<TITLE>**From Form to In-formation: A Spinozan Link between Deleuzian and Simondonian Ontologies**
<AU>*J. J. Sylvia IV* <AF>Fitchburg State University

<ABS>Abstract
<T>In developing the concept of assemblages, Gilles Deleuze draws at least some inspiration from Gilbert Simondon's concept of information. While his acknowledgement of Simondon's influence is almost entirely positive, Deleuze explicitly distances himself from the concept of information in order to avoid its link to the field of cybernetics. However, a Deleuzian informational ontology could instead be leveraged as an alternative to cybernetics. Drawing on the Spinozan link between the work of Deleuze and Simondon, it is possible to develop a hybrid informational ontology. This system can not only offer a different approach to information, data and technology than the essentialist concept of information embraced by cybernetics, but also aligns well with recent research in the biological sciences that has disrupted a long-held concept of individuals as entirely separate and autonomous. Shifting away from the Platonic Form to a Deleuzian/Simondonian in-formation furthers the post-human project aimed at understanding processes of subjectivation at multiple scales, including the micro (biome) and macro (city, population, planet).

<K>Keywords: Deleuze, Simondon, ontology, information, microbiome, post-humanism

<T>This article develops an informational ontology by drawing on the work of both Gilles Deleuze and Gilbert Simondon as it is situated in the philosophical context of Baruch Spinoza. While Michel Foucault's work has opened up the possibilities for understanding media through processes of subjectivation, this approach still needs to be theorised within a larger ontological project. I argue for the replacement of the concept of the neoliberal subject with a new understanding of the metastable post-human as explicated through an informational ontology constructed using the concepts of Deleuze and Simondon. Although there is not a perfect match between the philosophical systems of Simondon and Deleuze and Guattari, both have a Spinozan monist ontology at their core.

I argue that putting the Deleuzo-Guattarian geophilosophy into a more explicit conversation with Simondon's conceptualisation of information opens up an alternative problem-space for information, big data and technology. As Scott (2017) has argued, understanding the Spinozism that supports the work of both Deleuze and Simondon allows one to more fully appreciate the unique post-structuralist approach of each. Further, although Deleuze himself seems to have purposely avoided using the concept of information due to its uptake by the field of cybernetics, I argue that a Deleuzo-Guattarian influenced Simondonian concept of information can be an important tool in thinking about new paradigms that offer an alternative way of thinking about information, data and technology outside of the cybernetic approach. This informational ontology, once developed, explains how the process of individuation occurs and offers an alternative understanding to the concept of information, moving away from a Platonic conceptualisation of *eidos* as an eternal form. In contrast to this Platonic and Cartesian notion of disembodied information that is at the centre of cybernetics, I construct a material, embodied conceptualisation of information. This project answers Hayles's (1999) and Terranova's (2006) calls for the development of an embodied, materialist concept of information and Braidotti's (2013) call for a new theory of the subject that takes stock of the post-human turn. Such a

conceptualisation of information is of primary importance because it provides the ontological framework for an embodied version of post-humanism that demonstrates how one can explore and experiment with media-specific processes of subjectivation and lines of flight.

In addition to offering an alternative to the cybernetic paradigm, an informational ontology provides a philosophical grounding for the larger assemblage theory of Deleuze and Guattari, Deleuze's virtual/actual distinction, and Guattari's ecosophy. This system connects closely with developing approaches to the non-unitary nature of the individual in the field of biology, offering the philosophical underpinning for contemporary biological approaches and making it explanatory of diverse systems of thought and highly fecund. Research on the microbiome is challenging the traditional biological notion of the self as an island – as a separate individual that can be understood apart from its environment. This work has challenged some of the fundamental assumptions in the field of biology, including the standard definition of life itself. As scientists struggle to understand the biological ramifications of this shift towards an ecological perspective, other fields will likely be impacted by such a shift in a myriad of as yet unimagined ways. In particular, philosophical questions about the nature of identity and agency will need to reconcile such an approach, with potential impacts rippling into ethics and epistemology. Although post-structuralist and post-humanist theories of discourse, media and subjectivity have long challenged the concept of the individual, this growing consensus across fields will increase the pressure to rethink other theories that rely on a concept of the individual. Communication studies will also have to grapple with this shift in understanding because the transmission model, or standard view of communication that is based on the work of Claude Shannon (Shannon and Weaver 1998 [1949]), posits a separate individual sender that transmits information to a receiver. I argue that post-humanism provides the theoretical framework that can best help us understand these biological, philosophical and communication changes once it is supported by an informational ontology that recognises the conceptual shift from a static *eidos* (form) to a dynamic *in-formation*.

After briefly considering how microbiome research is upending the traditional biological notion of the self, I then develop a post-human informational ontology that can support this biological approach. Such an approach eliminates the concept of the human as a natural individual, understanding it instead as only one possible arrangement or scale through which to view the world, though one that has long been the nearly exclusive focus of analysis. Such an approach aligns well with Balibar's (2018) interpretation of Spinozan individuals as 'transindividuals'. Finally, I examine why the concept of the individual no longer makes sense and necessitates the development of larger ecological or ecosophical approaches.

Informational ontology makes clear that micro and macro conceptualisations beyond the scale of the human are equally important. In contrast to the microbiome, I consider how we might approach the city from a post-human macro scale. I will argue that the microbiome and the city, understood as assemblages, provide concrete examples of a post-human approach grounded in an informational ontology at a practical level. I then link this approach to Guattari's ecosophical theory, which emphasises the inherent connectedness of everything. From this perspective, informational ontology provides a philosophical grounding for recent microbiome research that upends the notion of the individual while also suggesting a new post-human approach to media studies.

<A>I. The Microbiome and Limitations of the Biological Individual

<T>The essentialist emphasis on form has a long history in science. Biology, in particular, has long relied on the conception of an essential individual as a unit of analysis. An individual might be defined in a myriad of ways, including anatomically, embryologically, physiologically, immunologically, genetically or evolutionarily (Gilbert et al. 2012). However, microbial symbiosis research is disrupting what was a standard biological research framework:

> <EXT>Symbiosis is becoming a core principle of contemporary biology, and it is replacing an essentialist conception of 'individuality' with a conception congruent with the larger systems approach now pushing the life sciences in diverse directions. These findings lead us into directions that transcend the self/nonself, subject/object dichotomies that have characterised Western thought. (Gilbert et al. 2012: 326)</EXT>

<T>Ed Yong (2016: 24) explains in *I Contain Multitudes* that none of the former attempts at defining biological individuals can survive scrutiny in light of microbiome research, even claiming that, 'perhaps it is less that I *contain* multitudes and more that I *am* multitudes'. Such language connects closely with Deleuze and Guattari's (1987 [1980]: 8) notion of rhizomatic multiplicities in the opening plateau of *A Thousand Plateaus:* 'there is no unity to serve as a pivot in the object, or to divide in the subject'. Why consider informational ontology in light of the sciences? On the one hand, microbiome research offers practical, concrete examples of the non-unity of the subject, or individual, for what has remained a highly abstract approach within post-structuralist and post-human theory. On the other hand, the informational ontology developed in this article can extend current biological approaches by offering the concept of a rhizomatic assemblage in lieu of the concept of the individual. The understanding of each can be deepened by an appreciation for the other.

Anatomically, every 'individual' body shares its space with a wealth of microbes, with some estimates showing that up to 90 per cent of the human body is composed of bacteria (Bäckhed et al. 2005; Ley et al. 2006; Gilbert et al. 2012; Yong 2016). An Australian termite, *Mastotermes darwiniensis*, exemplifies the difficulty of the lens of the individual from an anatomical perspective, as it relies on the gut symbiont *Mixotricha paradoxa*, the 'paradoxical being with mixed-up hairs' (Sutherland 1933), to enable its digestion of the cellulose in the wood it eats (Gilbert et al. 2012). Further, the *Mixotricha paradoxa* is itself composed of five separate genomes. From an anatomical perspective, there is no individual.

