Simondon and Big Data

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This article explores some limitations of the claims made for Big Data, particularly in the work of Alex Pentland, as providing a universal method for understanding and managing the social. It does so by analysing Pentland's social physics in the light of the work of Gilbert Simondon. It argues that Pentland's social theory is essentially cybernetic and thus open to Simondon's criticisms of this schema of understanding. Additionally, it questions the way social physics leads to the development of hypertelic social structures; its lack of ability for theorizing invention, teleology and open systems; and queries the social ontology it has developed. Simondon's reformed notion of information, situated as it is, between determinism and indeterminism, may not disagree with Pentland's claim that "we're going to reinvent what it means to have a human society," but understands the nature of this claim in a radically different way. Where Pentland's work points towards yet another phase of the control revolution, this article asserts that it misses the more important question of how it theorizes indeterminacy and omits consideration of the transindividual as a mode of the social.

"The rise of the Information Society itself, more than even the parallel development of formal information theory, has exposed the centrality of information processing, communication, and control to all aspects of human society and social behaviour. It is to these fundamental informational concepts, I believe, that we social scientists may hope to reduce our proliferating but still largely unsystematic knowledge of social structure and process" (Beniger, 1986, p. 436). With this conclusion to his extensive historical analysis of the development of the role of information for social control, James Beniger reaffirms the importance for sociology of a broadly cybernetic understanding of society. Although he questions first-order cybernetics focus on control behaviour rather than programming[1] it is clear that, in his view, the three Cs of cybernetics (command, control, and communication) offer the most promising approach for understanding social complexity. We are currently witnessing the furtherance of that project with the recent development of Big Data.

In this article we will explore some of the limitations for the sociological claims made for Big Data through the lens of the work of the philosopher, Gilbert Simondon. By doing so we also hope to demonstrate the ongoing relevance of Simondon's work. In particular we will focus on Alex Pentland's work on social physics (2014), which is the most fully developed theory for the application of Big Data to understanding the social produced to date. Another aim is to situate Big Data, and in particular social physics, within the genealogy of cybernetics. One of the striking achievements of Simondon's work is that he questioned the main tenets of cybernetics, prior to it attaining widespread application, whilst also developing upon the work of cybernetics himself.

At the outset, it is necessary to be clear regarding what some of the claims being made for Big Data are in relation to the domain of the social. According to Kitchin (2013), what is new regarding Big Data is not just the massive volume of data available but also the near real-time speed of its collection and distribution (velocity) from a wide number of sources (variety). This being due to the widespread usage of networked digital devices. The overall aim being to collect and analyse an *exhaustive* amount of data regarding the targeted population.

Although initial claims for Big Data's ability for modelling and prediction were made in relation to business, marketing, science and economics, increasingly it is being touted as offering solutions in other areas such as healthcare, transport, housing, and more generally as offering a broad sociological method.

[1] Whereas *control* is defined as "purposive influence toward a predetermined goal", Beniger (1986, pp. 39-40) calls the setting of the goal to be achieved *programming*.

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Such ambition is also closely related to the development of phenomenon such as the Internet of Things, Web Squared and persuasive technology.[2]

Many of the applications to which Big Data has been applied involve relatively closed systems where data is collected to investigate particular problems. For example, it is used for systems controlling traffic flow, where real-time data is algorithmically analysed relative to models in order to steer them towards a pre-programmed state.

A significant issue with this approach is gaining an understanding of the causal operation of the systems involved. As is well documented the use of quantitative data, due to the problem of induction, leads to the ability to derive correlations but not necessarily the presence of causality. One notorious claim made for Big Data by Chris Anderson (2008, no page) is that it dissolves this problem through the sheer scale of quantitative analysis:

> This is a world where massive amounts of data and applied mathematics replace every other tool that might be brought to bear. Out with every theory of human behaviour, from linguistics to sociology. Forget taxonomy, ontology and psychology ... We can throw the numbers into the biggest computing clusters the world has ever seen and let statistical algorithms find patterns where science cannot.

The strong claim for Big Data, then, is that our understanding of systems of all kind will emerge from working on data itself and messy theoretical struggles regarding interpretation will be dispensed with. Kitchin (2013, p. 130) sees this as a re-emergence of empiricism in which the model is to "collect first and ask questions later" (Croll as quoted in Kitchin 2013).

Although there is good reason to be optimistic about some of the claims made for the use of Big Data for regulating relatively closed and limited systems or networks (e.g. the electricity grid, traffic control, shopping behaviours), should we approach the more ambitious claims made for it to regulate society as a whole with some caution? For example, how seriously should we take Alex Pentland, a leading proponent for Big Data, when he states:

> Adam Smith and Karl Marx were wrong, or at least had only half the answers. Why? Because they talked about markets and classes, but those are aggregates. They're averages ... This is the first time in human history that we have the ability to see enough about ourselves that we can hope to actually build social systems that work qualitatively better than the systems we've always had. That's a remarkable change. It's like the phase transition that happened when writing was developed or when education became ubiquitous, or perhaps when people began being tied together via the Internet (Pentland 2012).

