The New Empiricism of the Fractal Fold:

Rethinking Monadology in Digital Times

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Abstract

A new configuration of social science is emerging in these digital times, as we tap into new kinds of data that trouble conventions regarding what constitutes the *unit* of analysis, and question the extent to which this data is owned or even correlated to a definitive organic and individuated subject customarily referred to as 'human'. These methodological shifts demand a more careful consideration of the historical lineage of empiricism and its relation to the history of science more generally. In this paper, I track the historical mutations of *monadology,* an ontology well suited to empiricism in these digital times. Both Gilles Deleuze and Bruno Latour ascribe to variants of monadology in their proposals for a new empiricism, drawing extensively on the work of Gabriel Tarde (1843-1904), a French sociologist, judge, and author of the audacious post-humanist 1895

text *Sociology and monadology*. In this paper I discuss how monadology helps us rethink research methods in these digital times. I argue that a *fractal monadology* re-assembles the fold with the digital, the continuous with the discrete, and ultimately offers a philosophical foundation for contemporary social science research.

1. Introduction:

New developments in digital technologies, software analytics and computational power are changing the relationship between the quantitative and the qualitative in social science methods. These developments have occurred alongside a growing interest in philosophies of immanence, and a widespread turn to the study of non-human agency (Bennett, 2010; Braidotti, 2013; Coole & Frost, 2010). This confluence of ideas and practices is changing the way we think about the relationship between mind and matter, with implications for empiricism in the social sciences (Sorensen, 2011). A new configuration of social science is emerging in these digital times, as we tap into new kinds of data that trouble conventions regarding what constitutes the *unit* of analysis, and question the extent to which this data is owned or even correlated to a definitive organic and individuated subject customarily referred to as 'human'. These methodological shifts demand a more careful consideration of the historical lineage of empiricism and its relation to the history of science more generally. Such historical work can help identify and articulate the specific contributions of new empiricisms.

In this paper, I track the historical mutations of *monadology,* a philosophical approach to empiricism well suited to these digital times. The term monadology refers to a metaphysical theory formally developed by the 18th century philosopher Gottfried Leibniz who rejected Cartesian dualist ontology. Leibniz argued that mind and matter were composed of the same simple substance, that being the monad. Although 'simple', each monad expressed the universe and was as such composed of infinite folds. Leibniz is likely to have taken the term 'monad' from the tradition of Pythagorean philosophy, and perhaps also from other scholars who had used it in related but different ways (Strickland, 2014). Although not *new*, Leibniz' monadology text, published in 1714 and comprised of less than 6,000 words, has inspired a vast array of diverse proposals for how mind and matter commingle.

Both Gilles Deleuze and Bruno Latour ascribe to variants of monadology in their proposals for a new empiricism. In the case of Deleuze (1988a,b, 1993), monadology is essential for his theory of difference and multiplicity, and for how he studies the virtual dimensions of matter. In the case of Latour (2010, 2012), monadology becomes a way of rethinking how degrees of agency are distributed across human and non-human agents. Both Deleuze and Latour will draw extensively on the work of Gabriel Tarde (1843-1904), a French sociologist, judge, and author of the audacious post-humanist 1895 text *Sociology and monadology*. Unlike Leibniz, Tarde proposed an atheistic monadology, in which monads aggregate because of desire and avidity, rather than teleology or destiny. Tarde uses the monadology as a way to rethink social science methods, avoiding the binary between agent and structure, and developing an alternative way of thinking about quantitative methods in the social sciences.

In this paper I discuss how monadology helps us rethink research methods in these digital times. Drawing primarily from Deleuze and Latour, I argue that a *fractal monadology* re-assembles the fold with the digital, the continuous with the discrete, and ultimately offers a philosophical foundation for contemporary social science research. In so doing, I follow other work in related fields that seeks to develop an adequate notion of the *recombinant subject* that is not identified with a numerical statistical data point, but with a fractal complexity in itself (Galloway, 2014; Massumi, 1992; Portanova, 2009).

2. The fold

Initially, one might think that the continuous fold is simply at odds with the digital, since the two seem to reference two fundamentally distinct modes of being. But in a world where the flows of desire and affiliation are increasingly digitized and quantified at scales beyond human perception, where we gleefully participate in calculated publics and software cultures, and where neuroscience shows that we often perform calculations unconsciously, it seems rather urgent that we reconsider the nature of the fold.

> We are discovering new ways of folding, akin to new envelopments, but we all remain Leibnizan because what always matters is folding, unfolding, refolding (Deleuze, 1993, p. 137).

Deleuze (1993) characterizes monadology as a way of theorizing multiplicity and difference as fundamental ontological forces. Monadology offers an alternative way of thinking about individuation and distinctness, recasting the relationship between the one and the many. Distinctness is no longer that which separates and cuts off one individual or object from another, but refers rather to a particular fold or twist in the undulating

fabric of the universe. Processes of individuation, by which identities and subjects and institutions come into being, are not acts of disconnection or separation, whereby the one is cut off from the rest, but are continuous topological folds of the whole. Thus a monadology works through topological concepts of connectivity and elasticity, in which individuals emerge through continuous stretching and distortion. This process describes all being, whether it be the birth of an idea or concept, or the making of a bowl. If we were able to see monads, we would see how bowls and concepts were simply folds of the one simple substance. This is a haptic theory of contiguous relationality, a way of studying life as it contracts and expands across a continuum of mind-matter. The smallest unit of matter or life, thus, is not the atom or any other particle, but is rather the fold. Leibniz offers a truly relational ontology:

> The division of the continuous must not be taken as of sand dividing into grains, but as that of a sheet of paper or of a tunic in folds, in such a way that an infinite number of folds can be produced, some smaller than others, but without the body ever dissolving into points or minima. (Leibniz, Pacidus Philalethi (C, 614-15), in Deleuze, 1993, p. 6)

Thus Leibniz's monads are riddled with folds that produce caverns within caverns, 'each' compressed differently by the forces of appetite and perception. For Leibniz, each monad expressed the entirety of the universe, a distinct perspective or contraction of the relational forces that saturate the monadology. A fold is never final, never a definitive cut, and thus the mechanism of creation is invagination, pleating, further folding and twisting, rather than unfolding or cutting. For Leibniz, this "muscular conception of

matter" corresponds to a spirit in matter, a vitalism or virtuality inherent to matter itself (Deleuze, 1993, p. 7).

This focus on the fold is related to Leibniz' development of the concept of the infinitesimal as the "smallest interval", an interval that is smaller than any conceivable measurement, but still, and yet paradoxically, not zero. Deleuze (1994) will use this concept to argue for the idea of *difference in itself* and claim that we must study *degrees of difference* rather than *differences in degree*. In other words, the fold, as the basic ontological 'unit', captures this idea of difference in itself because it can always be further folded. Two distinct individuals partake in this difference in differing degrees (some more folded than others), but there is no absolute measure that will allow us to distinguish them, since the one always folds the other. Thus the emphasis on the monadological fold rebukes a difference (or distinctness/individuation) that is determined through reference to something outside of it. With this emphasis, we begin to glimpse the consequences for empiricism, since the monadology demands that we shift from 'interaction' between distinct individuals, to intra-action, much like the proposal of Karen Barad to rethink relational ontology using ideas from quantum physics (2007).

Between the years 1886-1904, Gabriele Tarde develops these ideas within the field of sociology, arguing that there is never a complete cut-out of the individual, only folds and knotted twists in the one flowing substance of society. For Tarde, everything is a society, including cells, viruses, ants, rocks and schools. Each society is a particular configuration of the one simple substance – the monad – whether it be human or non-human. The key

for Tarde is that difference and variation underlie all illusions of oneness and unity, so that *difference in itself* – rather than difference between distinct individuals – is inherent to all matter and life. Rather than Leibniz' appetite and perception, Tarde's monadology folds according to the two fundamental actions of *imitation* and *invention* (much like Deleuze's repetition and difference). Invention for Tarde is not the neo-liberal celebration of the entrepreneur. Tarde's invention occurs by way of an individual only insofar as the multiplicity of imitations and repetitions associated with that individual lead a "life of their own" (Latour and Lépinay, 2009, pp.37-38). In other words, invention is a collective swarm of *imitative* actions occurring at the level of the trait (Tarde, 1903/2009). This swarm of imitation reconfigures the relations that comprise the individual. A society is monadological in that there are no individuals. Focus on the fold rather than the individual allows Tarde to decenter human agency. Thus freedom is expressed in relationships to varying degrees, but not as an attribute of individuals. Creativity and invention are simply "a particular moment between invention and adaptation"(Latour and Lépinay, 2009, p.43). Social Darwinism is avoided, in theory, as long as one stays close to the monads and resists the appeal to master plans, teleological designs, and overarching structures.

Because of the nature of a continuous fold, agents in a monadology don't 'interact' with each other, "they own one another to begin with" (Latour, 2012, p.7). Tarde argues that a monadology operates through the verb "to have" rather than "to be". The French verb *avoir* is used to conjugate most verbs, including verbs associated with subjective feelings, like *to be hungry* (J'ai faime). Tarde's focus on the material verb *to have* rather than the

existential verb *to be* is a direct statement of his anti-Cartesianism. In this case, *to own one another to begin with* suggests various material ways of belonging to each other, but not in terms of set containment (not, for instance, as an element within the enclosure of a set), which tends to entrench inside/outside ways of conceptualizing the verb to have. For Tarde, there is a relational ethics at stake in the monadology that insists we imagine monads in terms of how they *express* the world. Every monad contains all the other monads insofar as the world is comprised of an infinite continuum of ongoing expression. In other words, a monadology is a vast undulating flow of affective expressivity, contracting and expanding into the infinite past and future. His emphasis on the material verb *to have* allows us to better grasp the temporality of becoming (rather than being), and the contiguity of the past with the future.

> All philosophy hitherto has been based on the verb *Be* [être], the definition of which was the philosopher's stone, which all sought to discover. We may affirm that, if it had been based on the verb to *Have* [avoir], many sterile debates and fruitless intellectual exertions would have been avoided. From this principle, I am, all the subtlety in the world has not made it possible to deduce any existence other than my own: hence the negation of external reality. If however, the postulate *I have* [J'ai] is posited, as the fundamental fact, both that which *has* [eu] and that which *is had* [ayant] are given inseparably at once (Tarde, 1895/2012, p. 52, original emphasis).

The verb “avoir” captures the *immanence* of life, because it stresses the material coupling and contiguous haptic *encountering* of everyday life. In moving away from the Cartesian verb “to be”, which seems to be stuck in the dichotomy of being and non-being, monadology operates in and through the materiality of life. Predicates that typically are assigned to being (i.e. I am female) become degrees of having (I have some degree of female). Note how this ‘having’ is not possession of an element in a set, because it is a matter of the degree to which monads express each other. My body expresses female to some degree, and female expresses my body to some degree, and these degrees are not equal. Clearly degrees of power are at work here in configuring the topological features of the monadology.