Developmentally, numerous 'individuals' have been shown to depend on genetic instructions that are derived both from their own bodies and those of their microbes (Yong 2016). Gilbert et al. (2012) outline several examples of this dependence. Newborn squid are only able to develop a light organ through cooperation with luminescent bacteria that the squid absorbs. Mice rely on gut bacteria for the development of their immune system and would not develop normally in a sterile environment. Microbial symbionts are necessary for this normal development of mammals through interspecies communication via the eukaryotic cells of the so-called host (Gilbert 2001; McFall-Ngai 2002; Gilbert et al. 2012). From a developmental perspective, there is no individual.

Physiological approaches have long conceived of 'individuals' as constructed of multiple parts, but microbiome research is demonstrating that it makes at least as much sense to conceive of these relationships from the lens of multiple species living together, such as insects whose enzymes work together with those of bacteria to create nutrients (Gilbert et al. 2012; Yong 2016). Bacteria have been shown to provide functions such as lipid metabolism, vitamin

synthesis, and more to their vertebrate 'hosts'. Ongoing metagenomic sequencing continues to expand the way we understand the relationship of the so-called human to its own microbial populations as well. From a physiological perspective, there is no individual.

A genetic approach would suggest that an individual inherits one genome that is expressed biologically; however, microbial symbionts have been shown in many cases to offer a second type of genetic inheritance (Moran 2007; Gilbert 2011; Gilbert et al. 2012). Moran (2007: 8632) explains that symbiotic relationships have played an important role in many evolutionary events that generate phenotypic variation:

> <EXT>Examples from insects show that symbioses can result in specialised organs with unique development, innovations in metabolic capabilities that allow new lifestyles, defenses against natural enemies and other environmental challenges, constraints on evolutionary range, and ongoing acquisition of novel genes and capabilities.</EXT>

<T>From a genetic perspective, there is no individual.

Immunologically, an 'individual' was long understood as developing an immune system that would allow it to defend itself from outside pathogens such as bacteria and viruses; however, we now know that the immune system is created, at least in part, because of the existence of the local microbiome (Gilbert et al. 2012). Such development has been observed to occur in vertebrates, insects and plants alike. The immune system is now understood to also serve as a form of 'passport control' that regulates the way the body allows or disallows the entry of others. From an immunology perspective, there is no individual.

Microbiome research leads Gilbert et al. (2012) to describe the 'self' as dynamic and context dependent, while Ed Yong (2016) highlights the way that this research demonstrates the connection that all life on earth shares. For example, citizen-science projects being undertaken by scientists at North Carolina State University are pushing our understanding of the microbiome to even greater depths (Dunn 2016). Research demonstrates that the composition of the microbiome not only varies from individual to individual but also across time (Flores et al. 2014). The genes of *Bacteroides plebeius* in the human microbiome have a separate Japanese strain that allows it to metabolise the types of complex sugars found in seaweed (Gilbert et al. 2012). However, Flores et al. (2014), using a longitudinal study of 85 adults and profiling the microbial communities of the forehead, gut, palm and tongue over 3 months, have found that the microbiome has a high degree of temporal variability as well. The so-called human host, then, does not merely acquire microbes at birth and develop a symbiotic relationship with them (Knight 2015). Instead, a dynamic and context-dependent swarm of selves – held together by habit and a permeable, but real, organismal membrane – is connected to all life on earth, is constantly in *flux*, and always changing – or in Deleuzian terms, is always in the process of becoming.

These scientific insights closely mirror the ontological underpinnings of Deleuze's assemblage theory in which 'a human being (or social group) is as likely to be a *component part* of a larger assemblage as it is to constitute an assemblage in its own right', and is 'also a component of many other micro- and macro-assemblages that do not coincide with the biological boundaries of my body or the phenomenological boundaries of my perception and cognition' (Wiley 2005: 76). Microbiome research, by its nature, has tended to focus narrowly on the microbes that make up the microbial host at the level of the individual as it was previously conceived, such as the 'human' or the 'beetle'. However, an informational ontology, as

conceptualised through Deleuze and Simondon, can both make sense of the biological perspective of the microbiome and allow us to theorise the role of non-biological component parts, such as media. Importantly, this informational ontology is built upon the foundations of Spinozan ontology.

<A>II. Informational Ontology: The Metastable Post-human

<T>While biologists and the sciences begin to adapt to this conceptualisation of multitude rather than individual, an informational ontology is already well suited to explain these shifts in thinking from an epistemological and metaphysical perspective. This ontology deploys a new arrangement of form, supporting a notion of the 'individual' that is also dynamic and context dependent. Though scientists such as Gilbert et al. (2012) are using the word *holobiont* to draw a distinction from the classic notion of the individual, this term emphasises only that the host is made up of smaller symbionts. Other fields such as population biology and epidemiology conceive of the biome at a larger scale through the concept of *populations*, though this is often understood in the still somewhat limited sense of a group of individuals within a particular species (Brennan 2013). In a post-human approach as it is theorised through an informational ontology, the understanding of the individual as dynamic and context dependent flows in both directions of the scale – both downward to understand it as composed of smaller, often micro symbionts, but also upward to understand that the assemblage at the level of the so-called human can also be seen as a smaller part in a larger ecosystem such as a city, population, planet, or the universe at large.

Additionally, informational ontology emphasises the process of individuation and the metastable state of the resulting 'individual'. Understanding an individual as always in the process of becoming is key, as it pushes back against the possibility of simply understanding the human as a type of super organism made up of smaller individuals. In other words, it guards against shifting the concept of the individual downward to a smaller microbial scale, insisting instead that all of reality exists as assemblage always in the process of becoming. This approach is not focused on what comes after the human, but instead shifts the locus of understanding and discussion to the larger milieu of non-human forces both inside and beyond the so-called human (Hayles 1999; Parikka 2010).

This post-human perspective creates a metaphysical underpinning for recent scientific analyses while extending them to larger scales, but it is also well suited to introduce a new problem-space of information. An informational ontology is able to escape the resource doctrine of information because it escapes the predominant cybernetic model of information which relies heavily on the essentialised Forms of Plato and the disembodied nature of Descartes's philosophy. Conceived through this lens, information will be radically opened up to its machinic potential as it drives the very process of becoming. Simondon (1992: 316) explains how his conceptualisation of information will point in new directions:

> <EXT>The notion of *Form* deserves to be replaced by that of *information*. In the course of this replacement, the notion of information must not be associated with that of signals or supports or vehicles of information, *as the technological theory of information tends to do, derived by abstraction as it is in the first instance from transmission technology*. The pure notion of form must therefore be retrieved twice over from the evils resulting from a superficial use of a technological paradigm: in the first place, in relation to the culture of the ancients, due to the reductive use made of this notion in the *hylomorphic schema*; in

the second place, where it exists as a notion of information, in order to save information as meaning from the *technological theory* of information in modern culture.</EXT>

<NP>Cybernetics still relies on an Aristotelian hylomorphism through its focus on analysing form and particularly behaviour (Ashby 2015 [1956]; Mills 2016). Such a system leaves out any account of becoming, assuming these already individuated entities. While some cyberneticians see this as a benefit because it allows an uncomplicated analysis at the level of behaviour, Simondon argues that such an approach is critically incomplete. In Shannon and Weaver's information theory, as adopted by cybernetics, the messages always travel between a sender and receiver, but these are themselves already individuated entities (Mills 2016). While Weaver's work added the notion of meaning to Shannon's original theory that conceived of information solely in relation to entropy, this approach is both personological and cognitive (Shannon and Weaver 1998; Behrenshausen 2016). Specifically, Weaver begins his essay by stipulating that 'The word *communication* will be used here in a very broad sense to include all the procedures by which one mind may affect another', and information is 'a measure of one's freedom of choice when one selects a message' (Shannon and Weaver 1998: 9). These definitions strictly limit communication and information to the human context, and thus still require an already individuated (human) entity. Understanding the genesis, or the becoming, of these entities is at the heart of Simondon's work, and will move beyond the human-only limitations of Shannon and Weaver. Information understood this way is what drives becoming, and this highlights the body as a living milieu, and also a collectivity instead of an individual (Parikka 2010). In order to more fully understand how this changes the problem-space of information, I begin by exploring the metaphysical and epistemological consequences of replacing the notion of *Form* with a Simondonian notion of *information*. I situate this shift within the larger oeuvre of Gilles Deleuze and Félix Guattari, whose work was often inspired by Simondon.

