

**Knots: For an Interactivist Ontology**  
**Levi R. Bryant**  
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**Umeå universitet**

A flower turns towards the moon and begins to bloom late in the night. A glass mug shifts between different shades of blue, going all the way to black, depending on whether it's viewed under harsh fluorescent lights, natural sunlight, candlelight, or in a dark room. Our bodies swell in extreme heat and contract when it is bitter cold. A person's helmet cracks and they scream in the unimaginably cold reaches of outer space, yet no sound is emitted for there is no air to carry the waves stirred by their vocal cords beings are being-with, ecological, and interactive. Let us begin as if we were prisoners in Plato's cave,; the world of common sense and ordinary language. In the cave, when we speak of objects, of things, we conceive them as discrete, individual entities composed of properties. A rock isn't particularly interesting; at least to anyone other than the geologist or the builder. It is gray, irregularly shaped, and just sits there. We conceive of it as doing nothing until it is acted upon. Then it will move, but in a Newtonian fashion. Something else hits it and it goes flying. In this world, rock, the prisoner says, is inert. Unlike living things, it does nothing if not prompted by something else. This is generally what we signify by the term "object"; an inert clump that does nothing.

Yet cave walls and ordinary language should be no guide to ontology or questions about the being of beings. Our tendency is to conceive objects as collections of properties or qualities inhering in a substance. As Aristotle said, substances are individual things, they are entities, of which other things can be said. I can, for example, say "grey" of the rock in the sense that grey is a property or quality of the rock. The being of the being consists of those properties that belong to the substance. There are those properties or qualities that

are essential, and there are those properties that are accidental. Essential properties are the properties that make an entity the sort of thing that it is. For example, a triangle *must* have the property of having three sides to be a triangle. Take away one of those sides and you no longer have a triangle. By contrast, accidental properties are properties that can be taken away with the thing still remaining that type of thing. The fact that the triangle is green is accidental. If I paint the triangle red it doesn't cease to be a triangle because it still has three sides. Notably we don't need to discuss any other entities when we treat beings, individual things or substances, in terms of their individual qualities.

However, what if, instead of thinking beings in terms of their qualities and properties—striving to distinguish between the essential and the accidental –we instead treated beings as *activities, doings, and powers*? Ask not what a thing *is*, for that will lead you to a list of qualities or properties. Ask instead what entities *do*. Indeed, when discussing properties, don't stop by simply enumerating the qualities that a substance, thing, or individual being possesses. Instead treat the quality as an event, a happening, an act, on the part of the substance. Here we wouldn't say that the rock *is* grey, but rather that the rock *greys*. The greyness of the rock would be the result of a verb or an activity.

Certainly this is a strange way of talking about substances or entities in the world, but is there good reason for it? We can imagine two philosophers enjoying beers together at the local pub. The bartender has placed their glasses on slate coasters so as not to ruin the beautiful wood of the table in their booth. One of the philosophers, Diotima leans forward against the table as she's making her point to Plato who somehow always seems to miss the point as a result of the stark binary oppositions that haunt his thought. As she again tries to explain her version of the dialectic, she notices that the coaster, that was

before a bright grey is now a dark grey as a result of the shadow cast by her body. A philosophical discussion ensues. Has the color of the slate *changed*, or is the color *really* bright grey that has been masked or veiled in much the same way that we protect a piece of furniture from dust by placing a sheet over it?

Between the claim that the color has merely been veiled and the claim that the color of the slate has changed, we have two very different ontologies or theories of reality. If I say that the slate really is bright grey, I am saying that its color is an *intrinsic* property of the slate, that it belongs to its inmost being. Here the slate is *doing* nothing. Its real nature has merely been veiled or hidden. By contrast, if I say the color of the slate has changed, I am saying that qualities or properties are *activities* or *doings* on the part of entities. Properties become verbs rather than adjectives. The slate really is bright grey *and* dark grey. Or, more precisely, the slate *was* bright gray and is *now* dark grey. Diotima declares, much to the dismay of Plato who is a great lover of identity, seeing it as a mark of truth, that the color has indeed changed.