> To have or to possess is to fold, in other words, to convey what one contains “with a certain power.” If the Baroque has often been associated with capitalism, it is because the Baroque is linked to a crisis of property, a crisis that appears at once with the growth of new machines in the social field and the discovery of new living beings in the organism. (Deleuze, 1993, p. 110)

Deleuze directs our attention to how the particular monadology of Leibniz was linked to the particular historical time in which it was articulated. Indeed, as I discuss below, the link between capitalism and monadology becomes newly inflected in our digital times. But before turning to this issue, I raise the question here as to how *knowledge* is conceived in a folding monadology. What could it mean for one monad to know another, if each is always already an expression of all the others? And how might

the monadology furnish a new answer to this question, different from the usual postmodern claim that we are always already implicated in our representations of others? First, the monadology studies relationships less in terms of representation, and more in terms of haptic contiguity – or contagion. Second, the monadology offers more than the relativism of postmodernism, which focused on the epistemic limitations of an individual's knowledge of the world. Instead, the monadology affirms an ontological relativism, rather than an epistemological relativism. It asserts that diversity and difference are *not* simply evidence of human limitation, but are rather essential forces in the world. This is precisely what Deleuze has in mind when he speaks of *difference in itself*. We can see where Deleuze found his inspiration:

> To exist is to differ; difference is, in a sense, the truly substantial side of things; it is at once their ownmost possession and that which they hold most in common. This must be our starting point, and we must refrain from further explaining this principle, since all things come back to it – including identity, which is more usually, but mistakenly, taken as the point of departure. For identity is only the *minimal degree* of difference and hence a kind of difference, and an infinitely rare kind, as rest is only a special case of movement, and the circle only a particular variety of ellipse. (Tarde, 1895/2012, p. 40).

We might still ask what comes of epistemology if knowledge is no longer or not only the more or less accurate *representation* of the world (Maclure, 2013). As part of this ontological turn, Tarde will claim that an increase in knowledge 'about' the world entails

tracking the material fold that was previously taken to be a cut. Learning is a process of feeling the contiguous links that are woven together to form the fabric of the monadology. Thus knowledge is based on haptic encountering (touch) rather than representation and image. *To know* is to track the contiguity *between*, to flow through the connecting lines, and feel the collective affect as it contracts into a knot, or expands and undulates across the surface of a swarm. *To know is to become* this material configuration of proliferating folds and crenellations. I will argue in the proceeding sections of this paper that this monadological approach to epistemology is different from previous postmodernisms insofar as it engages with new digital media. These media are in fact fully material, and are folded into the ever-changing monadology.

3. The recombinant subject

Deleuze (1988b) will introduce the term "superfold" to describe the ways in which contemporary digital life is monadological (p.131). In describing the digital variant of monadology that emerges in our post-cybernetic world, he brings together the iterative algorithm of computing power with the genetic fold of life, and points to the micropolitics of traits and non-human forces:

> Biology had to take a leap into molecular biology, or dispersed life regroup in the genetic code. Dispersed work had to regroup in third-generation machines, cybernetics and information technology. What would be the forces in play, with which the forces within man would then enter into a relation? It would no longer involve raising to infinity or finitude but an unlimited finity, thereby evoking every situation of force in which a finite number of components yields a

> practically unlimited diversity of combinations. It would be neither the fold or the unfold that would constitute the active mechanism, but something like the Superfold, as borne out by the foldings proper to the chains of the genetic code, and the potential of silicon in third-generation machines … The forces within man enter into a relation with forces from the outside, those of silicon which supersedes carbon, or genetic components which supersede the organism …. In each case we must study the operations of the superfold, of which the "double helix" is the best-known example. (Deleuze, 1988b, p131-132, note that surpli could be translated as overfold)

Just as the fold was used by Deleuze to describe the Baroque subject, the superfold or overfold is used to describe the current "computerized control society" (Galloway, 2014, p. 108). The dividual (rather than the individual) and the superfold are the key tropes of this new era, still monadological, but reconfiguring the relation between the discrete and the continuous. The term *dividual* refers to the traits that flow through the monadology, across what appears to be an individual member of a society, forging a swarming transindividual society. For Deleuze, the subject emerges through the multiple permutations of these traits – "an unlimited diversity of combinations". If the fold conveys a smoothness, the superfold introduces an algorithmic iteration, a transversal crease in the fabric. The superfold is thus the crease or line that produces a repetition within the monadology. If the fold is "the unit of matter, the smallest element of the labyrinth" (Deleuze, 1993, p.6) then the superfold is the combinatorial repetition of that fold, the twist or crease of the fold, evoked in the example offered by Deleuze of the double helix. While the Baroque

subject was pleated into matter, contemporary dividuals are recombinant subjects, assembling always in relation to the bioinformatic ecosystem. This recombinant subject is dispersed across "an unlimited finity" of molecular repetitions. The superfold will be a fractal fold, an iterative craggy fold, a transversal crease where the flow splits apart. The superfold points to a new way of incorporating the discrete into the continuous, and suggests that the act of calculating occurs at the most minute scales.