It is clear from this statement that Pentland's aim is to undermine traditional theories of social abstraction and develop his own operationalized abstraction with a wholly quantitative and empiricist basis whose scientific credentials are underscored by the name "social physics". However, as well as dismissing theories based on class Pentland is clear that social physics is not just going to be a reductionist theory, such as found in some recent economic theories regarding individuals as rational actors whose collective actions lead to an emergent equilibrium. Pentland (2014, p. 4) maintains the existence of "social effects" and claims that these are constituted, in a manner reminiscent of the account given in cybernetics, through the flow of information and ideas:

> Social physics is a quantitative social science that describes reliable, mathematical connections between information and idea flow on the one hand and people's behaviour on the other. Social physics helps us understand how ideas flow from person to person through the mechanism of social learning and

[2] The Internet of Things and Web Squared point to the increasingly widespread and automated ways in which data is collected, distributed and analysed in real time. Persuasive technology describes the way that such data can be utilized to attempt to manage user behaviour.

> how this flow of ideas ends up shaping the norms, productivity and creative output of our companies, cities and societies.

Social physics thus differs from the economic rational actor approach which views individuals as rationally determining their goals and actions because it demonstrates "that both peoples desires and their decisions about how to act are often dominated by social network effects" (Pentland, 2014, p. 59). As such it shifts the focus away from individuals as drivers of action onto the flows of information and ideas which individuals inhabit: "ideas flow is the real story of community and culture. The rest is just surface appearance and illusion" (Pentland, 2014, p. 44).

Pentland's (2014, p. 20) definition of an idea is "a strategy for instrumental behaviour" and information is "an observation that can be incorporated into an idea". As such, although Pentland allows for individual goals and motives these are subsumed into the overall flow of ideas throughout social networks.

The promise of social physics is to map the patterns created by these flows of information and ideas in order to understand social behaviour at a more fine-grained level of micropatterns, "because they don't just average out to the classical way of understanding society" (Pentland, 2014, p. 10). Pentland further maintains that traditional quantitative and qualitative sociological methods collect insufficient amounts of data to come close to being able to develop predictive models of future behaviour.

This is where Big Data comes to the fore. It is the ability to use contemporary digital technology to collect, store and analyse vast amounts of "digital bread crumbs" which enables social physics to accurately map social networks and see how "ideas turn into behaviour and action".

But of course, the overriding goal of such an enterprise is not just to map the operation of the social but, in the tradition of socio-cybernetics as developed by Wiener and Beer, to develop strategies for its command and control. As such Pentland's (2014, p. 171) text is littered with claims for the positive potential of "reality mining" such as when discussing applying social physics to cities; "we want to engineer the environment to enhance both exploration and engagement"; or that social networks "can provide more effective incentives to promote the development and enforcement of useful social norms. We need to begin applying these lessons to reinvent our current economic, government, and work systems" (Pentland, 2014, p. 208).

As far as Pentland (2014, p. 180) is concerned the main issue preventing this project from fulfilling its utopian potential is that of privacy, or to use terms which rather give away the implicit liberal politics underpinning his work, to "define ownership rights" so that we "recognize personal data as a valuable asset of the individual that is given to companies and government in return for services".

In what follows I want to think about the sociological claims made for Big Data via the work of Gilbert Simondon. It is my contention that social physics emerged from a cybernetic world picture updated to reflect contemporary technological developments. As such, Simondon's work is particularly relevant due to its unique position in combining aspects of cybernetics with the tradition of French epistemology as well as developing an original perspective on both technology and the nature of the social. The claims made for Big Data and for social physics traverse these same domains and as such a dialogue between them seems appropriate.

Open systems and hypertelia

An initial observation, from a Simondonian perspective, is that in the claims made for Big Data, especially in relation to social physics, little has been mentioned regarding the extent of the openness of the systems under discussion. Pentland (2012; 2014, p. 203) is optimistic for the potential of Big Data for maintaining concretized techno-social mechanisms whose stability he claims can be improved through designing in "social efficiency, operational efficiency, and resilience":

> That's the promise of Big Data, to really understand the systems that make our technological society. As you begin to understand them, then you can build systems that are better. The promise is for financial systems that don't melt down, governments that don't get mired in inaction, health systems that actually work, and so on, and so forth.

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One danger of such a proposition is that it aims towards the development of hypertelic social structures. To understand the implication of this we need to briefly describe the central role that individuation plays in Simondon's ontology for understanding a broad range of phenomena and for avoiding a substantialist metaphysic. Simondon expends much effort critiquing metaphysical theories which assume *a priori* the existence of fully-constituted individuals. His ontology is concerned rather with the ontogenetic operations by which individuals come to be structured and continue to individuate.

Generally speaking, for Simondon the development and continuing individuation of a system occurs due to the retention of a double relationship to both an associated milieu and to what he calls the pre-individual[3]. One of the places where Simondon most clearly explains his notion of individuation is in relation to technical individuals:

> Such individualization is possible because of the recurrence of causality in the environment which the technical being creates around itself, an environment which it influences and by which it is influenced. This environment, which is at the same time natural and technical, can be called the associated milieu. By means of this the technical being is conditioned in its operation. This is no fabricated milieu, or at least it is not wholly fabricated; it is a definite system of natural elements surrounding the technical object. The associated milieu is the mediator of the relationship between manufactured technical elements and natural elements within which the technical being functions (Simondon, 1980, p. 60).

From this we can ascertain that the individualization of a technical individual as a coherent system means that its own operation partially determines the necessary conditions for its continuing operation; that a satisfactory environment for the technical object is created by some transformation of a part of the natural world; and that technical individuals operate with a level of indeterminacy which enables them to individuate further in relation to changes in the external environment.

