation. The structure of crystal internally remains relatively fixed as new layers arrange themselves through progressive iteration. Hence the transductive process occurs at some kind of limit or interface between different orders. In this case, the two orders would be the geometrically regular planes of the surface of the crystal and the unbound molecules in solution. The growth of the crystal in solution constitutes *a partial solution* to the problem of how to structure a domain given the prevailing energetic conditions which have changed the solubility of the solution. From the process of individuation results both a new kind of individual – the crystal – and an *associated milieu* (a term that Deleuze & Guattari later pick up: Deleuze & Guattari, 1988) – the now somewhat diluted solution with a different solubility.

To render this conceptual description more concrete in relation to technologies, the example of public key cryptography is useful. This technology addresses the problem of communication between parties when both the communication itself can be readily intercepted (e.g. On the internet) and when the communicating parties cannot meet up to agree on how to encode their messages. In the context of greatly increased computer network connectivity during the 1980s, the problem of maintaining privacy loomed ever larger, especially in nations with strongly developed traditions of individual rights such as the U.S.A. There the problem centres on relations between the State and private individuals. Public key cryptography, the basis of most contemporary digital signature, authentication and digital privacy protection technologies, restructured those relations in narrowly defined but important ways. The technologyrevolves around the idea that a potential recipient of messages widely publishes a cryptographic key – the sequence of numbers used to encrypt messages - so that anyone else can encode a message destined for that recipient. The recipient alone possesses the private key to decipher it. The

mathematical relation between the public and the private key is crucial here. The notion of making a cryptographic key *public* ran counter to almost all accepted cryptological expert knowledge. Without going into the ramifications of this solution to the problem of inter-individual relations, by 'splitting the key' as (Levy, 2002) puts it, public key cryptography made possible the emergence of qualitatively different kinds of relations. Trusted transactions and exchanges could occur between people who actually remained strangers to each other. It shifted relations of power between State and individuals.

3. A partial, provisional and metastable solution to a problem

Transductions are not limited to physical cases like crystal growth. The in-forming operations becomes more complicated when the domain contains living things, things that reproduce, form collectives, construct sign systems, feel, perceive or occupy situations where whole milieux or even worlds form and change. Given this generality, under what conditions does any particular transduction occur? Transduction is an operation which *partially* and *provisionally* solves a *problem* posed by interactions between different zones within a domain. In the more complicated case of living things, the limit or interface where structuration occurs will be topologically and perhaps temporally complicated. A plant might be seen (albeit somewhat crudely) as a solution posed to the relational problems of a domain characterised by certain fluxes of solar energy, atmospheric composition, mineral and organic molecules, and, importantly, populations of symbiont bacteria. The evolutionary diversity of plants suggests that the relationnality of a domain can be structured or 'solved' in many different ways. That plethora of solutions also provides the conditions for the the contemporary biopolitical management of life-forms. If, as (Rabinow, 1992) and (Agamben, 1999) have argued in different but related ways, the collective management of individual and species life is being knotted into the most elementary relations of collective life, an understanding of how relationnality can trigger different solutions or alternative in-formations becomes crucial.

The case of the crystal suggests that once individuation has occurred, then the problem is solved, and in a certain sense complete. A singular crystal has formed along with its associated milieu. But in many domains, ongoing individuations occur. The obvious

example here would be living things: they entail multiple and ongoing processes of individuation. For living things, in contrast to simpler physical individuations, the sites of ongoing structuration are not situated purely on the interface or on a growing edge. Structuring processes are topologically distributed throughout different zones or interior milieus such as organs, cells, or intra-cellular organelles. They are also temporally distributed and co-ordinated between different individual living things involved in collective life through cycles of reproduction and growth. Symbionts, breeding populations and life-cyles may be all enter into an ongoing emergence and modulation of form.[iv]

For collective processes which involve perceptual and affective components, or psychic life, different kinds of problems emerge, and other topological and temporal complications are involved. An individuation may involve, for instance, feelings and signification, as well as retroactive and anticipatory interiorised milieu such as imagination and memory. Due to their relationnality, certains domains may continually generate further problems. For instance, for an animal that moves such as a feral dog, new problems occur all the time. The dog's mobility constantly changes his or her relation between to their territorial milieu. Those changes pose numerous ordinary problems. Perception, and perceptual capacities of different kinds provide one way of constantly re-structuring the relation between the organism and its milieu. Perception, put simply, is an ongoing relation nexus which in-forms the mobility and metabolism of animals in extra-ordinary diverse ways. In the co-constitution of human societies and domestic dogs, mobility and metabolism detour through complex semiotic and affective circuits (see Haraway, 2003).