This fractal monadology seems to offer a philosophical foundation for developing new research methods suitable to these digital times. Galloway (2014) will link this to the current digital dispersion of observation and document, where a multiplicity of points of view proliferate and flood the world, where pixels are re-assembled at micro scales, and millions of data points are mined every nano-second. The fractal iteration repeats the fold – where one might think of the fold as the *analog* event – and generates a self-similar somewhat dilated and distorted superfold. It is this iterative repetition of the fold that introduces the discrete into the world. And it is through the discrete that the world begins to count and calibrate. Calculation and numeracy are thus *not* unique human capacities. Instead, calculation is a tendency or potentiality of all matter, be it human or non-human. According to this philosophy, geometry would become a more material mingling of *geo* and *metric,* rather than an idealization or abstraction. For Kirby (2011), too much of socio-cultural discourse theory forecloses this possibility by defining geometry against geology, language against matter, where the former always codes the latter. Instead she urges us to consider a *nonhuman mathesis* that disallows any exemption from measure. Of course there are huge dangers in pursuing this theoretical path. It's all too easy to

imagine dystopic scenarios where we pay tribute to a calculating universe with built-in agenda. We know all too well the horrors of quantitative methods enthral to cybernetic dreams of calculated publics and digital labor.

But Deleuze helps us see how the control society is not simply imposed on us from without - we come to realize that computation is within us. We are computational everywhere, from RNA recombination to markets to digesting stomachs to degrees of affect. Through this fractal monadology, we begin to grasp the flow and the quanta as mutually entailed. When we consider the digital proliferation of life in our digitized collectives, we can see how a philosophy of immanence is addressed through a fractal monadology. Rather than banish the digital as the *other* to the continuous, or confine their relationship to a dialectic resolution, Deleuze tracks the calculating micro-habits generative of continuous matter. Thus we are asked to imagine how the quantitative functions in research methods aside from the usual segmenting of the continuous, where quantity is always assumed to be that which is outside of matter. Our research methods must begin to imagine how discrete quantity is somehow immanent within continuous matter. Might it be the case that computation, calculation, and the digital more generally, are the most adequate ways of communing with matter?

How might such a claim be taken up and developed into a research method? How might there be a notion of quantity associated with this continuous flow? Indeed, Deleuze and Guattari (1987) will argue for "the importance of statistics, providing it concerns itself with the cutting edges and not only with the 'stationary' zone of representations." (p. 219). Such a statistics must pursue the lines of flight, the zig-zag folds that form creases

in the monadology and segment the fabric in new transversal directions. But such a statistics must keep close the fact that these creases "exist only by virtue of the flow suffusing them" (p. 218). In other words, we need to attend to the quantum flows that suffuse and modulate the macropolitics of institutional practices (de Freitas, 2014). For Deleuze and Guattari (1987), this is precisely why Tarde was interested in the world of detail and the infinitesimal, the miniscule variation of a bureaucratic detail, the minute movements that constituted a sub-representative matter (p. 219). Tarde critiqued Durkheim's sociology of 'social norms' for how it failed to address exactly what needed explaining, that being "the similarity of millions of people" (Deleuze & Guattari, 1987, p. 218). Durkheimains claimed that Tarde was more of a psychologist than a sociologist because of this attention to trait and habit. But he was less interested in how one individual copied another, and instead committed to a theory of flow or wave propagation through a swarm or collective, tracking the way that these flows were superimposed and diffracted. Flows, for Tarde, were always comprised of belief and desire, and were quantifiable not as discrete units but as infinitesimal propagation. Attention to flows offers us a way around the individual-structure binary that haunts the Durkheim sociology project, because flows are indifferent to these two constructs. You cannot attribute a flow to an individual or to a structure. In the next section, I discuss how Bruno Latour develops this idea, drawing again from Tarde's monadology.

4. Calculating matter

Latour (2002, 2010, 2012) lauds Tarde for his radically different vision of what it might mean for a discipline to be quantitative. Latour reads Tarde as offering an alternative to the tradition of parametric statistical modeling that has all too often misrecognized the dynamic nature of society. Indeed, the very public dispute between Tarde and Durkheim regarding what role statistics plays in sociology supports this reading. Tarde considered the social science of his time reflected a particular "patchy statistical apparatus" and that social scientists should think past the methods of statistics to new ways of working with the quantitative (Latour, 2010, p. 152). In Latour's words, the way we work with and conceive the quantitative has huge impact on social theory - "you have the social theory of your statistics" (Latour, 2010, p. 152).

Recall that for Tarde, the sociologist, everything is a society, including human and non-human collectives. Whether a collective of humans, rats, rocks, or shoes, each collective operates as a society. But studies of society have different methods depending on their *material access* to what they study. Thus there should be important differences between methods, not because of any fundamental ontological difference between human and non-human, but because we humans have different kinds of access to different kinds of society. For Tarde, different methods are demanded because of the scale and relative size of that which is under study. Whenever we study something that operates at a radically different scale to human interaction, we are obliged to use different methods. It's important to note that such a distinction changes with time, as we develop new prosthetic devices and change our understanding of what constitutes human perception. But in any given historical period, the natural sciences concern themselves with activity that is at a non-human scale, and thus they develop the practice of using sampling and

case studies and the practice of inductively generalizing to the whole population. This practice treats the generalized law or model as the governing structure that stands outside of the particulars.

Although such methods are adequately suited to the physical sciences, they are not suitable to the social sciences, where we are able to follow the complex relational ontology of particulars without positing an overarching structure. Latour will take up Tarde's point and argue that contemporary social scientists who ape after the natural sciences, in putting such structure to work, fail to grasp the virtue of their privileged access to that which they study. The individual-structure distinction breaks down in the social sciences, because the social sciences involve humans who study human society (rather than the society of bees or swamps).[1] For Latour the implications of this are monumental, as it offers a "completely different way of calibrating what should be expected from any science of any society." (Latour, 2010, p. 149).