In addition to the stipulation of an associated milieu it is also worthwhile mentioning the difference of the abstract technical object from that of the concrete. The development of a technical object occurs via a process of increasing concretization:

> The essence of the concretization of a technical object is the organizing of functional sub-systems into the total functioning ... Each structure fulfills a number of functions; but in the abstract technical object each structure fulfills only one essential and positive function that is integrated into the functioning of the whole, whereas in the concrete technical object all functions fulfilled by a particular structure are positive, essential, and integrated into the functioning whole (Simondon, 1980, p. 31).

The difference is that a technical object which contains abstract structures necessary to its operation is comprised of a number of systems which are operationally independent from one another and which each perform only a single function. As such their operation often conflicts, as they aren't operationally integrated. The process of concretization has occurred when the requirement for such abstract structures is overcome by a solution that utilizes a single structure, which operates with a coherent level of pluri-functionality.

An example Simondon gives is that of a water-cooled combustion engine which consists of two abstract systems (the engine and the water cooling system) the concretized solution to which is the use of gills on the piston cylinder which solves the problem of cooling through air flow whilst also functioning as part of the structural support for the cylinder. An object is described as hypertelic when it is so closed as to be abstracted from both its genesis and any possibility of further functional development. A hypertelic tool signifies the completion of a lineage, to which no more development can be made.

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[3] The pre-individual is a foundational concept in Simondon's ontology, in the sense that it supplies his ontogenetic ontology with a non-substantial primary reality. As such the pre-individual is the "first phase of being" that also has the capacity to fall out of phase with itself. Thus the pre-individual does not name a primary substance but the fundamental condition of being as metastable. Simondon's (2005, p. 327) main sources of inspiration for the pre-individual comes from thermodynamic notion of metastability which describes a state rich in potentials and that is neither wholly stable nor unstable but can "produce a sudden alteration leading to a new equally metastable structure".

Although the description used so far has been specific to the individuation of technical individuals this general schema is also applied by Simondon to a broad range of phenomena at different scales. For example, in *The Limits of Human Progress* (2010, p. 230), Simondon describes human cultural progress ('the entire system of activity and existence constituted by what man produces and what man is') using the same terms as those used to describe technical development, that is as the progressive operation of concretizing relations between differing domains (e.g. language, ethics, religion, technology) in order to resolve disparities. Progress in any domain requires that it isn't saturated (hypertelic) but retains a degree of resonance, both internally and with other domains, to enable further development. Such development is also described as occurring via phase shifts involving the division of domains and the transformation of their relations.

However, we should be careful in too swiftly transposing the account of the mode of individuation of technical objects onto that of other domains, such as that of vital and psychic individuals. Although there are many similarities with how the individuation of these are understood there are also significant differences which ensure that, for example, the individuation of a vital individual can never be reduced to that of a technical individual. The individuation of technical objects occurs in discrete leaps whereas vital individuation is continuous. These differences are far too complex to give an account of here where all that's required is an understanding of the general axiomatic at work in Simondon's ontology.

Simondon's account of the individuation of psychic individuals also shares some of these common aspects such as the importance of the subject's relation to its milieu and the overcoming of problems. However an additional aspect of this account involves the role of meaning. To help clarify this Simondon (1989, p. 126) brings into play the difference between signals and signification. Individuation involves the overcoming of problematic disparities through a process of resolution, the result of which is the appearance of an individual (individualization), or "a new systematic" by which signification also appears. Signification here is the concurrent development of meaning or sense which accompanies the resolving individuation of a new systematic. In contrast signals are representative and can be understood as being like the messages passed between individualized individuals in traditional Information Theory. Signification however marks the actual spatio-temporal accomplishment of an individual's individuation in relation to both its environment and within itself.

There may appear a superficial similarity between Simondon's use of signal and signification with Pentland's use of information and ideas here. However, where Pentland's understanding of the social focuses just on the flow of ideas and information Simondon highlights the central role of individuation, of both the psychic individual and the collective, associated with signification. In this way Simondon resists the hypertelia to which Pentland's account is susceptible.

The questions need to be asked, if we are to interrogate the sociological claims made for Big Data from a Simondonian perspective, to what extent do these claims rely on an assumption of social systems as being abstract enough that their continued operation can be maintained in a controlled state of equilibrium via data analysis or conversely, and perhaps more troubling, to what extent does such proposed management of the social require that it becomes hypertelic?

Pentland's social physics doesn't entirely fail to respond to these questions but its responses are limited. The vast majority of the systems discussed in his book concern what can be considered as examples of systems understood in a relatively abstract sense such as financial investing, health monitoring, marketing and improving the productivity of a company. Although we know that the complexity of the social means that all these examples, as well as many others, are interconnected to some extent, Pentland needs to understand them as relatively closed. He is therefore more akin in his thinking to the theorizing of autopoieses such as that of Maturana, Varela and Luhmann.[4]

As such social physics' main concern is with the self-maintenance of systems, or their untroubled operation in relations of structural coupling. In itself this is an understandable enterprise when involving the protection and improvement of public utility systems. However, is the possibility of expanding such a

[4] Making such a comparison is problematic given the theoretical differences of these thinkers. However, Pentland's social physics shares aspects of autopoiesis with its assumed operational closure of systems such that they operate only utilizing that which they produce.

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vision to the much larger and more complex situation of society as a whole really feasible? Such a goal points to the necessity of the becoming hypertelic of the social; that is programming its set purpose to that of homeostatic regulation. Such a vision would encourage dispensing with the political in favour of the technocratic.