<A>III. A Deleuzian Ontology via Simondon's Concept of Information

<T>Through his work in *Expressionism in Philosophy: Spinoza* (1990a [1968]) and *Difference and Repetition* (1994 [1968]), Gilles Deleuze adapts and extends Baruch Spinoza's monist ontology. One of the challenges for developing such an ontological system is explaining how, if there is only one substance in existence, there can appear to be so many seemingly different individuals in existence. In developing his ontological framework, Deleuze draws upon a Spinozan conceptualisation of modes, combined with the concept of individuation that has been reworked by Gilbert Simondon.

Spinoza's philosophy was in many ways a reaction to the dualism generated by the metaphysical and epistemological philosophy of René Descartes. Descartes (2010 [1644]) explicitly recognised only three classes of things: the intellectual, the material and God (I: 48). Drawing on terminology that can be traced back to Aristotle, he called each of these things 'substances'. Each substance has an attribute – thought for the intellect and extension for the material – that exists as a mode, which is a particular idea or thing. However, this split not only creates a problem in explaining how the different substances are able to interact or communicate between one another, but also emphasises the primacy of the mind over the body, and eventually information over matter (Spinoza 1992 [1677]*;* Hayles 1999).

In contrast to this system, and to overcome such difficulties, Spinoza proposed only a single substance, God, or Nature, which has an infinite number of attributes, including thought

and extension, the only two to which humans have access:

> <EXT>Whatever can be perceived by infinite intellect as constituting the essence of substance pertains entirely to the one sole substance. Consequently, thinking substance and extended substance are one and the same substance, comprehended now under this attribute, now under that. So, too, a mode of Extension and the idea of that mode are one and the same thing, expressed in two ways. (Spinoza 1992: 67)</EXT>

<T>Although understanding all of reality as different expressions of one underlying substance overcomes many of the problems with a dualist ontology, such as how to explain the connection between mind and body, it still requires an explanation regarding the mechanism that differentiates substance into these different expressions, or modes. Deleuze leverages the concept of individuation, via Simondon, to solve just this problem. In *Expressionism in Philosophy: Spinoza*, Deleuze (1990a) explains that individuation is related to a mode's existence rather than its essence. Each existing mode has duration (thought) or extension (material), and these are the extrinsic individuations of their attribute.

Further, this process is intensive, precisely because intensity 'creates the qualities and extensities in which it explicates itself' (Deleuze 1994: 246). During a discussion of intensity in *Difference and Repetition*, Deleuze briefly notes the work of Simondon as demonstrating the necessity of a prior metastable state for the process of individuation. From this metastable state, individuation arises 'like the actualisation of a potential and the establishing of communication between disparates' (ibid. 246). This communication between disparate elements in the pre-individual virtual-ideal field creates a coupling that resonates internally. Fully understanding this resonance as it relates to the prior metastable state requires a detour into the philosophy of Simondon.

Iliadis (2013a) traces Deleuze's acknowledgement of Simondon's influence through several of his works, the most substantial of which I will elaborate upon here. As Iliadis notes, one difficulty in tracing this connection is that Deleuze very rarely uses the word 'information' in his own work. Iliadis suggests that Deleuze is probably aware of this term and avoiding it so as not to fall back into the cybernetic paradigm. Deleuze makes this explicit in his review of Simondon's work, republished in *Desert Islands and Other Texts 1953–1974* (2004: 88), where he recognises the role of information in individuation, writing in a parenthetical expression: 'here we encounter Simondon's preoccupations with cybernetics, and a whole theory of signification in the relations of the individual'. While acknowledging Deleuze's apparent hesitation to adopt cybernetic terminology and its potential connection to signification, I think there are important benefits to be gained from understanding the role that this concept plays, as information, in a Deleuzian ontology. Briefly, these include the ability to link information to Félix Guattari's a-signifying semiotics and to think of big data through a material, affirmative approach.

In addition to his review of Simondon's work and a brief mention of Simondon in *Difference and Repetition* (1994), Deleuze uses a footnote in *Logic of Sense* (1990b [1969]: 344) to explain that Simondon's work 'has a special importance, since it presents the first thought-out theory of impersonal and pre-individual singularities. It proposes explicitly, beginning with these singularities, to work out the genesis of the living individual and the knowing subject'. He further notes that his work in *The Logic of Sense* depends directly on Simondon. Finally, and perhaps most importantly for Deleuze [1986] (1988b), in the book *Foucault* he references Simondon in a passage that emphasises the way the fold brings the past and future into the

present. The individual in this system, always in a process of individuation, is understood as a folding that redeploys all of nature when unfolded (Debaise 2012). This confrontation of the past and future in the living present, discussed in further detail below, is important for not only the process of individuation but also an affirmative ethics as explicated by Rosi Braidotti (2011).

Although Simondon's work has been referenced by scholars such as Gilles Deleuze (1994) and Bernard Stiegler (1998 [1994], 2009 [1996]), much of this work has largely ignored technical terminology such as *information* or has selectively chosen only particular elements of the work to emphasise (Hayward and Geoghegan 2012; Iliadis 2013b). In the past several years, scholars such as Iliadis (2013a, 2013b), Mills (2016) and Scott (2014) have attempted to make Simondon's oeuvre, much of it still available only in the original French, accessible to a larger audience through work in English that summarises and explicates rather than appropriates. Simondon's primary work is *Psychic and Collective Individuation*, which aims to show how one perceives things as individuals and, related to that, how those things come to exist in the first place.

To begin this process, Simondon builds from Aristotle's concept of individuation over that of Plato because it places the process of becoming internally within an object; however, whereas Aristotle separated form and substance, Simondon rejects this hylomorphism and replaces the notion of form with information (Iliadis 2013a; Scott 2014). Deleuze and Guattari (1987 [1980]: 409) acknowledge this criticism of the hylomorphic model in *A Thousand Plateaus*:

> <EXT>What Simondon criticizes the hylomorphic model for is taking form and matter to be two terms defined separately, like the ends of two half-chains whose connection can no longer be seen, like a simple relation of molding behind which there is a perpetually variable, continuous modulation that is no longer possible to grasp. The critique of the hylomorphic schema is based on 'the existence, between form and matter, of a zone of medium and intermediary dimension,' of energetic molecular dimension – a space unto itself that deploys its materiality through matter, a number unto itself that propels its traits through form.</EXT>

<T>Following Hjelmslev, substance, for Deleuze and Guattari, is a formed matter. In many ways, this is similar to Aristotle's analysis of the relationship between form and substance; however, Aristotle begins his analysis with the individual, situating the human as a necessary mediator between sense and form, which is also problematic for Simondon because it only allows the individuation of groups based on inter-individual convention (Iliadis 2013a; Scott 2014).

The problem with a hylomorphic model such as Aristotle's is that form and matter are already structured. In other words, it begins by considering already individuated entities rather than focusing on the process of individuation itself (Parikka 2010). This approach neglects the role of energy in forming matter, as Scott (2014: 4) explains: 'It is a matter of metaphysically re-describing what Simondon calls the "obscure zone" lying between the articulation of form and matter, where the operation of individuation occurs, which brings about their encounter, yet is neglected by hylomorphism.' Simondon avoids this problem by beginning his analysis with individuation itself rather than the individual in the way that Aristotle does and further allows individuals to be understood as a relative reality in the manner of modalities (Scott 2014).