But how can this be, Plato asks? The slate has done nothing; at least not in the sense of a chemical reaction or a vital movement as in the case of a living being. All that happened is that the slate fell into the shadow of your body, Diotima. Isn't that merely a veiling of the true color of the object? Diotima, who is a lover of the material world, of this world, who refuses to bifurcate being into the ideal world of the forms and the illusory world of material, smiles to herself. For her, the world of matter and appearances is the real world; being, existence. We are beings of this world and act upon it, but are also of it, acted upon by it, and our flesh is intertwined with its flesh. Once again poor Plato has fallen prey to his obsession with identity; a sad obsession that leads him to denigrate this

world or universe in which we live. Working from the premise that  $A = A$ , the principle of identity, and the principle of non-contradiction,  $\sim(A \ \& \ \sim A)$  are the foundation of all reasoning and that being must be rational, Plato notes that propositions like “the rose is red” are fundamentally irrational because after a time the rose withers and becomes brown, thereby violating the principle of identity and contradiction. The statement, the rose is red, is true at one time and false at another. Plato thereby declares that the physical world we live in cannot possibly be true, that it can’t be the real world, for it is contradictory and fails to meet the demands of reason. Only the eternal, that which is unchanging and therefore always identical to itself and never characterized by contradiction, Plato says, can be true.

Diotima, who has studied the sciences extensively, thinks otherwise. What has changed, she points out, is the coaster’s relation to other beings in the world. When her body cast a shadow over the coaster the wavelengths of light the coaster *interacted* with changed. Color is not a property that is *in* the coaster, but is a property that *arises* through interactions between the atomic structure of the slate and wavelengths of light. Change the wavelengths of light and you change the color. Return them to the original wavelengths of light and the color changes again, returning to its prior shade. It’s not that the coaster *is* bright grey or dark grey. Rather, the coaster is both bright grey *and* dark grey depending on the light it interacts with.

Such is the basic thesis of an interactivist ontology. Profoundly ecological in its orientation of thought, interactivism conceives the actualized states of beings, what Karen Barad calls “phenomena” and what I call “local manifestations”, as *between*. The local manifestation, its properties, its states, will be an event that takes place in an interaction

between one entity and a field of other entities. Look not to the entity in isolation to know what it is, but rather look outward to the field of entities, the ecology of beings, that the entity interacts with. The color of an entity is not in an entity, though it does take place in an entity, but rather it's as if all beings are citational, referencing beings other than themselves. The dark grey of the coaster references, cites, Diotima's body and the shifting wavelengths of light. This is why the impressionists painted their haystacks and lily pads in *series*. They sought to capture the nature of these beings as ever shifting events, as ever shifting happenings, resulting from changing ecological conditions. What we learn is that beings are knotted to one another, that they internalize one another, being affected and affecting each other.

Yet certainly the solid properties of the slate coasters aren't like those of color. Isn't color merely, to use Locke's terminology, a "secondary quality" that isn't really a feature of the coaster itself? However the situation isn't markedly different with properties like the solidity of the coaster. To be sure, the solidity of the coaster is more enduring than its color, yet that solidity too is citational, referencing a broader ecology. If the temperature drops dramatically, the slate becomes brittle, cracking and flaking easily. If temperature and pressure rise dramatically, the slate becomes molten, a liquid. The solidity of the slate is more enduring, more reliable, than its color because pressure and temperature conditions on the planet earth are fairly persistent. However, the stability of the slate is no less an activity, interaction, or event for this reason. The enduring nature of the slate's solidity is the result of an *ongoing* interaction between the forces of the planet and the slate. This stability and endurance leads us to read properties into substances or entities, treating them as properties of the thing itself, because we don't see how the entity changes

when those ecological conditions markedly change. There is thus a sort of transcendental illusion built into the fabric of matter, a materialist transcendental illusion that arises not from mind but from being itself. Because ecological fields are often more or less stable due to planetary conditions, they generate fairly enduring qualities as events. This leads us to think qualities are enduring qualities of entities *themselves* resulting from the things themselves as intrinsic properties. However, were the field to change, the object's properties would change. Properties are results of interacting forces between entities. Never imagine an environment is an inert container, transcendent to the entities that inhabit them. Environments are immanent and are nothing more than the entities that inhabit them. Insofar as beings are always moving and becoming, environments are therefore ever shifting machinic ecologies. Objects are defined not by their qualities, but their forces, their power, what they can do.