This is where the other relationship that the individual holds, its relation to the pre-individual, becomes significant. In simple terms, this can be understood as how the system is related to its openness with what it is not. In respect of the technical object Simondon writes:

> [T]he existence of the technical object is sustained by a double relationship – a relationship with its geographic environment on the one hand, and with its technical environment on the other. The technical object stands at the point where two environments come together, and it ought to be integrated into both these environments at the same time. Still, these two environments are two worlds that do not belong to the same system and are not necessarily completely compatible with each other (Simondon, 1980, p. 54).

Without this secondary relationship any system is incomplete and in danger of becoming hypertelic – that is focused on a single unwavering purpose. The problem with the use of Big Data to control any system is that it faces the problem of integration with a broader and oft changing environment, which is a likely source of indeterminism. This is, of course, usually the role of politics, a subject which receives scant attention in Pentland's (2014, p. 203) book, tending as he does to take it as self evident that the core social aim is that of technocratic efficiency and resilience in an environment which provides "for individuals to make correct decisions and develop useful behavioural norms".

It also begs the question of what is the purpose of society as a whole, if it is to be subject to such control? This is Beniger's problem of *programming* previously mentioned, which has its roots in the cybernetic concern with finality. This question is elided by Pentland and, just as importantly from a Simondonian perspective, so is the role of invention.

Invention and information

What is at stake with claims being made for social physics' ability to maintain the social in equilibrium via control, or its ability to predict future states of the social system in order to enable it to adapt, is the role of invention. One claim is that through the implementation of social physics we will "begin to explain many things – crashes, revolutions, bubbles – that previously appeared to be random "acts of God'" (Pentland 2014, p. 9). From these explanations arise the potential to adapt behaviour, for as Pentland (2014, p. 106) aphoristically contends, "What isn't measured cannot be managed".

It is precisely the removal of indeterminism and novelty from the domain of the social that is being proposed. That Pentland (2014, p. 16) states that "social physics is inherently probabilistic" in its measurement of information flow belies its affinity to cybernetics and the probabilistic notion of information as the mathematical measure of the uncertainty surrounding the communication of a message between two entities.

For Simondon, however, the cybernetic notion of information as something measurable should not be understood as describing a fundamental reality. Simondon describes the cybernetic account of information as "secondary information" indicating that it is founded on a more primary kind of information. For Simondon, this secondary information is too hylemorphic and atomistic in nature, given that it focuses only on already individuated individuals between which signals are sent and received. Such an understanding enables a probabilistic account of systems that are able to adapt to environmental changes within narrow parameters, but Simondon's conception of being is one in which the role of invention is central and which exposes the weakness of information so described.

In part, Simondon's project is a reformulation of cybernetics, which has at its heart a reworking of the notion of information that acknowledges novelty. As noted above, in reference to the importance of the notion of the pre-individual, Simondon's ontology is founded on thermodynamics. A key concept Simondon borrows from this science, which helps him place invention at the core of his ontology, is that of the phase-transition. A phase transition occurs when a system shifts from one relatively stable state of

equilibrium to another, such as when water turns to ice or when a liquid is heated in such a way as to produce convection rolls. These transitions occur when certain systemic thresholds are crossed which leave the system in a metastable or critical state. In fact Simondon's (1964, p. 130) notion of (primary) information is based on a first-order phase transition that he describes as "the arrival of a singularity establishing a communication between levels of reality".

The difference between levels of reality that come into tension with one another is described as a *disparity* forming a problem for being which needs resolution to a higher level. It is the arrival of a singularity that causes a resolving structuration to occur around it through the invention of a new spatio-temporal reality. Information is not then something measurable but refers to the process of in-formation of one level into another thus resolving a disparity. It is this structuring process that Simondon calls transduction.

This is not to say that embracing a Simondonian prioritization of primary information entails ruling out the possibility of more highly determined mechanisms or the mathematical interpretation of some systems. However, what we find is that there are a broad range of systems with varying levels of determination and that indeterminacy does not have to be located at the level of the already individuated information-as-message but can be found at a more fundamental ontological level. What Simondon's levels based ontology enables, beyond the probabilistic ontology of cybernetic information, is an account that includes strong emergence and not just adaptation. Such a distinction is consistent with the difference between weak and strong emergence.

Weak emergence describes when a phenomenon emerges from a lower level in an unexpected and surprising manner. It is also called epistemic emergence as the impossibility of predicting it is due to a limitation of knowledge of the lower levels from which emergence occurs. Essentially, with weak emergence the claim is that we could predict emergent phenomena if we only had more data regarding the situation in the first place. This is basically the claim of Big Data, that by gathering more data about any system we can predict how it might adapt.

Strong emergence describes events that aren't merely epistemologically unpredictable but are instances of the production of *ontologically novel phenomenon* that are "not deducible even in principle from truths of lower level domain" (Mumford and Anjum, 2011, p. 92). The claim here is that it is not possible to predict some phenomenon however much data you have.

These two types of emergence differ in their understanding of the role of the environment. The adaptionist theory tends to understand systems being able to adapt to environmental changes by inhabiting already virtually present pre-adaptations, rather than the stronger thesis that the environment is causally implicated in an operation of radical creation, that is to say, the invention of something completely novel.

As we have seen an individual maintains a double relationship with both an associated milieu and to the pre-individual and attempts to integrate both of these in an inventive and resolving act. The implication here is that the individual doesn't always adapt to environmental changes but that sometimes such openness requires a leap of invention.