Simondon (1995) makes this clear by turning the classic hylomorphic model of human technics on its head. In this model, a mould (form) is understood to shape clay (matter). Simondon's argument is that both the mould and the clay are already individuated entities and thus cannot explain the process of individuation. Clay, in this example, is not simply unformed matter, but rather a material that already has some forms such as variable plasticity. The mould is already an individuated entity that was given shape using yet other matter. In other words, the classic hylomorphic example of individuation uses two already individuated entities, only pushing the problem of individuation back one degree. How was clay individuated? The mould? Simondon analyses the creation of a brick by replacing the concept of moulding with that of modulation: '*Instead of grasping individuation using the individuated being as a starting point, we must grasp the individuated being from the viewpoint of individuation, and individuation from the viewpoint of preindividual being*, each operating at many different orders of magnitude' (Simondon 1992: 311). In other words, we must understand how the clay itself comes into existence, or is in-formed in the first place. Simondon replaces form with information, which he defines as 'the tension between two disparate realities', and it '*emerges when a process of individuation reveals the dimension through which two disparate realities together become a system*' (Simondon 1992: 311). The concept of form is no longer needed to understand individuation, and has been replaced by information.

This simple reversal to information rather than form eliminates the transcendental gap between matter and its attributes, transforming a transcendent ontology into an immanent ontology. The primary benefit of this transformation is that 'it supposes the existence of any system as only ever in a state of metastability and, so, always on the cusp of individuating itself' (Scott 2014: 39–40). Individuation is thus reconceptualised as an ongoing process. Scott explains that the continuous flux that is part of the process of individuation is necessary for understanding living beings not as an endpoint, but rather as a becoming between individuations. In Deleuzian terms, this means that a human is always in the process of Becoming. Further, Mills (2016) explains that this approach emphasises a larger milieu because an individual never comes into being on its own, but is instead part of an individual–milieu dyad, necessitating that relations arise as part of this process itself rather than as something established after individuation. Simondon explains that 'the physical individual must be thought of as a chrono-topological ensemble whose complex becoming is made from successive crises of individuation; the becoming of being consists in this non-coincidence of the chronology and the topology' (Simondon 2013, qtd. in Mills 2016). The emphasis on a milieu is important because this helps avoid the construction of any form of substantial identity by emphasising the inherent incompleteness of every individual.

This ontological approach to flux, becoming and a milieu can be grounded firmly in the ontological approach developed by Spinoza. Étiene Balibar (2018: 14) argues that for Spinoza 'every individual in nature is in reality a "transindividual", which is to say a "finite" relational mode'. These transindividuals are constantly being created and recreated as part of their larger milieu through an exchange of affects. For Spinoza, an affect describes an 'encounter between bodies that involves a change in power, for better or worse, together with an idea of change' (Sharp 2011: 26). One can begin to more clearly see the connections between Spinoza and Simondon. The transindividual's encounters with others (human or non-human) continually shapes and reshapes it over time. Balibar and Sharp argue that Spinoza's ontology anticipates the informational ontology later developed by Simondon. However, Spinoza draws out the political implication of his ontology, whereas Simondon leaves these largely unaddressed (Sharp 2011).

While Deleuze and Guattari begin to draw out these implications in their work, Rosi Braidotti explicitly reconnects this ontology to a Spinozan ethics and politics. This connection is why it is vital to understand the Spinozan connection between the work of Deleuze and Simondon – connecting and extending their philosophic approaches allows one to develop a cohesive approach to a monistic ontology, in light of contemporary technics, which also addresses the full ethical and political consequences of such an approach, as explored below.

David Hume's version of empiricism also supports this notion of subjectivity as a process of becoming, with the subject understood as an imprint or impression 'left by principles, that it progressively turns into a machine capable of using this impression' (Deleuze 1991 [1953]: 113). Or, in Simondonian terminology: 'The transindividual relation develops in a double movement by connecting the interior of the individual to the exterior ("interiorize the exterior") while also connecting the external to the individual's interior ("exteriorize the interior")' (Mills 2016: 85). This process reflects the creation of a subject. Rosi Braidotti (2011) quotes Ansell-Pearson (1997: 140–1) in explaining this system:

> <EXT>An autopoietic machine [the self-organizing subject created by individuation] is one which continuously generates and specifies its own organization through its operation as a system of production of its own components. . . . An autopoietic machine is defined not in terms of the components or their static relations, but by the particular network of processes (relations) of production. The relations of production of components are given only as processes; if the processes 'stop,' then the relations vanish. Therefore machines require regeneration by the components they produce.</EXT>

<T>Individual objects, including (post)humans, are only defined by their *relations* with other objects, which allows Deleuze to equate his virtual with Simondon's pre-individual and his process of actualisation with Simondon's individuation (Deleuze 1994; Faucher 2013). The information that drives this process of individuation is the concept that supports Deleuze's virtual/actual distinction, gives rise to differentiation and drives the process of becoming.

How does Simondon conceptualise the information that he posits as a replacement for form? Rejecting a predominant cybernetic conceptualisation of information as negentropy, he suggests that it has no structure, content or meaning, but is inseparably entangled with matter and energy as the tension between two disparate realities, or between the virtual and the actual (De Boever et al. 2012; Faucher 2013; Iliadis 2013a;). Understanding information as the tension between two disparate realities connects the concept of information with other terminology in Deleuze's work. It is worth noting briefly the language that Deleuze uses to explain this concept. Sauvagnargues (2016) argues that Deleuze uses the term 'simulacrum' instead of 'information'. Such a substitution makes sense when understood in the context of Deleuze's reversal of Platonism in *Difference and Repetition*. Here, Deleuze engages with the concept of the Form as Plato relates it to the simulacra. The motivation for Plato's theoretical concept of Form was to select, or sort out '(literally "to make the difference") between true and false images' (Smith 2006: 4) or, in other words between the true Form and the copy.

For Plato, this problem occurred within the specific context of Athenian democracy and the issue of rivalry – highlighted by the rivalry between philosophers and sophists. Plato creates the Form as a concept to sort out the false claimants from the true: 'If the foundation of essence is defined by the original and superior identity or *sameness* of the Idea, the claimant will be well founded only to the degree that it *resembles* or imitates the foundation' (Smith 2006: 9). Within

this system, one can move closer to or further away from the foundational Form. The furthest away from this foundation is the simulacra, or the Sophists. The *Phaedrus* and *Statesmen* dialogues ascend towards the foundation through *irony*, while the *Sophist* dialogue descends through humour towards a false copy. Smith (2006: 10) argues that this descent 'can make no appeal to a foundational myth or model, for it is no longer a matter of discerning the true sophist from the false claimant, since the *true sophist is himself the false claimant*'. This paradoxical conclusion leads Deleuze to write:

> <EXT>By dint of inquiring in the direction of the simulacrum, Plato discovers, in the flash of an instant as he leans over its abyss, that the simulation is not simply a false copy, but that it calls into question the very notion of the copy . . . and the model. (1990b: 294)</EXT>

<T>Irony is pushed to its limit in humour, suggesting the grounds for the overthrow of Platonism.

The concept of the Form is created by Plato to eliminate the simulacra as means of accessing knowledge. Therefore, overturning Platonism would instead mean affirming the simulacra. In his inversion, Deleuze creates an entirely immanent simulacrum founded on difference and defined by three characteristics (Smith 2006). First, the simulacrum is conceptualised as an image without resemblance (Deleuze 1990b). Second, by consequence of the first characteristic, the simulacrum is understood as difference-in-itself, which is a force placing disparates in communication (Lawlor 2003; Smith 2006). Deleuze explains this as such: 'Things are simulacra themselves, simulacra are the superior forms, and the difficulty facing everything is to become its own simulacrum . . . The important thing, for the in-itself, is that the difference, whether large or small, be internal' (1994: 67*).* The problematic mode of the simulacra is no longer that of an imitation but a challenge 'to the very idea of a model or privileged position that is challenged and overturned' (ibid. 69). Third, by removing the privileged point of view of the Platonic Form, the simulacrum takes on a positive conception. Rather than rejecting Platonism entirely, Deleuze (ibid. 299) simply starts with the simulacrum and acknowledges its immanent being: 'Simulacra are those systems in which the different relates to the different *by means of* difference itself. What is essential is that we find in these systems no prior identity, no internal resemblance: it is all a matter of difference.' Deleuzian ideas then are immanent to the simulacra and based on difference rather than identity. Plato's difference was external (transcendent) and based on Forms. Deleuze's difference is internal (immanent). In other words, Deleuze is overthrowing the Platonic concept of *Eidos*, but using Plato's own concept of the simulacra as a way of doing so. Simondon overturns the concept of form in much the same way, but uses the term 'information' rather than 'simulacra'.