According to Latour, a new quantitative method, based on Tarde's insights and developments in new media, will resist the tendency to construct laws and models that transcend the multiplicity under study. Such methods will not, according to Latour, inductively generate models that transcend the particular or the components of the network. In these digital times, argues Latour, we do not have to abstract from the particulars to the structural law. If in the past, ethnography was said to attend to the particulars of situated individuals through thick description, allowing for an intimacy and proximity that defined qualitative methods, the digital saturation of most lives and contexts brings the quantitative into that proximate fold. If in the past, the quantitative

[1] Presumably this privilege also applies to bees who study bee society.

was that model or code that failed to capture the kind of data collected when up close and intimate with a participant, the internet has completely altered the nature of proximity and intimacy. According to Latour, Tarde anticipates this digital turn, arguing that the quantitative operates at the most minute and proximal scales:

> the more we get into the intimacy of the individual, the more discrete quantities we'll find; and if we move away from the individual towards the aggregate we might begin to *lose* quantities, more and more, along the way because we lack the instruments to collect enough of their quantitative evaluations. (Latour, 2010, p. 149).

In other words, the individual is always already the quantitative in that the 'one' is never given. This qual-quant collective character of our individuality is based on the monadological fractal fold discussed in the previous section. The challenge is then to follow all these dividuals for how they are aggregated, and to resist moving to a static image of society; we must study the way that dividuals come together to form assemblages without producing a rigid structure. Rather than deploy the quantitative as that which produces rigid structure, we need to reclaim the dynamic and unfinished nature of number (and structure), to consider quantity as itself infinitely elastic. When we make the leap to *rigid overarching structures*, we operate only according to a discrete image of quantity, and an impoverished understanding of multiplicity. Monadology is precisely what helps us imagine a different mingling of the discrete and the continuous, collapsing them ontologically. The vast amounts of quantitative 'evaluations" that are

generated every milli-second produce *data waves* that *are* human society. A quantum flow cannot be attributed to an individual, because by definition it breaks with the conventions of location or attribution. Such flows circulate stochastically across an assemblage, making them quantifiable through probabilistic measures. A flow partakes of an abstract quanta or "degree of deterritorialization" in the line of flight. Flows are always detached desires or beliefs, imitative and varying as they circulate. Deleuze and Guattari (1987) will argue that a statistics of these flows is essential, "providing it concerns itself with the cutting edges and not only with the "stationary" zone of representations." (p. 219). Indeed Deleuze (1988a) will argue for a "qualitative probabilism" (p.30).

Even at our most personal moments, when we feel most authentic, there are minute calculations occurring at all scales. One can see in Tarde's monadology an attempt to think bio-power long before the term was used, to recognize the way that the body and the neuron and various other traits and tensors join the material flow of capital, indeed *they comprise the flow of capital as much as any abstract currency*. For Tarde, economy and ecology are entwined. It is not that one is a superstructure and the other a material base. There are no principles guiding economics (no invisible hands or ossified social norms), except for those passionate attachments that happen in the proximal moment of encounter. These moments entail calculations of 'value', micro-evaluations of more or less, relational adjustments of assemblages, whereby two adjacent molecules adjust to the milieu of their encounter. Calculations are thus never cut-off from the social world, performed in some cold objective way upon the material base, *because the material is*

always already social. This is not the usual socio-cultural approach, not the "cultural capital" approach of Bourdieu, because Tarde draws principally from a philosophy of immanence. He doesn't interpret or code culture in terms of capitalism, but rather sees capitalism as part of the monadology. For Tarde, the capitalist hydra is just one example or one facet of the pulsing monadology – there is no phase of capitalism out of which we emerge. Capital is part of an ontological process of intensification, by which the monadology folds and creases, interlacing what was previously distant, contaminating what was once unified or isolated, through imitation and invention.

As social science researchers begin to study millions of participants who share their "natural data" on twitter, instagram and other social networks, we begin to glimpse the undulations and involutions of this quantum flow. The calculations spread across a network of relations through "imitative rays" or what Latour and Lépinay (2009) will call "contaminations" (p.9). Desire and belief are contagious, leaping from adjacent cell to adjacent cell, but never through a context or structure, or any 'norm' that seems to sit outside of the immediacy and immanence of the encounter. There is no plan guiding contagion, no structural schemas that determine its progress, and so all we can do as social scientists is study its flow. Everything is potentially a number for Tarde, but it is not that we are simply more able to measure what was previously innumerable. Tarde offers a new concept of number – a new way of thinking about the material nature of quantity: "For him, there already exists in the batter, dare we say, a particular type of quantum that has only an *indirect* link to what economists call the quantifiable" (Latour and Lépinay, 2009, p. 17). It is not that the social scientists are doomed because of their

mania for calculating, but that they haven't pursued the proliferation of "tensors" that carry "a vast reserve of quantification" (Latour and Lépinay, 2009, p. 17). Only after multiplying the types of quantum does the quantitative fabric of life come alive. The calculating universe is simply operating at scales that most often escape us, while we wander around within this "swarming of assessments" (Latour and Lépinay, 2009, p. 30).