Because entities or substances are defined by their doings and interactions, they deserve to be called machines. Stars are machines. Planets are machines. Rocks are machines. Dogs, people, cities, microbes, and institutions are machines. The realm of the machine, to which all beings belong, is not restricted to the computer or automobile. Indeed, the machines that humans have managed to fabricate pale in complexity and inventiveness to those nature has created in the form, for example, of the octopus. Clearly I am here using the term "machine" in a technical and unusual way to define a concept. If one doesn't like the *term*, another will do. What's important is the *concept*. The merit of the term "machine" is that it leads us to attend to how things operate, to what they do. It leads us to think of powers and activities, not properties. Do not first list a set of properties nor a use, but ask what things, living and non-living, human and nonhuman, do. Machines

draw on flows and transform them, producing outputs. Among other things, the slate draws on flows of light producing colors. What sort of a machine is a chair? We are accustomed to discussing how we *use* chairs; yet the question of what chairs *do* perhaps seems odd. Nonetheless, we can ask this question no matter how strange it might seem. In the first place, the chair draws upon flows of gravity, the forces of the cosmos, distributing them through their back and legs. However, chairs also draw on flows of bodies, contributing to the actualization of the machines of our bodies, to their states and what they can do, in a variety of ways. Some chairs act on us interactively in such a way as to encourage states of relaxation, beckoning sleep. You sit down on the overstuffed chair with every intention of reading a book, and the next thing you know you are snoring. Other chairs such as those found in elementary schools and churches seem designed to produce discomfort. Here the chair, as a machine, operates to produce states of attentiveness proper to learning and spiritual edification. These chairs are machines that refuse relaxation, thereby beckoning attention. Other chairs operate to render activities like writing all but impossible. Here we might think of the egg chair in *men in black*.

There are three ways in which machines operate on flows. First, a machine can draw on a flow to produce a new state, quality, or action within *itself*. A rock laden with iron draws on flows of oxygen and water to produce the quality or state of rust. The skin of our bodies produce tans by drawing on flows of sunlight. Cognitively we might draw on texts to produce new affects and actions. For example, the reader of Sartre's *Nausea* might seek out the experience of nausea. Stacy Alaimo claims that all beings are characterized by "trans-corporeality". As she puts it in the case of humans,

Imagining human corporeality as trans-corporeality, in which the human is always intermeshed with the more-than-human world, underlines the extent to which the

substance of the human is ultimately inseparable from “the environment.” It makes it difficult to pose nature as a mere background... for the exploits of the human since “nature” is always as close as one’s own skin—perhaps even closer... By emphasizing the movement across bodies, trans-corporeality reveals the interchanges and interconnections between various bodily natures. (Alaimo 2010, 2).

What Alaimo says of humans is true of all other machines, living and non-living. It’s as if all beings were sheafed in one another, drawing flows from one another producing actualized states and behaviors. Again the citationality of being. All beings grow from the soil of a field of interactions with other entities, from the soil of the comos, its inhabitants, its forces, expressing that field and bringing something new into existence with each interaction that cites those specific conditions; a citation of the unique conditions of that soil. It’s as if, to use Thomas Rickert’s beautiful example of French wine, every being were like the wine grape, where its local soil and the singular events of the year it was grown, have everything to do with the qualities it possesses.

Second, machines operate on flows to produce products. A tree is a machine that draws on flows of sunlight, water, carbon dioxide, and soil nutrients to produce things such as oxygen. A university is a machine that draws on flows of human bodies to produce first students and then graduates. In approaching a university as a machine, we can ask how it operates upon these bodies, how it transforms these bodies in operating upon them, and what types of subjectivities are produced as a result of these operations. Machines are often highly complex entities or assemblages of machines, with many smaller machines coiled within them. Thus, for example, the classroom is a sort of machine that operates in its own way. What type of subjectivity is produced as a result of that configuration of space where students sit in desks with the professor dispensing knowledge at the front of the classroom? Are there different configurations that would produce different subjectivities



or agents? A university is a machine composed of semiotic machines such as the curriculum, the pedagogical techniques, the sorts of assignments used, the methods of evaluations, the aims dictated for education, the rules, the procedures; architectural machines such as buildings, open regions, the configuration of the classrooms, technological machines such as computers, pens, papers, boards, markers, and, of course, the students, faculty, administrators, organizations, and all the different ways these beings interact. The university is a machine in which other machines are wrapped in yet other machines, all whirring away, sometimes in harmony, but often in tension and in conflict.