Ongoing individuation occurs because transductive operations are nested or convoluted within each other. An ordinary perception or action may provisionally solve a local problem within a domain. That occurs all time. But ordinary perceptions may be swept up within and subordinate to other ongoing more singular problems. Indeed they may be situated in relation to problems whose ongoing process of solution involves vectors working at national or transnational scales. Individuation structures something pre-individual in relation to the specific individuation in question. While a given domain may bear the traces of many previous individuations, (for instance, a city includes many

individual entities), it also stay open to further individuations. To that extent that it retains openness or relationality, it can be said to contain *pre-individual reserves*.

Put differently, the existence of pure potentials or virtuality has to be assumed in order to understand the emergence of an actual order or structure as a partial, provisional solution to a problem. Yet without the emergence of that actual individuated order, those potentials could not be said to exist as such. To cite Massumi again:

> A potential does not pre-exist its emergence. If it doesn't emerge, it's because it wasn't really there. If it does, it really only just arrived. Potential is an advent. It is the contingency of an event in the future imperfect:'will have' (precessive processing). It just will have come, that's all there is to it. (Massumi, 2000, 192)

On this reading, a domain is *metastable* to the extent that a range of different structures constitute potential solutions to the problem posed by some difference or differential within the domain. Hence the structure that results will always be singular, as the case of crystallisation suggests (every snowflake is different etc). Through the process of individuation, some aspect of that domain becomes individuated, but other potentials remain. The corollary of this reserve of preindividual potentials is that some domains exhibit diverse phases and multiple individuations.

4. A mode of thought that conceives events

Until now, I have been characterising transduction as a process involving ontogenesis, the process whereby things come into being. Transduction is an operation through which a domain structures itself through individuations. The concept of transduction carries implications for thought itself. Thought itself, conceived transductively, occurs as an individuation. It follows that no thought can comprehend an entity in genesis without an accompanying or analogous individuation. Technical, as well as artistic, political, organisational, religious or philosophical thought entails an individuation. Even ordinary perception is an individuation since it modulates, albeit often minutely, relations between the perceiver and their milieu. Not all perceptions or events, however, are singular. Most are ordinary. If individuation is singular, an observer receptive to its singularity undergoes a kind of genesis connected to that occurring in the domain in question. To the extent that thinking transductively entails individuation for the thinker, transductions have no pre-constituted observers.

Transduction contrasts with both *in*duction and *de*duction as styles of thought in the way it relates to its domain. The whole point of thinking transductively consists in being open to the advent of anomalies. By contrast, deduction and induction detect the implicit presence of order in a domain. Rather than focus on operations characterised by their predictability, transduction as a way of thinking focuses on making events *conceivable*. As contrasted with both induction and deduction, transductive thought means forms part of the relationality in question. The openness of a situation to the advent of something new flows, as we saw, from its relationality. A crystal in formation both results from the process of individuation occurring in the domain and acts itself within that process. So too, transductive thought results from and acts within the individuation under way.

IV: Technicity : a transductive conception of technology

Transduction pertains to relationality, singularity, and generativity within domains. How do those general features translate into something relevant in the domain of technologies? How could this general conceptual approach change the way we approach technologies? Do they solve the problems of the representation and the representability of technology discussed earlier? What value would there be, for instance, in trying to the technique of PCR (Polymerase Chain Reaction), now used extremely widely to produce copies of selected pieces of DNA or RNA, transductively?