> It is because of this background of "calculable forces" that the addition of calculative devices, of metrological chains, can have such a performative, explicatory capacity, that they can even become forces of production. It is because the monads calculate at all times and in all possible manners that the addition of calculative devices, which are miniscule prostheses, brings about such a prodigious amplification of evaluations. (Latour and Lépinay, 2009, p. 40)

In the next section I look more carefully at how this prodigious amplification of evaluation shapes the fractal monadology of today.

5. Big data and dividuation

Latour (2010, 2012) claims that current techniques for digital navigation through social data may provide us with the kind of methods we need to pursue Tarde's vision of social science. Rather than work with a two-tiered model, between the individual and the aggregate, Latour suggests that digital navigation, large data mining methods, and new visualization software may reflect the principles of Tarde's proposal for a different kind

of sociology. Rather than relying on small samples from populations, and creating a model that is meant to stand outside the data and represent the data, one can study the long lasting features of social order from *within* the large data set. Latour describes how the internet search itself operates as a network of *continuous* feed-back associations. The search *entity* is defined by a network of other entries, and although these form the *attributes* of the entity, they are also changed through the very act of searching. When I search for "monadology" I generate a list of entries that form the attributes of the name "monadology", but since my search intervenes in the network, through ranking algorithms and IP address tagging, the relationship between entity and attribute is continuously reconfigured. In other words, the name "monadology" is folded into the mesh of its own associations.

> 'Specific' and 'general', 'individual' and 'collective', 'actor' and 'system' are not essential realities but provisional terms that depend rather on the ease with which it is possible to navigate through profiles and to envelope them inside their names. (Latour, 2012, p. 4)

The more cumbersome the navigation, suggests Latour, the more likely we are to introduce an external model for representing the complexity. However, introducing external models to describe multiplicities is what we need to resist doing, according to Latour. Similarly, the concept of *structure* (as something qualitatively different from the particulars) is also to be avoided in the study of collective behaviour in digital networks, whether it is a structure assumed to be *a priori* or *emergent*.

> The experience of navigating through profiles available on digital platforms is such that when you move from one entity – the substance – to its network – the attributes – you don't go from the particular to the general, but from particular to more particulars. (Latour, 2012, p. 8).

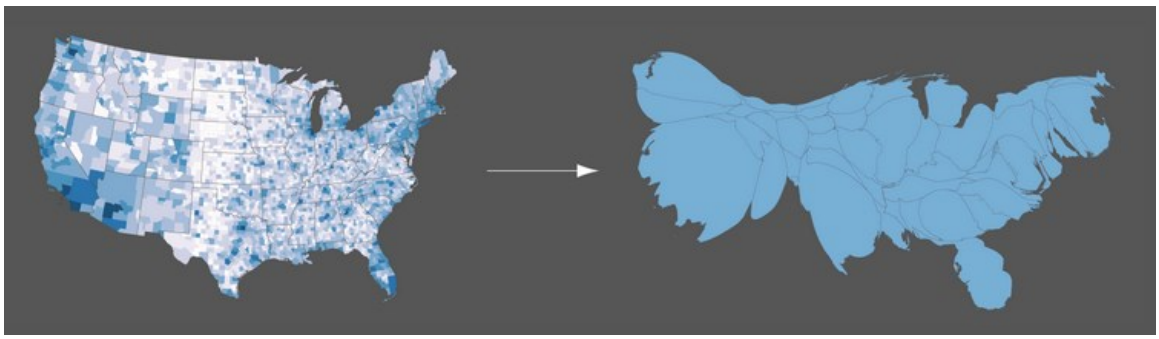
If there are long lasting or enduring entities (be they identities, institutions, affects, etc.) within this network, it is not because they are *qualitatively* different from the particulars – they don't stand outside as structural models representing the network. An enduring entity like an institution or gender identity – and thus an aspect of social order – endures because it is repeated with variation (like Tarde's imitation and invention), enough times to be counted as the same, but with enough variation and modulation to be 'alive'. In the case of the internet search, an agent or entity is never part of a whole, since there is no whole that isn't always made bigger by a network association. In other words, the proliferating associations that are generated through the search also add more – increase in number – the items in the list. The 'whole' expands in time as we navigate through the dataset. Profiles are expanding exponentially when searched.

In this new empiricism, there are no norms that transcend the particulars, just meshworks assembling in a new kind of quantitative relationship. This quantitative assembling is no longer based on deterministic parametric models that force the quantitative data to conform to pre-given distributions. One might consider this new approach as a kind of grounded theory for quantitative methods, where the stochastic and probabilistic

mutations remain operative at the level of the particular. We can see in this approach an attempt to reclaim quantitative methods as part of a philosophy of immanence, and indeed an opening onto the unscripted future of the qual-quant concept. And this is why Latour so appreciates Tarde – not only does the monadology support Latour's image of interaction as an undulating generative network, but also because Tarde shows how "science is in and of the world it studies. It does not hang over the world from the outside." (Latour, 2010, p. 158).