Finally, machines can operate to influence the movement and capacities of other machines. Roads, for example, guide automobiles along particular vectors rather than others. As such, people and towns are brought together because there are some paths between them and separated because there are others. Recall the Gus van Sant remake of Hitchcock's *Psycho*. We are accustomed to attributing the genesis of Norman Bates's madness to his relationship with his mother. However, in the van Sant remake we learn that the hotel has lost business because a new interstate highway has been built. How might the isolation produced as a result of no longer getting traffic coupled with the stress of having little business contributed to creating fertile soil for madness? While certainly not causing that madness, might not that isolation have created soil fertile for the activation of that madness? But it is not just machines like roads and highways that afford and constrain relationships between various machines. Mountain ranges and ocean currents, for example, operate on other machines in similar ways. As Manuel DeLanda suggests in early works such as *A Thousand Years of Non-Linear History*, to what degree did many cities

develop where they did because ocean currents suggested those locations in relation to already existing cities.

However, it's not merely that machines structure the movement of other machines, affording and constraining relationships between machines; it's also that machines afford and constrain what other machines do. Paraphrasing Marshall McLuhan, a medium is anything that extends the powers and capacities of another machine. Theorists such as Donna Haraway and Andy Clark express similar ideas with their concept of cyborgs. We need not have machines surgically embedded in our flesh to be cyborgs. No, wherever we couple with other machines to form an emergent machine with new powers or capacities, we are a cyborg. Writing expands the power of speech through the formation of an enduring medium that can travel great distances while preserving messages, even after the death of the author. However, writing does far more than this. It's unlikely that abstract conceptuality is possible without writing because our minds seem geared to think in terms of narratives with a beginning, a middle, and an end depicted relations between protagonists and antagonists. With writing, highly abstract chains of reasoning become possible. For example, our mathematical abilities are expanded significantly insofar as the *paper*, as a machine, preserves the details of the mathematical chain. This is something that would be incredibly difficult, if not impossible, for the memory given to us by biology. However, it's not simply that the paper preserves. The symbols matter too. Imagine attempting to do calculus with Roman numerals. Arabic numerals are a machine that render an entirely different type of mathematics possible.

In *A Thousand Plateaus*, Deleuze describe a cyborg composed of a man, a lance, and the stirrup. The stirrup profoundly transformed the nature of warfare. For every action,

Newton taught us, there is an equal and opposite reaction. Prior to the stirrup the force of the man-horse assemblage couldn't be transferred to another entity because when the rider hit another he would be thrown from his horse. With the stirrup the force is preserved and can be transferred to the target with devastating effect. These cybernetic extensions of what a being can do are not restricted to humans, but belong to the animal world as well. In *Laws of Media*, Marshall and Eric McLuhan talk about how electric light transformed human relations. Where before the night was dangerous and menacing, now we can take romantic strolls along the Seine. There are now nighttime baseball games. But above all, and not, for the good, labor becomes possible at night. However, these cybernetic extensions of what beings can do are not restricted to humans. Electric light, for example, extends the powers of animals as well. On my back patio lizards use my porch light as a lure to attract insects. Given their size compared to the other lizards I see, they seem to have benefitted a great deal from this assemblage.

Interactivist ontology calls for an ecological concept of being; however there's a tendency to associate ecology solely with nature and biology. Concepts or distinctions have a sort of unconscious that guide how we comport to the world. The definition of ecology as the branch of biology that investigates relations of organisms to one another and their physical environment is not without its presuppositions. Unconsciously, *implicitly*, it presupposes a distinction between society and nature, the cultural and the biological, the human and the nonhuman. These implicit have consequences. Understood as a domain of being (the natural, the biological), interest in ecology can be restricted to those who care about the welfare of polar bears and spotted owls. The person interested in politics, society, and culture it is said can safely ignore ecology. Human issues, they say, are more

important than the plight of polar bears. For example, one says that issues of economy are more important than whether or not there are dead zones in the oceans. However, as theorists such as Karen Barad, Donna Haraway, Bruno Latour, and Isabelle Stengers have taught us, we would do well to question this ontological distinction between nature and culture; for everything is embedded in an ecology as all beings, even signs, are interactive.