At this point it is useful to remind ourselves that social physics is not the first attempt to utilize quantitative data to model and regulate the social. For example, Stafford Beer's theory of the Viable Systems Model (VSM), which he developed from 1972 onwards, was an attempt to develop operational real-time models of various social systems based on quantitative data flows, whose aim was to enable such systems to survive "in an environment that was not just fluctuating but also changing" (Pickering, 2010, p. 244). As such, and although he never mentions it, Pentland's project is resolutely in the tradition of cybernetics.

Pentland's project echoes that of Beer in that he begins by conceiving such modelling to help structure and maintain relatively small systems such as factories and firms but goes on to extrapolate from this the possibility of similarly running whole societies. The pinnacle of this, for Beer, was the Cybersyn project he helped organize in Allende's Chile but which was brought to a premature close by political events in that country.

The VSM is relevant when considering social physics because one of its explicit aims was to enable a social system to survive and adapt in a world of constant change and becoming. It did this through the implementation of a "performative epistemology" (Pickering, 2010, p. 251) that was troubled by the problems of *which* information flows were relevant and how were they related? So described, Beer was

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confronting, as many of the second-order cyberneticists did, the problem of weak emergence in that it wasn't always clear which data to collect and how to interpret them. As Pickering describes it:

> What might adaptation of these models in practice mean? I just described adaptation in the VSM as open ended, but Beer imagined and was prepared to implement something less than this in his models. He understood them as sets of mathematical equations linking long lists of variables such as demand, revenue, technological and economic change, dividends, share prices, and the money market. And the basic form of these sets of equations was not, in itself, revisable, at least as part of Beer's description of the regular functioning of a viable system. What could be revised in practice were the parameters figuring in these equations which specified the intensity of the couplings between variables. Beer's models were thus adaptive, but only to a degree, within a fixed overall form (Pickering, 2010, p. 252).

What is interesting here is that not only did Beer struggle to deal with the problem of weak epistemic emergence but that, even though he had an awareness of it, he could not even confront the thornier issue of the environments radical role in invention, which Simondon describes with his ontogenetic notion of information.

The best Beer could achieve was to model the social on an understanding of organisms as adaptive to their environment and not as inherently inventive in their individuation. Pentland's social physics seems oblivious to these previous discussions. For him, they appear blithely resolved through sheer mass of data, much as Anderson claims.

So, as well as invention being a seemingly insuperable problem for social physics, Beer's experience with his VSM also makes clear that epistemological issues such as with selection bias and conceiving of ways that data should be interpreted and which data should be collected and related have yet to be acknowledged. It remains unclear how having bigger data sets makes these problems disappear.

The analogy which Beer makes of social systems with organisms is typical of a long-running fascination cybernetics had with reducing all phenomena to mere informational flows and thereby erasing ontological difference in order to contrast forms of behaviour. Although Pentland certainly doesn't think of society in terms of an organism it is worth asking what analogy might be in play in social physics.

The role of analogy in social physics

The role of analogy is crucial for cybernetics. From the outset cyberneticists such as Wiener and Ashby drew analogies between systems which enacted the same kind of purposive behaviour but were materially distinct; such as between games and the economy, cellular automata and living organisms, and brains and computers. For example, in their seminal paper, "Behavior, Purpose and Teleology", Rosenblueth, Wiener and Bigelow drew an analogy between a human patient with a damaged cerebellum who is unable to drink a glass of water and the operation of a machine with an "inadequately damped' feedback mechanism"

From such behavioural analogies it was a short distance to claiming an isomorphism between organisms and machines and hence the ongoing fascination with studying machine behaviour. It is unnecessary here to explore examples but just state that first-order cybernetics was interested in drawing analogies based on the exhibition of forms of behaviour and similarity regarding regulation towards a purpose.

As already discussed, Simondon was critical of the cybernetic formulation of information which he saw as both hylemorphic and atomistic. Another issue he had with cybernetics was its use of analogy. In a key passage of his thesis called *allagmatics* Simondon makes an important distinction between two types of analogy:

> [A]nalogical thought is that which observes identities of relations, not relations of identity but it must clarify that these identities of relation are the identities of operative relations, not the identities of structural relationships. By itself it discovers the opposition between resemblance and analogy: resemblance is given from structural relationships. Pseudoscientific thought makes substantial use of

> resemblance, sometimes even the resemblance of vocabulary, but it does not make use of analogy. (Simondon, 2005, p. 563).

For Simondon (2005, p. 564) an analogy is only valid "if it covers a world where beings are defined by their operations and not by their structures". An analogy based on structures does not in fact constitute an analogy for Simondon but merely a resemblance because it "cannot reach the whole reality of being". Simondon's theory of knowledge is thus premised on his ontological account of the operation of being.

This isn't to say that Simondon dismissed such resemblance as being of no use, rather one had to be careful of overstepping the limitations of its suitability. For Simondon the cybernetic *schema* of understanding the world is one amongst a set of other schemas (e.g. Hylemorphism, Cartesianism) which has been developed by analogy from the operation of different technologies:

> In this sense, technology manifests in successive waves a power of analogical interpretation that is sui generis ... None of the schemas exhausts a domain, but each of them accounts for a certain number of effects in each domain, and allows for the passage of one domain to another (Simondon, 2005, p. 18).

However, the attempt to universally apply such schemas is problematic as it misses the ontological reality of operation and reifies understanding in poor analogies across distinct domains. Additionally, Simondon (2001, p. 175) also warns of the reductive, fragmentary and inductive nature of these schemas which by extrapolating from the particular to the universal fail to "account for the existence of the totality, taken as a unity, but does account for the point by point and instant by instant functioning of that totality". As such the universal application of such schemas runs the risk of a hypertelia in thought.