However, Deleuze drops his use of the term 'simulacra' in his work after *Logic of Sense*. Smith (2006: 28) argues that this is because Deleuze moves on to create his own ontological terminology:

> <EXT>Within Deleuze's own work, the concept of the simulacrum is ultimately replaced by the concept of the assemblage [*agencement*], and the process of simulation is more properly characterized as the process of actualization (or even more precisely, the complex process of 'different/ciation').</EXT>

<T>Faucher (2013: 186) makes the connection in this way:

> <EXT>Information is differential selection within the milieu in which the thing is constituted as resonance between content and expression, always in a composition of assemblages. Between the virtual and the actual (the former 'contained' in the latter and perpetually unfolding without exhaustion as a 'trace' and a 'dark precursor'), information is 'at work'. Information is at work in the disparation between heterogeneous series, in the milieu of the intensive multiplicities manifest as assemblages. Information attends the process of assemblage, or *agencement*, as a multiplicity of choice.</EXT>

<T>Though Deleuze does not explicate the dark precursor as explicitly as Simondon does information, he refers to it as a precursor to a lighting bolt – an invisible and imperceptible force that ensures the communication of peripheral series, tracing its path in advance, but in reverse. Seen in this way, *Difference and Repetition* [1968] (1994) is a work about information. However, rather than deploying the concept of information in the way Simondon does, Deleuze works within the context of the simulacra, which in later work becomes *agencement*. By connecting these two approaches from Simondon and Deleuze, we have a rich concept of information best understood as in-formation — an ontology that emphasises and prioritises change and becoming. Information, then, is what connects and creates.

Said another way, in more Simondonian terms, information enables the resolution between two disparate realities. It is the quasi-cause of the process of actualisation, attending to the creation of a new metastable state of an assemblage. This process also demonstrates an affirmative approach at the ontological level. Simondon gives the example of the incompatibility of two retinal images: 'To resolve bi-dimensional disparation, the human brain integrates it as the condition of coherence of a *new* axioim: tri-dimensionality. Volume, or depth perception, resolves the bi-dimensional conflict by positively creating a new dimension' (Sauvagnargues 2016: 63). This resolution through creation is an affirmative approach rather than negation of the dialectic. The simplest, and perhaps more commonly cited, example that Simondon offers is the growth of a crystal:

> <EXT>The crystalline seed figures this eruption of singularity, which brings the metastable milieu to the point of disparation. The crystal thus emerges as a result, an individuation which creatively resolves the tension between the disparate reals of the mother-liquor and the seed. (Sauvagnargues 2012: 58–9)</EXT>

<T>The role information plays here highlights the importance of metastability: even after resolution through creation the resulting assemblage remains part of the larger milieu and is always open to further individuation. Information is the continued intensity of relationality (Scott 2014). In short, information replaces form and enables an ontological perspective of metastasis rather than stasis, becoming rather than being.

For Deleuze (1994), this process of creation occurs during the third synthesis of time – the static synthesis of the future. Here we see how the process of individuation connects with Deleuze's notion of time. The disparation of the virtual/actual 'activates the information and produces a process of individuation that *comes from the future*' (Iliadis 2013a: 94). The aforementioned discussion in *Foucault* brings together inside-space and outside-space, linking the future and the past in the living present: 'Thought thinks its own history (the past), but in

order to free itself from what it thinks (the present) and be able finally to "think otherwise" (the future)' (Deleuze [1986] 1988b: 119). It is this ability for the past and future to come together in the present that enables the tendency towards change that is Becoming. Rosi Braidotti (2011: 296) explicitly connects this to an affirmative politics by emphasising not stasis, but *endurance* in space and time by an individual:

> <EXT>In Spinozist-Deleuzian political terms, this sustainable idea of endurance is linked to the construction of possible futures, insofar as the future is the virtual unfolding of the affirmative aspect of the present. An equation is therefore drawn between the radical politics of disidentification, the formation of alternative subject positions, and the construction of social hope in the future. This equation rests on the strategy of transformation of negative passions into affirmative and empowering modes of relation to the conditions of our historicity.</EXT>

<T>The process of individuation, drawing from the future as it does, paves the way for the Becoming of alternative subject positions and an affirmative politics. This possibility can be understood further through Deleuze's reading of Henri Bergson. Deleuze explains that Bergson's notion of intuition offers a method that allows us to make use of our own duration to both affirm and acknowledge the existence of other durations (Deleuze 1988a [1966]). Because of the fluid nature of identity, the possibility for future connections and experiments with what a body can do – future becomings – are radically open. We 'construct possible worlds through a web of sustainable interconnections. This is the point of becoming: a collective assemblage of forces that coalesce around commonly shared elements and import them to grow and to endure' (Braidotti 2011: 96). Although subjectivation comes after individuation, we continue existing in a metastable state that is always open to further individuation. In this sense, individuation never ends, it is never complete. So, there is a subject that hangs together as habit but can also direct new connections and becomings. We experiment with new assemblages to drive our own change, our own Becoming, and our own processes of subjectivation.

Simondon's notion of information can now be understood as the necessary framework that drives both Deleuze's ontological emphasis on individuation through differenciation, and as the mechanism that enables Becoming and its related ethical and political significance. Both first- and second-order cybernetics ultimately disembody information and ontologically constrain machinic potential while enabling systems of alienation, surveillance, command and control through capitalist systems (Hayles 1999; Terranova 2006; Genosko 2014; Mills 2016). In contrast, the concept of information for which I am advocating answers the feminist critique of information by overcoming the problem of its cybernetic disembodiment. Even more powerfully, it undergirds an ontological system that enables an affirmative politics and allows for an escape from the closed system of technological surveillance. When connected with Guattari's notions of a-signifying semiotics and a-semiotic encodings, such a system also enables using technology such as big data and algorithms for generating experimental new processes of subjectivation outside of the traditional capitalistic system. In other words, this definition allows us to think of technics in entirely new and affirmative ways not afforded by competing definitions of information.

Additionally, this ontology offers a philosophic framework that aligns well with the scientific research on the microbiome that challenges the long-held concept of the existence of an individual, as discussed above. As Wiley (2005) noted, this ontological framework of

agencement allows us to scale in both directions, down to the microbiome but also up to larger scales. However, I would like to be clear that I am not arguing that the world can be divided into localities which each become a site of study. Although we might try to isolate one level of the scale, it is always in a process of individuation (or becoming, or *agencement*) at every level and it must be approached in this way. Feminist physicist Karen Barad (2007: 33) coins the term 'intra-action' as a way to contrast this with the way we normally think about interaction:

> <EXT>The neologism 'intra-action' *signifies the mutual constitution of entangled agencies.* That is, in contrast to the usual 'interaction,' which assumes that there are separate individual agencies that precede their interaction, the notion of intra-action recognizes that distinct agencies do not precede, but rather emerge through, their intra-action. It is important to note that the 'distinct' agencies are only distinct in relational, not an absolute sense, that, *agencies are only distinct in relations to their mutual entanglement; they don't exist as individual elements*.</EXT>

<T>In this sense, intra-action offers a way of thinking about the process of becoming driven by information. It leaves open enough space to understand entities as always only metastable, potentially changing into new assemblages based on the relations to other assemblages. The process of intra-action draws attention to the way that relations between metastable assemblages help generate new processes of becoming. Drawing on this notion of intra-action, Iris van der Tuin (2009: 25) emphasises the importance of not being limited by pre-existing scales:

> <EXT>'Intra-action' enables a way of thinking that moves beyond the existence of isolated and a priori existing entities that subsequently start to interact. A predetermined scale can never be isolated for interaction with another, possibly contradictory predetermined scale. These are all idealisms and, following Barad, we should be studying the ways in which entities, like spatialities, materialise.</EXT>

<T>With this emphasis on intra-action fully in mind, I turn in the next section to considering the city and its role in the process of becoming. This shift towards the macro scale will also make clear the connection to Guattari's work on ecosophy.