The dominant conception of ecology implicitly treats nature and culture as two ontologically distinct domains that are independent of one another. Nature is treated as the domain of the biological, of physical or material entities governed by causality and essence. From the Greek, nature refers to essence, or to that which resides intrinsically within beings. The acorn naturally becomes the oak tree, not a table. A table is a product of culture. Society is treated as the domain of ideas, norms, customs, signs, art, laws, meanings, and so on. In short, nature is treated as the domain of the corporeal, the physical, the material, the body, the innate and necessary, while society is treated as the domain of the incorporeal or the idea, meaning, the free, the contingent or what is capable of being otherwise. As a consequence, the two domains call for different forms of intervention. If one wishes to enact changes in the natural world they must do so through science, by triggering causal mechanisms. By contrast, one produces changes in society through acting through and on meanings. One might enact a law, interpret a text in a new way, or deconstruct established meanings. We see, for example, why so much politics of the last century or so on has consisted in contesting various “natures” attributed to sexuality, gender, race, class, and so on. By showing that these things are cultural, social, we show that they are not ineluctable essences like the acorn in its destiny to become an oak tree, that they are capable of being otherwise, that they are products of social forces

not the biological. Freedom follows. The crucial point is that the two domains are conceived as distinct and ontologically separate, governed by different principles. Politics is thought as belonging exclusively to the domain of the social and as pertaining to the contestation of meanings. In this regard, satellites and roads are not political because they are material agencies, not meanings governing a collective. Here it's notable that under the nature/culture divide, design is largely thought to be outside of the domain of politics. Insofar as politics is thought largely to consist in interventions in fields of meaning or signs, features of built and natural environments are thought as not being political matters. Designing buildings, roads, and technologies is not seen as a political act as we don't count these things as social, nor discern how they contribute to the formation of collectives, link people in a variety of ways, contribute to the production of affect, and afford and constrain what we can do. Politics here becomes largely a matter of protest, legislation, rhetorical persuasion, and the formation of collectives of people or groups.

However, we can question the soundness of these conceptions of society and nature. First, everywhere today we see a growing awareness of both the impact of society on nature as a result of our technologies, the energies we use, and population growth, as well as the impact of these changes wrought in nature on society. Drought, natural disasters, intensifying disease epidemiologies as a result of climate change, and scarcity of resources all point to increased political instability. Increasingly, nature, which was once largely only a matter of concern for nature enthusiasts, is becoming a site of political concern for all. Second, as a result of the massive technological transformations society has undergone over the last two centuries, there's a growing awareness of the impact of things on our lives. Here we can cite a long line of thinkers that have focused on the role that nonhuman

actors play in our social lives such as Marshall McLuhan, Donna Haraway, Bruno Latour, Andy Clark, Friedrich Kittler, Karen Barad, and a host of others. Technologies, architecture, and infrastructure bring people together and separate them in a variety of ways, and afford and constrain different activities, ways of being with, and ways of becoming. As such, they deserve to be at the heart of political theory and activism. Unfortunately, both the humanities and social sciences remain dominated by a focus on meaning and these thinkers still remain largely at the periphery.

The hard nature/culture distinction cannot be maintained because not only is society embedded in nature and therefore in perpetual thermodynamic interface with the broader ecological world, but societies are themselves ecologies. What we need, I believe, is a queering of both nature and culture. While this precise terminology might not be used, this is a project, I believe, that is well underway and that has been undertaken by a variety of thinkers such as Latour, DeLanda, Stacy Alaimo, Jane Bennett, Haraway, Karen Barad, Rosi Braidotti, and a host of others. Queering nature and culture involves a chiasmatic exchange of properties. Nature must be seen to possess properties formerly reserved for culture. Likewise, culture must be seen to possess properties formerly reserved for nature.

The queering of nature is, I believe, also something attested to by contemporary science. To see this, let us return to the Greek concept of nature that wanders throughout history all the way to our present day. *Physis*, nature, is conceived as that which arises ineluctably out of itself, as that which unfolds necessarily according to a *telos*. According to Aristotle's favorite example, the acorn becomes the oak tree. Coiled within the acorn in *potentia* is a destiny, a goal, a vector, a trajectory that becomes an oak tree. Oak trees, in their turn, do not produce oranges or mangos, but acorns. The like can only produce the

like. There is a necessity to what the acorn becomes or something that the acorn is *supposed* to be. In this regard, natural development is conceived as the realization of form or essence in matter. Here sameness, essence, precedes difference and individuality. The individual chicken is an instantiation of the form or essence of chickenness contained in *potential* in the seed. It is for this reason that the classical universe contains *monsters*. A two-headed chicken is a monster because it deviates from the necessity of what it is supposed to be according to the *telos* of its nature. As an aside, it's worth noting just why this concept of nature is so problematic politically. When, for example, we say women, men, or members of a particular race have a particular nature, we're also saying that they embody an essence that delineates the role they necessarily should have in the social order. Deviation from this as in the case of women governing is seen, in this classical framework, as a genuine monstrosity.