Simondon's theory of schemas resonates with some work in French Epistemology, such as Bachelard's notion of epistemic breaks and Canguilhem's historical understanding of the development of knowledge. His contribution is that he ontologizes this process, something which becomes clearer in his work on the image-cycle in *Imagination et invention.*

In what way does this relate to social physics and big data? We can acknowledge that Pentland's theorizing of social physics is actually very close to cybernetics' with its focus on behaviour. Thus, in a description that resonates with the cybernetic focus on behaviour and purpose, Pentland describes the power of social physics as coming from:

> ...the fact that almost all our day-today actions are habitual, based mostly on what we have learned from observing the behaviour of others. Because most of our actions are habitual and based on physical, observable experiences, i.e., stories heard, actions seen, etc., they can be described as repeated patterns. This means that we can observe humans in just the same way we observe apes or bees and derive rules of behaviour, reaction and learning (Pentland, 2014, p. 190).

As described earlier, for social physics, the ultimate reality behind behaviour is the flow of information and ideas, which Pentland (2014, p. 20) describes rather tautologically as: "The propagation of behaviours and beliefs through a social network by means of social learning and social pressure. Idea flow takes into account the social network structure, the strength of the social influences between each pair of people, as well as the individual susceptibility to new ideas".

So, with Pentland's use of Big Data are we also witnessing the implementation of a reductive technical schema that "tends towards a phenomenology of regimes of activity, without an ontological presupposition that is relative to the nature of that which enters into activity"?

It seems apparent from the above that Pentland's schema for understanding the social is little more than a limited ontological schema developed from abstracting the flow of information through technical social networks. Thus it comes as no surprise that Pentland's idea of an improved social system "might look a lot like Wikipedia but founded on overlapping clusters of buddies who have face-to-face relationships" (Pentland, 2014, p. 209).

As such social physics can be understood as implementing an analogical technical schema that should be treated with as much care as the others discussed above (including cybernetics to which it is similar) in

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regard to the validity of the analogies made from them. That is not to say that what social physics tells us isn't useful in any way, rather that the limitations of its ontology must be acknowledged. As we have already shown, Beer was already aware of such limitations whereas Pentland fails to acknowledge them. In the next sections we will consider how Simondons reformed cybernetic ontology addresses the social and the question of finality.

The transindividual

It should now be apparent that Simondon's ontology is concerned with individuation and not mere adaptation or homeostasis. That is to say that in his descriptions of the ontogenesis of the various regimes which constitute nature (physical, vital, psycho-social) he is not seeking a description in which change occurs just through the actualization of adjacent potentialities, as an adaptive response to environmental change. What fascinates Simondon is what makes possible the emergence of novelty.

As already discussed the collection of ever more amounts of data does not necessitate a more developed understanding of the processes involved in social change. If anything, what Pentland's project aims at is the becoming hypertelic of the social.

We claim, in accordance with Simondon, that what the theoreticians of Big Data are missing is a philosophy of nature that undermines substantialism. Simondon's theory of individuation, grounded on energetic metastability holds as fundamental the ability of being (social or otherwise) to fall out of phase with itself, and to be restructured, as in a secondary phase shift, by a germ of information.

Applying his theory of individuation to the regime of the psycho-social Simondon develops one of his most striking theories, that of the transindividual. Simondon makes a distinction between two modes in which psychic individuals are related: the inter-individual and the transindividual. The inter-individual relation is that which most closely resembles the social abstraction found in Pentland. In this mode the relations between individuals are normative in that they relate to one another in accordance with the representations they have of one another as fully constituted individuals. Such a relation is functional and brings to mind the relation of fully formed entities passing and interpreting messages in conventional information theory.

This resembles Pentland's (2014, p. 21) theorizing of society as "mostly made up of networks of exchanges between individuals". Such a mode has two problems for Simondon. First, that from the perspective of the psychic individual this relation is unable to help resolve the problem of anxiety it feels in response to that which it is not. This is what Simondon (1989, p. 191) calls the problem of embodied immanence which cannot be resolved by the inter-individual relation as this is a relation that merely "goes from one individual to another" but "it does not penetrate individuals".

Second, the inter-individual relation fails to offer a means for true social invention. For this to be possible individuals need to form a system with one another which brings them into a state of resonance by which fresh structuration can emerge. For Simondon, the psychic and social are two poles of (and perspectives on) a single relation (the social relation) and the solution to both the problems mentioned above comes about through a transformation of the mode of this relation from the inter-individual to the transindividual:

> transindividual action is what makes individuals exist together as the elements of a system including potentials and metastability, anticipation and tension, then the discovery of a structure and a functional organization that integrates and resolves this problematic of embodied immanence (Simondon, 1989, p. 191).

Just as we witnessed with the individuation of the individual, the individuation of the transindividual also requires the attainment of *signification.* In the case of the transindividual the signification of the individual and the collective together create a problematic whose resolution is the structuring of the collective. The transindividual mode thus solves both the problem of embodied immanence (through the individual

being able to extend itself as part of a group) and that of change in a truly psycho-social gesture where individuals come into resonance with one another and form a metastable system.[5]

What enables the emergence of the transindividual is not just the flow of ideas between individuals (*a la* Pentland) but the individuation of the collective through the use of pre-individual potentiality, which individuals carry with them, as well as signification. As such the transindividual denotes a physical individuation, commensurate with energetics, like any other.