The notion of *technicity* stands at the centre of Simondon's first published book, a work entitled *The Mode of Existence of Technical Objects* (Simondon, 1989). Somewhat paradoxically given the book's title, technicity refers to the mode of existence of technical objects insofar as they *not* objects, that is objects for subjects. Framed in the terms I have just been using, technicity refers to the transductive dimension of technical objects. It describes the ontogenesis associated with technical objects, and in particular how move between abstraction to concreteness, or from virtuality to actuality.

1. Technical objects as norms

The technicity of technical objects in Simondon's account can be read in two very different ways. A more conservative interpretation has prevailed in most readings of

Simondon's work over the last two decades (Hottois, 1993; Dumouchel, 1995). According to these readings, technicity refers to a normative almost teleogical aspect of technical objects. As technical objects evolve over time, they tend to *concretise*. That is, they became more and more densely interlaced with or grafted onto a given context. As they move from abstract to concrete, more and more relations between different parts of the technical object come into mutually interactive relations. That move from abstract to concrete defines the technicity of the technical object. This normative aspect is independent of social norms or uses of technology.

Simondon's examples range from specific aspects of technical objects such as the cutting edge of a forged steel sword, the changing shape of cooling fins on motorbike and the changing design of electronic valves, none of which seem particularly crucial as sites of cultural contestation. Yet all of his mundane examples have something similar at stake – the growing together or concretion of previously divergent realities. It would be possible to extend his analysis to contemporary examples such as changes in the architecture of Intel CPU chips since the early 1980s as they integrate both security features and graphics processing (Kittler, 1997). Another example from biomedical and biotechnological research is the cloning of selected fragments of DNA or RNA. The practices of producing DNA or RNA have changed massively over the last two decades due to development of PCR (Polymerase Chain Reaction: see (Rabinow, 1996) which abstracts copying of DNA from a living milieu (such as bacteria) and reinstantiates it within an non-living chemical or in-vitro environment. In all these examples, technicity designates a degree of concretisation which comes about as a result of the articulation of divergent facets or realities together. By virtue of its technicity, a technical process increasingly produces the same effects at different times and places. Those effects include slowing-down or stabilising interactions as well as accelerations, and catalytic increases in the rate of interactions. A high degree of technicity characterises those objects whose interactions remain more invariant across different contexts.

2. Technicity exceeds objects

Of necessity, technicity overflows any particular technical object. Even on the conservative reading, technicity, as the temporal mode of existence of technologies, consists not so much in the concrete reality of a technical object but in the process of

the growing together or *concrescence*. The technicity of an object refers to the degree of concretisation in which the abstract character of a technical ensemble is gradually rendered more concrete over time. In other words, technical objects materialise within ensembles. They emerge through a process of individuation. We have seen already that individuation need not exhaust the capacity of a domain for further individuations. Hence, as Simondon writes, 'technicity does not exhaust itself in objects and is not entirely contained within them' (Simondon, 1989, 163). This latter dimension - reference beyond any particular technical object – opens the way for a less conservative reading of technicity, and of what is at stake in technical objects and practices.

If technicity is not entirely contained within objects, where does it exist? It exists as the reticulation of technical objects or elements with each other in a given domain. A sometimes extends across social – institutional, national, cultural, infrastructural - contexts. Beyond technical objects, technicity inheres within the relationality of the ensembles or assemblages composed of bodies, institutions, conventions, representations, methods and practices. Read transductively, technical objects evolve over time by articulating diverse realities with each other. Technicity is a transcontextual linkage which can be objectified in context-limited ways, but also potentially exceeds its objectification, stabilisation or immutabilisation. As the mode of being of something through multiple individuations, technicity would exhibit all the singularity, anomaly and excess of transductive processes more generally. Paradoxically then, the more an object works effectively accross different contexts (transcontextually), the more it articulates diverse realities together, the higher its technicity.