A research method that tracks the huge quantities of traces of internet activity, following the dynamic aggregate as it grows, will produce a map of convolutions and folds. Latour will suggest we follow the "trajectory of individual innovations" as best we can, or in Deleuze's terms, the dividuals that break off and spread through the network. Imitation and innovation are tracked across the mesh of associations, so that an "entity" comes to be known "by adding more and more items to its profile." (Latour, 2012, p. 7). Latour suggests that this proliferation might be an appropriate way to interpret Tarde's concept of "imitative rays" as the mechanisms by which swarms and networks reproduce and repeat (with difference) that which holds them together (p. 15). Thus the particular algorithms that we use are hugely significant in determining how we engage with digital data sets. It's important to keep in mind that the searches we perform are "a consequence of the type of technology used for navigating inside datasets"(Latour, 2012, p. 4). Recent studies of emotion using twitter data offer an interesting and problematic example, as they tap large data sets regarding a topic that was typically studied in the past using interviews and surveys, two qualitative methods that were unlikely to supply insights into

the spontaneous and public nature of emotion (Golder & Macy, 2011). Using three hundred million tweets, and software for analyzing text for lexical bundles, researchers are creating *cartograms* or maps in which the original map of a region is distorted and stretched in accordance with the emotional nature of the tweets (Mislove et al, 2010). Although the software is designed to maintain the original borders of states, the area within borders is scaled in proportion to the number of tweets (coded for emotion) that originate there (see figure #1). The researchers track the contagion of emotion across the region during a 12 hour period, using color codes to show how emotions change over time (see http://www.ccs.neu.edu/home/amislove/twittermood/ for video of this data).



Of course, there are limitations to such data in terms of what they are able to say about emotion. These same limitations, however, are precisely what make these methods suitable to the fractal monadology of Deleuze and Latour. Such an approach studies emotions *impersonally*, as something that circulates across populations. The software limitations direct attention to the transmission rather than the content (the lines rather than the nodes). Human bodies become the medium of emotional expression, and are perhaps no more than contractions of this flowing affect across the network. This focus

can be seen as part of the turn away from the phenomenological body of lived experience, towards a rhizomatic network of contaminations (Colebrook, 2014). But this focus can also be seen as part of the cybernetic fantasy of perfect transmission, an example of "the small cybernetic honeybee engaged in thoughtless, but communicative, actions." (Halpern, 2014, p. 75). In the cybernetic fantasy, affect becomes information. These early approaches to digital computation were intent on displacing materiality with information (Hayles, 1999). They claimed that computational sciences would no longer have to contend with the question of indexicality - cybernetics was the science of form, leaving materialism behind. Indeed, the cartogram above, "pulse of a nation", seems to achieve this translation.

But it is precisely this approach to the digital and the quantitative that is being contested in this paper, as I attempt to reclaim computation as immanent to matter. My aim is to seek out a counter-history of calculation and computation (in this case, that found through Leibniz-Tarde-Deleuze-Latour) that mutates this cybernetic fantasy. As Halpern (2014) suggests, Deleuze "is involved in an ethical act of excavating this possibility and repeating this cybernetic displacement" but in the interest of producing new opportunities for thought rather than for control (p. 58). For Norbert Weiner and Warren McCullough and other early champions of cybernetics, an obsession with "purpose" and prediction fueled the displacement of matter with information(Rosenblueth et al, 1943). Deleuze and Latour critique this *communication* model of interaction, exemplified in cybernetics but found in many language-focused theories of communication, because such models always pay tribute to a logic of exchange, translation, and teleological purpose (de

Freitas, 2013). The mistake of cybernetics was to treat communication and computation as equivalent to the act of choosing between discrete units. Although this approach influenced the development of systems theory and various related attempts to think about human society as ecology, the cybernetic objective was premised on an ideal of instantaneous and unadulterated transmission of information.[2] Instead, Deleuze will reclaim Bergson from Weiner, and show how "the material universe … is the machine assemblage" but without the ideal of communication and its prescriptive futures. Indeed, Deleuze will propose a calculating matter that doesn't pay tribute to the cybernetic image of communication as a set of choices between two discrete immaterial units. Following Bergson and Whitehead and other process philosophers, Deleuze will collapse perception and matter, but not as a way of anticipating future signals and predicting future acts of communication.[3]

In the case of the twitter data, it's worth noting that the moving image of the undulating cartogram (available on the website) incorporates a *continuous* visualization of an event using *miniscule repetitive discrete acts*. Cybernetics would see a teleological purpose in this unfolding event, amplified from act to act. They used the term "purpose" to emphasize the goal or target or aim of transmission in any act of communication. When

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[2] It's important to note that computer science research continues to look at biological systems for how they solve distributed processing and communication problems, with a view to designing human computational networks according to these models. For instance, Navlakha and Bar-Joseph (2014), compare different biological systems for speed of communication and the relative robustness of the network, suggesting that distributed algorithms mimic these structures.

[3] In an ironic fold, Wiener (1954) referenced the process philosophy of Henri Bergson to advocate for the collapse of matter and perception. Cybernetic theorists will tap the same process philosophers as Deleuze will – Bergson, Whitehead, James. In this we see how historical excavations of the kind achieved by Deleuze are crucial for opening up to different futures.

feed-back loops from these goals are incorporated into the event (as described above regarding the internet search), they described this as *teleological purpose* (Rosenblueth et al, 1943). It seems crucial to me that we problematize this notion of purpose as we explore alternative imaginaries of computation that refuse to pay lip service to a cybernetic fantasy of control.[4] Another crucial factor in rethinking computation is the issue of unit. If we treat the word "miniscule" as a term that refers to an objective and stable unit, we adopt the cybernetic tenet that all behavior is commensurable. If instead of the unit we adopt the fold, as discussed in previous sections of this paper, calculation becomes a plastic topological relation between the folds of the monadology. In other words, the folds of the monadology possess different geometries that are potentially incommensurable – there is no unit that can be used to measure each. The curvature of the fold is precisely what allows for different kinds of geometries, where basic notions such as "straight" and basic spatial relationships abide by different axiomatic constraints. Thus a fractal monadology possesses heterogeneous measures across its surface, and there is no constant of proportionality that can be used to measure one by the other. As we look to the future of computational methods in the social sciences, it seems essential that we study this radical incommensurability between measures. I follow Halpern (2014) who suggests we must excavate alternative genealogies in the history of ideas and "reveal these absurd, conflicting, and nondeterministic options for envisioning the future of how we sense and live in data-filled environments" (p.35).