What is being specified by the pre-individual for the level of the collective? To be clear what Simondon is proposing *in this context*, far exceeds just the passage of ideas in a network, although would include it. The answer cannot be too specific, but as we saw in the description of technical individuation the resources for individuation are found both in relation to an associated milieu and the environment. What Simondon is suggesting is that the source of potentiality for psycho-social individuation cannot be bounded due to its radical environmental openness.

As such the transindividual also builds on those funds of potentiality from that which is already individuated. For example, the sharing of common beliefs can enable a transindividual relation between members of a group, but the fund of potential resources is far broader and would include the whole gradation of psychic activity from sensation and affect to the social structuring of emotion and ideation. Beyond these Simondon also develops a unique theory of the imagination in which images and artefacts (what he calls image-objects) can play a role in structuring the social. It is worth quoting at length an interesting passage from *Imagination et invention* where he discusses the role of images in this respect:

> In effect, the image, as intermediate reality between the concrete and abstract, between self and world, is not only mental: it materializes, becomes institution, product, wealth, and is diffused as much through commercial networks as through the "mass media" disseminating information. Its intermediate character, a fact of consciousness but also object, gives it an intense capacity for propagation; images permeate civilizations and charge them with their power ... The circular causality that runs from the mental to the objective real through social processes of cumulative causation also runs from the objective real to the mental ... Almost all objects produced by man are in some measure object-images, they are carriers of latent meanings, not just cognitive but also conative and affectivo-emotional. Objects-images are almost organisms, or at the very least germs capable of revitalizing and developing in the subject (Simondon, 2008, p. 13).

From this passage we witness how for Simondon the resources for transindividual individuation are widespread, including the conative and affectivo-emotional, and how some individuations also become sources of information or structural germs for further structuration of the metastable field of the social. In *Imagination et invention* Simondon develops an extensive theory of how images develop within organisms to constitute the imagination and how these can also become materialized, through invention, into objects which further influence the cycle of image development. From such a perspective it is also clear that those images generated by the use of Big Data also intervene in the cycle of images and is thus also productive of invention. The situation is thus far more complex than just the passing around of ideas but involves an ongoing process of psycho-social individuation and invention. Coupled with his theory of technical schemas this also becomes a powerful ontogenetic account of epistemological development.

From this position Pentland's claim for the importance of ideas-flow is not entirely incorrect. However, it is also far too narrow for accounting how the social is structured and re-structured. Although Pentland's theory has the benefit of also being able to theorize the structuring of groups far smaller than a whole society, with its concentration on ideas it still remains too dilute to account for the reality of social novelty and thus we should be cautious of claims to the contrary. Bernard Stiegler makes a similar kind of reduction in his assertion that the pre-individual is just technical (for an excellent discussion of this see

[5] Unlike the superficial inter-individual relation the transindividual relation is such that it offers exterior resources for the resolution of the problem of embodied immanence as it penetrates the individuals concerned and brings them into resonance as a system. Such resonance is also metastable and thus allows for further transformation of this system.

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Combes, 2013, p. 67-70). Such an assertion is too limited given the breadth of resources that feed into the process of social individuation.

Teleology

Although Pentland's proposal for a new sociology is reminiscent of others working in the cybernetic tradition he does overlook its concerns regarding teleology. Such an oversight is unfortunate given how central the understanding of purpose in relation to systems is in so much of this work. Beniger's distinction between processes of control and their programming towards a purpose has already been mentioned. The problem of programming was also something that Stafford Beer wrestled with in relation to his VSM. His vision was for a social system that could undertake an active adaptation to a spontaneous finality which was itself determined via feedback from the social collective. Beer called this finality *eudemony* or social well-being (Pickering, 2010, p. 272). For Beer the aim was to cybernetically enhance democracy so that social adaptations could be decided collectively.

In social physics the presence or even requirement for such finality is not even considered. What is claimed instead is an almost essentialist understanding of the habitual nature of the social: "Social physics is based on statistical regularities that span the population, i.e., things that are true of almost everyone almost all of the time" (Pentland, 2014, p.189). As I've already argued such an essentialist formulation leads to a dubious state of social hypertelia, but additionally, also fails to confront the problem of the production of goals towards which social adaptation might occur.

Simondon (2001, p. 119) was also concerned with teleology in systems that were self-regulating: "In self-regulated functioning, all causality has a sense of finality, and all finality has a sense of causality". The use of "sense" here has a double meaning indicating both semantic sense as well as (sense of) direction. It's not so much the case that purpose should be applied to systems, which would then run the risk of hypertelia and normativity, but an awareness that individuation creates new levels of reality the recurrent causality of which operate as unities which have an emergent and coherent inclination which demand their own aesthetic and axiological consideration. As such Simondon was unwilling to impose sense onto individuations but instead tracked their development and mode of regulation in order to do them justice. It's in this sense that his philosophy of technology was concerned with how traditional culture imposed inadequate values on emergent techno-social individuations thus generating conflict.

Simondon (2014, p. 317) understands culture as a "depository of values" out-of-step with technical development, which is indifferent to traditional values. As such culture programs the use of technical means and imposes on them what Simondon describes as a condition of slavery in that it thwarts technology's freedom to evolve. The assumption that the present code of values is final is therefore to define a "reign of purpose" (ibid) that domesticates the technical.