Examples of this ensemble or domain-spanning mode of existence of technical objects are again legion. Some kinds of computer software exhibit the relational mode of existence particularly clearly. Much has been written about open source software such as the Linux operating system or the Apache webserver programs (Moody, 2001). These 'objects' constantly change. New complications or attributes are constantly added to them. At the same time, they move across and connect different contexts. Linux connects corporate software production with political activism and networks of academic computing research. Linking those contexts, Linux modestly changes them in

significant ways. Another example is public key cryptography, a technique that allows secure communication between parties whose channel of communication is publically accessible (for instance, on the internet) emerged in the US during the 1980s. Against strenuous attempts to suppress it by the government agencies, public key cryptography changed re-mediated commercial and non-commercial relations carried out online.

3. To act technically?

A major question remains: what role does human agency (collective or individual) play in relation to technicity? This question brings us back to the problem I started with: from what position can we think technologies? From a transductive standpoint, the status of technologies as objects is less important than the capacity of a technical ensemble for further reticulations or individuations in which new relations materialise. From this standpoint, collective life can be rethought in terms of a transductive operation that sometimes involves technical domains.[1] The technicity of a technical ensemble, understood as a transductive operation unfurling at singular points and moments in a domain, might alter our understanding of collective life in two different ways.

A normative reading of technicity would regard it as tending to stabilize social relations. From this perspective, 'technology is society rendered durable' . To the extent that relations are successfully translated into or through a technical ensemble, the ensemble becomes less visible and less eventful. Stable infrastructures (of communication, sanitation, transport sometimes) tend to become almost invisible (Bowker & Star, 1999). The conservative reading of technicity look for a kind of norm intrinsic to technical objects, orienting their evolution over time. Technologies or infrastructures become ordinary when the way they order actions has stabilised around that norm. By that time, human actors take on the performance of individuated and often highly normalised functions; they operators, users, power users, affluent consumers, executive etc of stable technical objects.[v] Their actions, channelled through stable patterns of relationality, tend more and more towards an ideal imposition of form on matter. Acting can then be understood as the imposition of a form on some kind of material. Henceforth, acts can be judged according to their conformity or deviation from some

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norm.

However, a transductive event also implies a different understanding of action. By virtue of the pre-individual reserves implicit to technicity, an act may also be part of a becoming or event that restructures that domain, and collective life more generally. It may link different zones or orders. Rather than acting by imposing a form, acting can be reticulatory or transductive. Like other domains, technical ensembles contain privileged sites and moments where a power of acting and an openness to being acted upon are concentrated (Simondon, 1989, 164). Privileged moments and sites exist because of the reticulated or distributed character undergoing individuation there. At those points, perceptions, feelings and action can become elements of singular transductive operations. In those sites and moments, as in all transductions, an individuation of the domain rather than just one actor occurs. Living actors participate in an individuation.

Technical individuations owe their particular texture to the articulations between living and non-living elements they establish. We could think for example of the articulations that emerged between popular music and drugs over the last decade. A heterogeneous transduction occurred between the computer-driven sampling and looping practices of dance music and the perceptual modifications associated with the drug MDMA or Ecstasy. As Sadie Plant describes the relation, 'the drug was the music, and the music was a means of engineering and exploring its affects' (Plant, 1999, 166). Sound and rhythm, rather than melody or linguistic meaning, progressively re-organised and re-structured bodily movement collectively.

So living things individuate themselves in ways that are topologically and temporally variable. They carry with them internal milieus of individuation such as perception, imagination and memory which slow down or suspend physical individuations. They complicate the relationality of the domains they inhabit by involuting interior milieux or pre-individual reserves. When psychic-collective lives involve affective relations, the temporal and topological potentials in play become very complex. When human actors perceive, act and feel within domains of technical transduction, temporal complications such as retroaction and anticipation will be prominent. The emergence and proliferation of photography in Europe and North America from the 1840s onwards can, for instance, can be understood as a transductive individuation sited on the ensemble of visual scene,

camera, light-sensitive plate-film and studio. It changes the conditions of visual perception, memory and identity (Barthes, 1981). What technical objects carry of collective life with them is not necessarily specific to some version of human or social, in the sense of specific social relations or human capacities delegated or translated into technical mediations. What is individuated in technical ensembles is precisely something that was virtual or pre-individuated in collective life. In that sense, strictly speaking, it was precisely what was not human or social.