Contrast the classical concept of nature with that of *techne* (art, craft, arguably culture) and habit. Aristotle characterizes habit as our second nature. It belongs to our first nature, our essence, to acquire habits, but the nature of these habits is not predelineated by our essence. There's nothing in the human essence that dictates that a human being must become a speaker of the English language. Likewise, with *techne*, craft or art, there's nothing about the wood that dictates it must become a table. It could become a carving, a chair, the handle of a shovel or any number of other things. Habit and *techne* are the domains of culture and society; their message is that we are self-fashioning, rather than dictated by *physis*. Habit and *techne* are thus domains of freedom and contingency, as opposed to *physis* or nature that is characterized by necessity.

Increasingly contemporary science has called this conception of *physis* or nature into question in ways that make nature look eerily similar to culture. First, evolutionary theory has called into question the primacy of form or species over the individual, championing a victory of ontological nominalism over realism with respect to universals or species. Within the framework of contemporary biology, species are useful fictions used to describe populations of individuals that are more or less similar in resemblance. Here there is nothing that individuals are *supposed* to be, there is no guiding *telos*; and as a result there are no monsters. The organism that diverges from its parents through mutation is not a monster, but is rather a possible vector of evolution tending towards the formation of a new species over time. Species are no longer invariant essences but are habits of nature. Second, a growing body of research indicates that genes are not a destiny, blueprint, or an essence. Branches of biological research such as developmental systems theory spearheaded by Susan Oyama, and evo-devo to which biologists such as Mary Jane West-Eberhard have contributed heavily, increasingly suggest that the genome is more like a set of tendencies, rather than a blueprint, that can be activated in a variety of ways through communication with environmental factors such as diet, chemistry, lighting conditions, stressors and so on. Increasingly it appears that the genome is characterized by pluripotency or the capacity to be actualized in a variety of ways under different conditions or different interactive fields, rather than what could be called unipotency or developmental vectors that ineluctably unfold in only a particular way. Epigenetic research is even suggesting the disturbing possibility that the genome of adults can be changed through traumas such as post-traumatic stress disorder produced through poverty and living through war and that these changes are heritable. Research conducted by Michael



Meany and Moshe Syzf indicates that children of parents who suffer PTSD are themselves more susceptible to trauma. In other words, here culture could affect the very flesh of our bodies at the level of the genome. In this connection, John Protevi has done excellent philosophical work synthesizing Foucault, Deleuze and Guattari, cognitive science, epigenetics, and developmental biology, complicating the nature/nurture debate, and exploring the interaction of biology and culture in the genesis of bodies. Elsewhere, in the world of physics, Lee Smolin has suggested that even nonliving matter can develop in a variety of ways and that the laws of physics are not fixed. Here the laws of physics themselves are conceived as the result of dynamic, developmental processes instead of being thought as a fixed grid within which all beings become. Complexity theory and the theory of dissipative systems is also showing the creativity of the material world. Manuel DeLanda has drawn on these trajectories of research to develop an ontology that seeks to replace the old eternal essences with a developmental account of being that seeks to articulate how actualized beings come into being. There we are to look at how beings are produced or generated under specific conditions in a field of relations, rather than how they are realizations of an essence that predelineates what they are to be.

Nature indeed looks quite queer from this vantage. In its creative contingency or capacity to be otherwise, it looks a lot like habit and *techne*. It becomes increasingly difficult to appeal to nature in the classical sense, to a teleology of what things are *supposed* to be, because everywhere nature experiments and creates new forms. That which deviates from what came before, from the species as essence, is no longer a monstrosity, but is rather an experimentation with form, with the genesis of new forms, that resembles the sort of inventiveness we find in culture. Similarly, developmental biology shows that

the formation of the phenotype or the actualized organism takes place not as a result of a unilateral development from genetic blueprint to adult, but rather is a collaboration between genome that can be actualized in a variety of ways and even epigenetically changed, and a variety of features of the environment. To take a simple example, the sort of ant a larvae becomes—queen, warrior, worker—is not determined by the genome for every ant can become any one of these types, but rather by their placement in the nest. The pheromones in the neighborhood of the larvae determine its developmental trajectory along one path or another. It would appear that the difference between culture and nature is less a difference of essence—nature being the field of ineluctability and culture being the domain of creative freedom and self-fashioning—but rather a difference in time or speed. Evolution and the laws of physics might move or change very slowly, but are nonetheless contingent, creative, and change.