As we have seen new technology enables "new schemes of intelligibility" and with this the likelihood of fresh axiological content. Big Data itself needs to be recognized as a fresh technological advance that will also challenge received values (Pentland has already identified privacy as a zone of contention) and needs to be understood as such rather than as a neutral means of imposing established cultural values through social regulation. It is itself constitutive of a transformation of the environment in that it is productive of new needs and desires as well as new imaginings of the social.

Although this is a gloss of Simondon's position it is enough to make the point that so far Big Data sociology has not confronted the question of the *sense* of that which it studies, in the connected sense both of how the purpose of social systems are divined in relation to technical development (an axiological question) nor in respect to what overarching sense data is interrogated (the epistemological question).

Despite Anderson's claim that the data will somehow reveal its secrets automatically upon interrogation without the need for biased theories or hypothesis it seems clear that Pentland is indeed imposing his own ontology onto the data he is collecting. That is to say that purpose is built into the epistemological frameworks employed to analyse the data. That Pentland's social ontology implicitly promotes a technocratic liberalism should not be a surprise given its cybernetic heritage. Norbert Wiener's original project was also rooted in a liberal humanism, which also had an uneasy tension with his technocratic leanings.

Conclusion

Although it has not been the goal of this article to dismiss the claims being made by some for Big Data for aiding the understanding and efficiency of some relatively deterministic systems, we have attempted to question some of the claims made that it offers a new and universal method for understanding and managing the social.

In brief, we maintain that social physics is a development of the cybernetic worldview and as such would do well to pay heed to previous work in this area and, in particular, its reworking by Simondon. We claim that Big Data fails to account for the importance of the extent and nature of relations social systems have with each other and the environment, which is so well captured by the notions of the associated milieu and pre-individual. Additionally, the limitation of thinking in terms of adaptation needs to be recognized as what is at stake is the integration of systems with a changing environment leading to invention, which will confound any attempt at control unless the society so controlled becomes hypertelic.

In a quotation used above Pentland mentions that Big Data will itself cause a societal phase shift. Whilst the recognition of such phenomenon is welcome the point is that such a shift means the intervention of an indeterminism, which by definition, social physics would not be able to predict. Data is not information in Simondon's sense. Big Data says nothing of metastability and resonance. As Beer also maintained, the ability to regulate the social required more than an extensive database. Beer's own problems with the VSM demonstrate that any such intervention in the complex regulatory causal loops that constitute the social, will itself feed back into the system.

As such we also direct attention to the facticity of Big Data as a new technical development which itself will be productive of new individuations and values. It is, to use Simondonian terminology, a *technical mentality*. Occasionally Pentland's certainty in his project slips and he acknowledges the constructivist nature of the epistemology he is actually dealing with, which falls far short of Anderson's confidence that the days of theory are over:

> These data are often indirect and noisy, and so interpretation requires greater care than usual ... We need to construct living laboratories – communities willing to try a new way of doing things or, to put it bluntly, to be guinea pigs – in order to test and prove our ideas.

Instead of touting Big Data as a means by which to regulate social homeostasis questions need to be asked about how Big Data will construct new orientations of social development? There is some distance between this position and that which sees Big Data as finally giving an objective and scientific basis for sociology.

What is really at stake is the production of new practices, epistemologies, and techno-social assemblages that will lead to new psycho-social individuations. Simondon offers us a way to more clearly see both the importance of ontology for such projects as well as their role in the production of the psycho-social.

Bibliography

Anderson, C. (2008) The end of theory: The data deluge makes the scientific method obsolete. *Wired.* Retrieved from http://www.wired.com/science/discoveries/magazine/16-07/pb_theory

Beniger, J. (1986) *The Control Revolution: Technological and Economic Origins of the Information Society*. Cambridge, MA: Harvard University Press.

Combes, M. (2013) *Gilbert Simondon and the Philosophy of the Transindivudal.* Cambridge, MA: The MIT Press.

Kitchin, R. (2013) Big data and human geography: Opportunities, challenges and risks. *Dialogues in Human Geography*, 3(3), 262-267.

Mumford, S. and Anjum, R.L. (2011) *Getting Causes from Powers*. Oxford: Oxford University Press.

Pentland, A. (2012) Reinventing Society in the Wake of Big Data: A Conversation with Alex (Sandy) Pentland. *Edge.org.* Retrieved from http://edge.org/conversation/reinventing-society-in-the-wake-of-big-data

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Pentland, A. (2014) *Social Physics: How Good Ideas Spread – The Lessons From a New Science*. Melbourne: Scribe Publications.

Pickering, A. (2010) T*he Cybernetic Brain: Sketches of Another Future.* Chicago: The University of Chicago Press.

Simondon, G. (1964) *L'individu et sa genese physico-biologique*. Paris: Presses Universitaires De France.

Simondon, G. (1980) *On the Mode of Existence of Technical Objects*, Trans. Ninian Mellamphy, unpublished. London, ON: University of Western Ontario.

Simondon, G. (1989) *L'individuation psychique et collective*. Paris: Aubier.

Simondon, G. (2001) *Du mode d'existence des objets techniques*. Paris: Aubier.

Simondon, G. (2005) *L'individuation à la lumière des notions de forme et d'information*. Grenoble: Éditions Jérôme Millon.

Simondon, G. (2008) *Imagination et invention*. Paris: Les Éditions de La Transparence.

Simondon, G. (2010) The Limits of Human Progress: A Critical Study. *Cultural Politics*, 6(2), 229-236.

Simondon, G. (2014) *Sur la technique.* Paris: Presses Universitaires de France.