<A>IV. Subjectivation and the City

<T>The existence of the microbiome makes clear that the boundaries of the post-human are quite blurry. While much analysis has focused on assemblages at the scale of the human, this informational approach makes clear that other scales of analysis have been greatly neglected. However, it is only by increasing the scale to that of the city that we can fully understand that in our previous analysis of the human as a stand-alone individual, we were missing a vital component of the processes of subjectivation. Before making this connection, I would like to briefly acknowledge that there is a significant and complex history of understanding the city as an organism, including the concept of a city as an organised body that is based on William Harvey's theory of the circulation of blood and Patrick Geddes' (1947) concept of the biopolis (Sennet 1994; Welter 2002; Horvath and Maicher 2016). Geddes' approach to cities offers an important starting point in understanding them from an informational ontology perspective. I offer a very brief overview of this perspective to show the connection of the city in shaping

individuals, before then continuing the development of the concept of the city through a Guattarian assemblage framework.

Geddes understood cities in a much more complex way than a simple organic entity, instead viewing them as one form of life, which he defined as something that processes matter and energy (Welter 2002). Because of this understanding of life as that which processes matter and energy, organisms and nations could also be understood as additional forms of life, all processing at different scales. He views the city as a:

> <EXT>specialized organ of social transmission. It is the vehicle of acquired inheritance. It accumulates and embodies the cultural heritage of a region, and combines it . . . with the cultural heritage of larger units, national, racial, religious, human. It stamps the resultant product upon each passing generation of its citizens . . . The city receives the experiences of each passing generation and hands the record on to the next . . . It is the instrument primarily of the regional memory, but serves also as the memory of larger groups. (Geddes 1947: 57)</EXT>

<T>Though Geddes acknowledged that social transmission also occurs through other artefacts such books or music, he gave primacy to the importance of understanding history directly through the city, most notably in the form of taking walks through the city (Welter 2002). This approach to the city leads Geddes to develop a method of conservative surgery which advocates against simply tearing down old buildings and putting up new ones, instead embracing an approach that allows for the adaptation of buildings to modern times while still preserving their history. This helps to build the city as an Open-Air Museum of Centuries (Welter 2002).

Perhaps most important for Geddes is the role of the city as place in his larger social and cultural system. He developed a complex chart of social life, dubbed his thinking machine, which explained how such a process works through four classifications that represented the systems of practical life (place, work), mental life (sense, experience, feeling), inner life (thought, values) and effective life (achievement, community, political action) (Welter 2002; Scott 2016). A constant cycling through these social systems presents a circular process in which change can be understood as a necessary element of life (Scott 2016). Most importantly, because this process is circular, the role of city as place within the practical life both affects and is affected by political action. The city shapes the individuals who live in it even as they shape and reshape the city.

A similar, though importantly different approach is required when understanding the city as a macro view of an assemblage containing buildings, humans, microbiomes and more. Spinoza anticipates this shift to larger scale thinking as well. For example, Spinoza argues that the ability for one to act can be enhanced or constrained by the stability of the larger milieu, such as a city, in which they live (Balibar 2018). The identity of this larger composite, the city, Balibar argues, is constructed from the composite of the minds that make it up. Here we must remember that for Spinoza this also includes non-human minds. The city, in this view, is a larger composite and its power to act is influenced by the affects of its constitutive bodies, just as the human body is on a smaller scale. Though there are very clear connections to Spinozan ontology, Guattari instead extends Lewis Mumford's notion of the megamachine to conceptualise the city as the 'humans–machines interfaces that define his post-humanism' (Genosko 2016: 243). For Guattari, the subjective city is not a living biological organism, but instead a machinic ecology at the centre of his ecosophical approach. Guattari's (2008 [1989]) ecosophical theory demonstrates

the complex interdependence and interconnection between the ecologies of the mind, society and environment. We can increase the depth of our understanding of processes of subjectivation by including the macro scale of urban and even planetary processes of subjectivation along with those at other scales throughout the assemblage.

On one hand, this understanding deepens through an analysis of collective processes of subjectivation by collective apparatuses such as education, health and culture. But perhaps even more important for Guattari (2015: 98), the fate of (post)humanity and the larger biosphere are closely linked:

> <EXT>That is to say, one cannot hope to recompose a humanly inhabitable earth without the reinvention of economic and productive finalities, urban assemblages, social, cultural, artistic, and mental practices. The infernal machine of a blind, quantitative economic belief, free of any concern for its human and ecological consequences, and placed under the exclusive aegis of a profit-driven economy and neoliberalism, must give way to a new type of qualitative development, rehabilitating the singularity and the complexity of the objects of human desire.</EXT>

<T>Capitalism, then, is identified clearly as the infernal machine against which humanity and the larger biosphere is struggling for its survival, in part because capitalism is more than anything else a producer of three forms of subjectivity: the serial (salaried classes), the uninsured and the elitist (Guattari 2008, 2015). Yet, the possibility for reorientation of these subjectivities depends largely on changing urban mentalities (Guattari 2015). In other words, the ways we create our relations with the cities in which we live are becoming increasingly important in context of the processes of subjectivation that occur through capitalism, as well as the possibility for developing alternatives. The city is part of our larger social ecosophy that also includes the way we live together as couples and families, for example. Briefly, Guattari defines ecosophy as the ethico-political articulation 'between the three ecological registers (the environment, social relations, and human subjectivity' (Guattari 2008: 19–20).

How might we rethink the city to generate new forms of subjectivity? Although Deleuze and Guattari (1987: 481) describe the city as a striated space par excellence, they also argue that even at its most striated, it gives rise to smooth spaces which can offer a line of flight that escapes capitalist processes of subjectivation. How do we cultivate such possibilities? In terms of the biosphere, climate change offers the greatest threat. Yet, Chris Ryan (2013), the director of the Victorian Eco-Innovation Lab (VEIL) makes the case that neither the logical scientific arguments nor the stories of potential and actual climate catastrophe have created significant change. Additionally, he believes that such stories may induce feelings of hopelessness that actually prevent action. However, drawing on the philosophy of Rosi Braidotti, Janet McGaw (2016) argues that a feminist approach should instead focus on the connectedness of a city as affirmative, creative and enabling. She makes the case that VEIL does just such a thing through its eco-acupuncture approach, which creates small-scale design interventions that improve the city. This approach has at least some resonance with Geddes' conservative surgery. Examples of Ryan's eco-acupuncture include restarting geothermal power plants and creating homes that are able to be easily relocated, for example, in the case of climate change induced flooding. These small interventions are important because they follow Guattari's (2006 [1992]) suggestion that to create new points of singularity that can generate affirmative change, it will be important to test new organisations at the small scale first, before later moving to larger implementations. When

we approach a city from the Spinozan perspective of what it can do, we cannot know ahead of time how our experiments will turn out. Therefore, smaller tests are a vital precursor to larger changes at the level of the city. Spinoza's own work on the city gives precedent for such an approach. Deleuze writes that 'Spinoza describes the City as a collective person, with common body and soul, a "multitude which is guided, as it were, by one mind"' (Deleuze 1990a: 266). The importance of scale is prominent in this thinking: 'The difference between the way an individual person affects and is affected and the way a state affects and is affected is simply one of scale and complexity' (Adkins 2009: 63). By participating in the city, Spinoza argues, a citizen commits himself to common collective affections, while still maintaining his own thought (Deleuze 1990a). In this way, we can understand the assemblage at both the level of the human and the city, and the affections that exist at multiple levels. Experimental approaches to what a body can do happen at these multiple levels at once.

One major hurdle to such experimental approaches is that mass media inundate our mental ecosophy with standardisation to the point that we can find our subjectivity threatened by paralysis (Guattari 2008, 2015). Guattari (2015: 98) argues that our subjectivity:

> <EXT>loses the taste for difference, the unpredictable, and for the singular event. TV game shows, the *star system* in sport, variety shows, political life, work on subjectivity like neuroleptic drugs which guard against anxiety at the price of infantilization and de-responsibilization.</EXT>

<T>This highlights the importance of the connection between the mental and social ecopsophies. If we lose the taste for difference within the mental ecosophy, the ability to experiment at the level of the social ecosophy becomes more difficult. However, Guattari calls for a social ecosophy approach that 'requires the collective production of unpredictable and untamed "dissident subjectivities" rather than a mass movement of like-minded people', that will sometimes drift together and collaborate while at other times drifting apart (Pindar and Sutton 2008: 9).