V: Conclusion

I began by framing the problem of technology in terms of representation and representability. Understood representationally, technology is difficult to think precisely because it seems to alter the conditions of representation in important ways. The question of the representability of technology centres on this problem.

Transduction is a structuring or articulating process which articulates divergent realities together within a given domain. By approaching technology transductively, we move technologies away from the normative framework embedded in most representations of technology. Technicity understood transductively downplays the normative, stabilising or context-binding facets of technological objects in favour of an openness to sites of unrepresentability.

The cost of this move is an alteration in the character of thinking and our concepts of acting. Transductive thought and action means following and/or becoming involved in processes of ontogenesis which can exceed their own contexts. Eventfulness and generativity does not originate in individual human subjects, nor even from some innate capacity of living things but from the undetermined relationnality or potentials present in any domain. It is precisely insofar as they are not configured as subjects, users, consumers, operators that living actors play a transductive role.

Transduction and technicity together suggest different ways of understanding the composition of collective life. Whilst acknowledging the presence of norms and differentiated structures and patterns within collective life, the transductive approach suggests that a collective life transpires as an ongoing process of individuation. That is, as an operation in which differentiation comes about as a result of the structuring of

what is not yet determined, yet carried by individual objects and subjects.

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i Technological determinism is a familiar target for critical social and political theory. It obscures collective agency by limiting it to a quasi-teleological process of evolution in which ever-increasing technical capability overtakes existing arrangements (Ansell Pearson, 1999). The criticisms of technological determinism bear repeating, especially in the context of the rampant (although now sounding a bit outmoded) informationalism of the last decade, but attacks on technological determinism are hardly ground-breaking or novel. Although an event-driven account of technology could resist the current of technological determinism that constantly flow through the institutional, organisational, enterprise, collective and individual perceptions of technology, such an account might be useful in a different domain. It would provide a way to talk about those occasions when 'an object or practices is associated with *opening up possibilities*' (Barry, 2002, 211). Objections to technological determinism in general terms concern determinism rather than technology *per se*. Determinism of any kind – biological, economic, theological or technology – usually counts as bad because it constricts both individual and collective agency to a limited reportoire of pre-given operations or attributes.

ii Agency itself has been the object of extensive reconceptualisation over the last few decades. If, for instance, agency is understood performatively, as working in the margins of iteratively maintained and highly contingent norms grounded in sexed, racialised bodies (Butler, 1997), where would technology stand? From the standpoint of performative understandings of agency, the problem is where to locate technology in relation to the singularity and radical contingency rooted in lived, heterogeneously materialised bodies. Within the context of recent political theory, the key issue of how technology and contingency can be thought together remains problematic. Hence, a prime motivation to engage with a processual account of technology, especially in central domains such as media, communication, and biotechnology would be to narrow the gap between the alternative understandings of agency developed in recent political theory, and the residue of technological objects and practices that persistently appear as substantial. While critical thought in many different guises has sought to resituate subjectivity, power, structure and knowledge on radically contingent footings, accounts of technologies - with notable exceptions - have largely remained mired in a more reductivist standpoint.

iii Following (Haraway, 1997), we could talk about *articulation* rather than critique in order to signal the need to think the linkages between technical and cultural phenomena, and to render the linkages visible. Articulation basically means introducting extra linkages or points of inflection in the networks of figures, signs, techniques, narratives, bodies and artefacts that compose the contemporary nexus.

iv (Simondon 1995) describes these processes in great detail.

v Technical objects can permit *transindividual* rather than *interindividual* relations to emerge in collective life. The emphasis of existing social accounts of technology rests on interindividual relations hold between constituted individuals in functionally differentiated zones of a social field, Transindividual relations pertain to the individuation of collective life rather than the reproduction of existing social functions. Individuation of collective life structures pre-individual reserves that individuals carry insofar as the not fully individuated. In the same that a technical ensemble carries pre-individuated reserves, collective life, rather than being determined through a social contract or cohering through formations of sovereignity, can be understood as a process of individuation of what is in common but not yet individuated in a group of individuals. In the case of technical ensembles, the transindividual dimension would mean that technical objects become involved in the structuring of collective life.