6. Concluding comments

[4] See Jackson (2013) for an alternative approach to purpose.

The current flourishing of computational distributed networks that link the somatic with the political demand new ways of thinking about how the digital is incorporated into life. Drawing on the sociologist Gabriele Tarde, we find that both Deleuze and Latour advocate for a new kind of monadology that incorporates the digital. I have characterized this monadology as *fractal*, because the folds are creased by an iterative imitation or an algorithmic repetition of miniscule quantitative evaluations. If socio-cultural research methods tended to produce *reflections* of that which they studied, this new empiricism will study the diffraction of knowledge and affect as it flows across the folds. The monadology offers an impersonal and anonymous matter, in which 'each' monad "reflects nothing, but absorbs all" (Galloway, 2014, p. 141). Monadology is thus a *relational ontology without exchange*, since there are no individuals that might communicate or transfer knowledge. Thus Tarde's focus on 'to have' is not about a trait *belonging* to an individual, but is meant to direct our attention to the flow of traits across the monadology. The monadology is both the one and the many – a way of rethinking multiplicity and advocating for an "inclusive materialism" (de Freitas & Sinclair, 2014).

Just to clarify, this paper is not arguing that matter is ultimately digital or binary. This paper turns to monadology as a way of rethinking the infinite variability of the quantitative. The concept of "the smallest interval" or infinitesimal plays a crucial role in this argument. Monads are ultimately composed of "infinitely small differences", rather than being "the sum of definite and discrete differences." (Tarde, 1895/2012, p.9). The infinitely small difference or infinitesimal does not differ from the finite only by degree –

one *cannot* arrive at the infinitesimal after some countably infinite set of cuts. This makes the infinitesimal "qualitatively different" from the finite (Tarde, 1895/2012, p. 11). One might think of the infinitesimal as force, mobility, duration, or potential energy. In the terminology of Deleuze, we can say that the infinitesimal is the *virtual* dimension of the finite. This virtual dimension is that which animates matter – "these tiny beings which we call infinitesimal will be the real *agents*, and these tiny variations which we call infinitesimal will be the real *actions*." (Tarde, 1895/2012, p. 11). As Tarde points out, mathematicians developed the theory of the infinitesimal in order to understand *quantity* and yet they proposed "elements which are not at all quantitative" (Tarde, 1895/2012, p. 11).

I want to close with a few more comments about the ethical issues associated with this new empiricism. Deleuze and Guattari (1987) speak to these ethical issues when they claim that "every politics is simultaneously a *macropolitics* and a *micropolitics*" (italics in original, p. 213). They direct our attention to how the political spreads across all bodies, at diverse scales, tracking traits and tensors across a field of intensity, a non-human field that trembles and quakes with multiplicity. The individuated body – the organic image of the body as organism – is disassembled through Deleuze and Guattari's concept of *becoming imperceptible*. I believe their notion of *micro-politics* and *becoming imperceptible* are crucial as we engage with a fractal monadology in these digital times. Indeed, Tarde will describe the infinitely small infinitesimal as "the imperceptible". (Tarde, 1895/2012, p.9).

This molecularization of politics has the potential to radically open up our research to new ways of attending to the biopolitics of life: “It’s too easy to be antifascist on the molar level, and not even see the fascist inside you, the fascist you yourself sustain and nourish and cherish with molecules both personal and collective.” (Deleuze & Guattari, 1987, p. 215). The links between macro human politics and the biopolitics of flow and fold are yet to be adequately studied. Deleuze and Guattari will argue that forces traverse these various scales, and that macro-politics are plugged-into micro-politics, through a molecularization of agency:

> Politics on the grand scale can never administer its molar segments without also dealing with the micro injections or infiltrations that work in its favor or present an obstacle to it; indeed, the larger the molar aggregates, the greater the molecularization of the agencies they put into play. (Deleuze & Guattari, 1987, p. 204).

These micro injections and infiltrations (dividuals) are exactly what Tarde was focusing on, in his proposal for a new kind of quantitative social science. My attempt in this paper has been to locate current trends in social science research as part of this philosophical tradition of monadology. My hope is that this tradition also furnishes us with reasons for studying the proliferation of previously indiscernible miniscule acts, operating according to micro calibrations and quanta that would never before have been considered relevant. And yet, as the history of cybernetics makes clear, attention to the computational dimension of human culture can lead to reductive behaviorism and essentialism.

Moreover, there are serious ethical issues evident in internet swarm behavior; we can well imagine how this data is evidence of a panic, as dividuals spread contagiously across various digital networks such as twitter and facebook through re-tweets and broadcasting, resulting in swarm behavior that is often disturbingly destructive. Latour doesn't deny this fact, but nor does he offer counsel for how to proceed. The job of designing ethical algorithms and checks on the proliferation of destructive digital memes is left to us. If software design is where ethical filtrations might occur, researchers must learn how to critique the particular software practices adopted in the field, while also becoming more inventive in altering this software to suit unscripted futures.

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