However, calls to social action have met with some pushback in light of postmodern theory. Philosophers such as Jean-François Lyotard and Jean Baudrillard have argued for the collapse of master narratives, an auto-critique of any call for social change or agitation as nothing more than language games based on opinion polls and publicity campaigns (Guattari 2013 [1989]). Guattari links the rise of these doctrines to the reductionist approach of post-war information theory and early cybernetic research. However, we can escape this impasse, Guattari argues, by shifting away from postmodernism to what he calls the post-media era. This entails the assemblage of humanity and machinism into a symbiotic relationship:

> <EXT>The emergence of these new practices of subjectification of a postmedia era will be greatly facilitated by a concerted reappropriation of information and communication technologies in so far as they will increasingly authorize: (1) the promotion of innovative forms of consultation and collective interaction, and, in the long run, a reinvention of democracy; (2) the miniaturization and personalization of apparatuses, a resingularization of mediatized means of expression. One may assume, in this respect, that it is the extension into a network of databanks that will have the biggest surprises in store for us; (3) the multiplication to infinity of 'existential shifters' permitting access to creative

mutant Universes. (Guattari 2013: 42)</EXT>

<T>Here Guattari is more specifically intuiting the post *mass* media age, drawing on his experience with the growth of networks through the French Minitel system (Genosko 2013). The later emergence of the Internet, cell phones and social media align well with Guattari's vision for the post-media era, though they have grown alongside mass media rather than replacing it and are thoroughly axiomatised by capitalism producing a-signifying subjectivations (Lazzarato 2014).

Though this post-media era has, on the one hand, increased surveillance, it has nonetheless shown significant promise in opening the types of collective interaction and resingularisations of mediatised means of expression that Guattari championed, as demonstrated through events such as the Twitter revolution in Egypt that saw the toppling of the Hosni Mubarak regime. Yet, much of the activity in the post-media era ultimately has relied exclusively on speech and direct communication. The true power of a post-media era lies outside of this exclusive focus on the discursive regime, drawing instead on apprehension through affect and a-signifying enunciation (Guattari 2013, 2015).

We have now seen how both Geddes and Guattari theorise the city in a way that prioritises its two-way impact with the so-called-human. For Geddes, it is part of a larger cycle of systems that continuously shape one another, while for Guattari, the city can be understood as one scale of an assemblage that includes the (post)human.

<A>V. Conclusion

<T>This ontological approach to in-formation should be understood as only the first step to more broadly thinking about its implications across the sciences, post-humanities and other fields such as media studies. By providing an ontological underpinning for concepts used by Deleuze, Guattari, Simondon and Spinoza, in-formation offers the possibility to put the sometimes disparate fields of philosophy, science and communication and media studies into productive conversations with one another. Shifting the lens of analysis to multiple scales, including both micro and macro, opens up new lines of flight across and between these fields, allowing new ways to think about the concept of 'body' in Spinoza's ethical imperative to consider what a body can do.

<A>References

<REFS>

Adkins, Brent (2009) *True Freedom: Spinoza's Practical Philosophy*, Lanham, MD: Lexington Books.

Ansell-Pearson, Keith (1997) *Deleuze and Philosophy: The Difference Engineer*. Warwick Studies in European Philosophy. London: New York: Routledge.

Ashby, W. Ross (2015 [1956]) *An Introduction to Cybernetics*, Mansfield Centre, CT: Martino Publishing.

Bäckhed, Fredrik, Ruth E. Ley, Justin L. Sonnenburg, Daniel A. Peterson and Jeffrey I. Gordon (2005) 'Host–Bacterial Mutualism in the Human Intestine', *Science*, 307:5717, pp. 1915–20, doi: 10.1126/science.1104816.

Balibar, Étienne (2018) 'Philosophies of the Transindividual: Spinoza, Marx, and Freud', *Australasian Philosophical Review*, 2:1, pp. 5–25, doi: 10.1080/24740500.2018.1514958.

Barad, Karen (2007) *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning,* Durham, NC: Duke University Press.
Behrenshausen, Bryan (2016) *Information in Formation: Power and Agency in Contemporary Informatic Assemblages*, Chapel Hill: University of North Carolina.
Braidotti, Rosi (2011) *Nomadic Theory: The Portable Rosi Braidotti*. Gender and Culture. New York: Columbia University Press.
Braidotti, Rosi (2013) *The Posthuman,* Cambridge: Polity Press.
Brennan, Heather (2013) 'Population Biology', *Explorable*, available at https://explorable.com/population-biology (accessed 20 January 2022).
Debaise, Didier (2012) 'What Is Relational Thinking?', *Inflexions*, 5 (March), available at http://www.inflexions.org/n5_debaisehtml.html (accessed 20 January 2022).
De Boever, Arne, Alex Murray, Jon Roffe and Ashley Woodward, eds (2012),*Gilbert Simondon: Being and Technology*, Edinburgh: Edinburgh University Press.
Deleuze, Gilles (1988a [1966]) *Bergsonism*, New York: Zone Books.
Deleuze, Gilles (1988b [1986]) *Foucault*, trans. Seán Hand. Minneapolis: University of Minnesota Press.
Deleuze, Gilles (1990a [1968]) *Expressionism in Philosophy: Spinoza*, New York: Zone Books.
Deleuze, Gilles (1990b [1969]) *The Logic of Sense*, New York: Columbia University Press.
Deleuze, Gilles (1991 [1953]) *Empiricism and Subjectivity: An Essay on Hume's Theory of Human Nature*, trans. Constantin V. Boundas. New York: Columbia University Press.
Deleuze, Gilles (1994 [1968]) *Difference and Repetition,* New York: Columbia University Press.
Deleuze, Gilles (2004) *Desert Islands and Other Texts, 1953–1974*, Los Angeles: Semiotext(e).
Deleuze, Gilles and Félix Guattari (1987 [1980]) *A Thousand Plateaus: Capitalism and Schizophrenia*, Minneapolis: University of Minnesota Press.
Descartes, René (2010 [1644]) *The Principles of Philosophy*, Whitefish, MT.: Kessinger Publishing.
Dunn, Robert R. (2016) 'The Evolution of Human Skin and the Thousands of Species It Sustains, with Ten Hypothesis of Relevance to Doctors.' in Robert A. Norman (ed.), *Personalized, Evolutionary, and Ecological Dermatology*. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-41088-3_5. pp. 57–66
Faucher, Kane X. (2013) *Metastasis and Metastability: A Deleuzian Approach to Information*, Sense Publishers.
Flores, Gilberto E., J. Gregory Caporaso, Jessica B. Henley, Jai Ram Rideout, Daniel Domogala, John Chase, Jonathan W. Leff et al. (2014) 'Temporal Variability Is a Personalized Feature of the Human Microbiome', *Genome Biology*, 15:12, doi: 10.1186/s13059-014-0531-y.
Geddes, Patrick (1947) 'Town Planning in Lucknow: A Second Report to the Municipal Council (Lucknow, 1917)', in Jaqueline Tyrwhitt (ed.), *Patrick Geddes in India*. Lund Humphries.
Genosko, Gary (2013) 'The Promise of Post-Media', in Clemens Apprich (ed.), *Provocative Alloys: A Post-Media Anthology*, London: Mute Publishing.
Genosko, Gary (2014) 'Information and Asignification', doi: 10.7480/footprint.8.1.798.
Genosko, Gary (2016) 'Postscript: For an Urban Machinic Ecology', in Helene Frichot, Catharina Gabrielsson and Jonathan Metzger (eds), *Deleuze and the City*,. Edinburgh: Edinburgh University Press, pp. 241–45.
Gilbert, Scott F. (2001) 'Ecological Developmental Biology: Developmental Biology Meets the Real World', *Developmental Biology*, 233:1, pp. 1–12, doi: 10.1006/dbio.2001.0210.

Gilbert, Scott F (2011) 'Symbionts as an Epigenetic Source of Heritable Variation', in Snait B. Gissis and Eva Jablonka (eds), *Transformations of Lamarckism*, Cambridge, MA: MIT Press, pp. 283–94.
Gilbert, Scott F., Jan Sapp and Alfred I. Tauber (2012) 'A Symbiotic View of Life: We Have Never Been Individuals', *The Quarterly Review of Biology*, 87:4, pp. 325–41.
Guattari, Félix (2006 [1992]) *Chaosmosis: An Ethico-Aesthetic Paradigm*, trans. Paul Bains and Julian Pefanis, Sydney: Power Publications.
Guattari, Félix (2008 [1989]) *The Three Ecologies*, London: Continuum.
Guattari, Félix (2013 [1989]) *Schizoanalytic Cartographies*, London and New York: Bloomsbury.
Guattari, Félix (2015) *Machinic Eros: Writings on Japan*, Minneapolis, MN: Univocal Publishing.
Hayles, N. Katherine (1999) *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*, Chicago: University of Chicago Press.
Hayles, N. Katherine, and Stephen B. Crofts Wiley (2012) 'Media, Materiality, and the Human: A Conversation with N. Katherine Hayles', in *Communication Matters: Materialist Approaches to Media, Mobility and Networks*, edited by Jeremy Packer and Stephen B. Crofts Wiley, Shaping Inquiry in Culture, Communication and Media Studies, London ; New York: Routledge.
Hayward, Mark and Dionysius Geoghegan (2012) 'Introduction: Catching Up with Simondon', *SubStance*, 41:3, pp. 3–15. doi: 10.1353/sub.2012.0027.
Horvath, Louise Beltzung and Markus Maicher (2016) 'Rethinking the City as a Body Without Organs', in Helene Frichot, Catharina Gabrielsson and Jonathan Metzger (eds), *Deleuze and the City*, Edinburgh: Edinburgh University Press, pp. 33–45.
Iliadis, Andrew (2013a) 'A New Individuation: Deleuze's Simondon Connection', *MediaTropes eJournal*, IV:1, pp. 83–100.
Iliadis, Andrew (2013b) 'Informational Ontology: The Meaning of Gilbert Simondon's Concept of Individuation', *Communication +1*, 2:1.
Knight, Rob (2015) *Follow Your Gut: The Enormous Impact of Tiny Microbes*, New York: TED Books and Simon & Schuster.
Lawlor, Leonard (2003) *Thinking through French Philosophy: The Being of the Question*. Studies in Continental Thought. Bloomington, IN: Indiana University Press.
Lazzarato, M. (2014) *Signs and Machines: Capitalism and the Production of Subjectivity*, trans. Joshua David Jordan, Los Angeles: Semiotext(e).
Ley, Ruth E., Peter J. Turnbaugh, Samuel Klein and Jeffrey I. Gordon (2006) 'Microbial Ecology: Human Gut Microbes Associated with Obesity', *Nature*, 444:7122, pp. 1022–23, doi: 10.1038/4441022a.
McFall-Ngai, Margaret J. (2002) 'Unseen Forces: The Influence of Bacteria on Animal Development', *Developmental Biology*, 242:1, pp. 1–14, doi: 10.1006/dbio.2001.0522.
McGaw, Janet (2016) 'Imagining Portland's Future Past: Lessons from Indigenous Placemaking in a Colonial City', in Helene Frichot, Catharina Gabrielsson and Jonathan Metzger (eds), *Deleuze and the City*, Edinburgh: Edinburgh University Press, pp. 33–45.
Mills, Simon (2016) *Gilbert Simondon: Information, Technology, and Media*, Lanham, MD: Rowman & Littlefield.

Moran, N. A. (2007) 'Symbiosis as an Adaptive Process and Source of Phenotypic Complexity', *Proceedings of the National Academy of Sciences*, 104 (Supplement 1): 8627–33, doi: 10.1073/pnas.0611659104.
Parikka, Jussi (2010) *Insect Media: An Archaeology of Animals and Technology*, Posthumanities, vol. 11. Minneapolis: University of Minnesota Press.
Pindar, Ian and Paul Sutton (2008) 'Translator's Introduction', in Félix Guattari, *The Three Ecologies*, London: Continuum, pp. 1–11.
Ryan, Chris (2013) 'Eco-Acupuncture: Designing and Facilitating Pathways for Urban Transformation, for a Resilient Low-Carbon Future', *Journal of Cleaner Production*, 50 (July): 189–99. doi: 10.1016/j.jclepro.2012.11.029.
Sauvagnargues, Anne (2012) 'Crystals and Membranes: Individuation and Temporality', in Arne De Boever (ed.), *Gilbert Simondon: Being and Technology*, Edinburgh: Edinburgh University Press, pp. 57–70.
Sauvagnargues, Anne (2016) *Artmachines: Deleuze, Guattari, Simondon*, trans. Suzanne Verderber and Eugene W. Holland, Edinburgh: Edinburgh University Press.
Scott, David (2014) *Gilbert Simondon's Psychic and Collective Individuation: A Critical Introduction and Guide*, Edinburgh: Edinburgh University Press.
Scott, David (2017) 'How Do We Recognise Deleuze and Simondon are Spinozists?', *Deleuze Studies*, 11:4, pp. 555–79, doi: 10.3366/dls.2017.0285.
Scott, J. (2016) 'The Social Theory of Patrick Geddes', *Journal of Classical Sociology*, 16:3, pp. 237–60. doi: 10.1177/1468795X15600941.
Sennett, Richard (1994) *Flesh and Stone: The Body and the City in Western Civilization*, New York: W. W. Norton.
Shannon, Claude Elwood and Warren Weaver (1998 [1949]) *The Mathematical Theory of Communication*, Urbana: University of Illinois Press.
Sharp, Hasana (2011) *Spinoza and the Politics of Renaturalization*, Chicago: University of Chicago Press.
Simondon, Gilbert (1992) 'The Genesis of the Individual', in by Jonathan Crary and Sanford Kwinter (eds), *Incorporations*, Zone 6. New York: Zone Books, pp. 297–319.
Simondon, Gilbert (1995) *L'individuation et Sa Genesése Physico-Biologique*, Grenoble: Millon.
Smith, Daniel W (2006) 'The Concept of the Simulacrum: Deleuze and the Overturning of Platonism', *Continental Philosophy Review*, 38:1–2, pp. 89–123, doi: 10.1007/s11007-006-3305-8.
Spinoza, Benedictus de (1992 [1677]) *The Ethics; Treatise on the Emendation of the Intellect; Selected Letters*, 2nd edn, ed. Seymour Feldman, trans. Samuel Shirley, Indianapolis: Hackett.
Stiegler, Bernard (1998 [1994]) *Technics and Time 1: The Fault of Epimetheus*, Meridian, Stanford: Stanford University Press.
Stiegler, Bernard (2009 [1996]) *Technics and Time 2: Disorientation*, Stanford: Stanford University Press.
Sutherland, Jean L (1933) 'Memoirs: Protozoa from Australian Termintes', *Journal of Cell Science*s, 2-76, pp. 145–73.
Terranova, Tiziana (2006) 'The Concept of Information', *Theory, Culture & Society*, 23:2–3, pp. 286–88, doi: 10.1177/0263276406023002115.

Tuin, Iris van der (2009) '"JUMPING GENERATIONS": On Second- and Third-Wave Feminist Epistemology', *Australian Feminist Studies*, 24:59, pp. 17–31. doi: 10.1080/08164640802645166.
Welter, Volker (2002) *Biopolis: Patrick Geddes and the City of Life,* Cambridge, MA: MIT Press.
Wiley, Stephen B. Crofts (2005) 'Spatial Materialism', *Cultural Studies*, 19:1, pp. 63–99, doi: 10.80/09502380500040886.
Yong, Ed (2016) *I Contain Multitudes: The Microbes within Us and a Grander View of Life*, New York: Ecco, an imprint of HarperCollins.