The queering of culture takes place in the opposite direction. First and foremost, it consists in expanding the domain of society beyond meaning, the sign, and the incorporeal, so as to underline the material nature of culture. This entails discerning technologies, infrastructure, geography, weather patterns, and the sun as dimensions of the social; but even the sign, meaning, text, narrative, and idea must be seen as material beings. No longer will the social and cultural be seen as the disembodied, but rather it too will be corporeal. Signs and narratives, for example, must travel throughout a society to produce changes and this requires time and the existence of mediums to distribute them. The invention of the internet creates new structures of social space-time and new collectives by both accelerating social time and linking elements in new collectives. Would contemporary

capitalism bet possible without the internet, oceanic cables, satellites, and supercomputers? Does this not make such things sites of political engagement?

Second, and in a closely related vein, the queering of culture and society also involves expanding the realm of social actors or participants, to include nonhuman actors such as plants, animals, microbes, and various tools, technologies, infrastructure, features of geography, resources, and so on. Far from the Genesis creation narrative where man is the sovereign of all other creatures, living and non-living, of nature, functioning as both a steward of nonhuman creatures and using them for his ends (in the story it is a he), it seems that the social is more of a collaboration between humans and nonhumans, both living and non-living, technological and mineral, where no one directs everything like a sovereign. For example, Michael Pollan argues that marijuana evolved its pleasant narcotic powers to seduce us so that we would assist in its reproduction by cultivating it, caring for it, and planting its seeds. All sorts of relations are forged as a result of this. Land is cleared to grow the plant, soil is transformed, means of distribution are developed involving roads, vehicles, stores, dealers, buyers, etc., subcultures around the narcotic emerge, laws are enacted, different narratives are produced, political struggles ensue, and so on. In addition to this, pesticides are enlisted to assist the plant in its struggle with insects and animals that would destroy it. It's very easy to think of the plant as something we just use for our enjoyment or ends; however, the plant has also enlisted us for its ends and functions as a sort of catalytic operator in the forging of a variety of semiotic codes and social relations. We should not understand the social exclusively as the set of relations between humans and their signs, but rather as the entire network of relations, the entire assemblage, involving humans, these semiotic codes (both human and non-human), the plants, the dogs

and technologies used to guard the plants, the roads and vehicles used to transport the materials, and so on. All of these actors generate exigencies that call for actions, creations, and relations that aren't solely directed by human beings. The queering of culture consists in a de-anthropologization of the concept of society. De-anthropologization does not consist in banishing or denigrating the human, for humans are actors in social assemblages as well, but in understanding humans as one set of actors in social assemblages among others. Perhaps no one has gone further in this queering of society and culture than Bruno Latour and Isabelle Stengers. Each, in their own way, emphasizes a need to understand the social as collectives of humans and nonhumans, and to trace the associations between entities to understand why social relations take the form they take.

An interactivist conception of society and politics would require us to think the social as a knotting of three broad orders of machine: material machines, semiotic machines, and phenomenological machines. Material machines refer both to entities of nature such as animals, microbes, mountains, ocean currents, and weather patterns, but also technologies and infrastructure. Semiotic machines refer to codes, categories, laws, techniques, narratives, myths, and so on. Phenomenological machines refer to the way in which different types of machines are selectively open to their environment. The aim is to trace how these various orders interact with one another and are knotted together forming the social assemblages within which beings dwell.

Interactivist ontology conceives the social as an entanglement of machines of matter, meaning, and experience, all affecting and modifying one another. The question of politics is that of how to best assemble collectives of machines in ways that would promote emancipatory and affirmative becomings. In this regard, politics is design. It is the design

both of machines and of ecologies of machines that afford and constrain relations between entities. Before discussing this, it will first be valuable to discuss how power functions in social ecologies.

Power can roughly be thought on the model of gravity. Within the Einsteinian framework, gravity is not so much a force that attracts two bodies together, as a curvature of space and time produced by the mass of an object that creates a furrow along with another object moves. Imagine a bed sheet with a grapefruit in the middle. As a consequence of the grapefruit, the sheet has a curvature in its middle. If you take a clementine and roll it along the sheet it will move about the curvature produced by the grapefruit. This is how it is with the machines and power. As a result of the interactions among the machines in their ecologies, there are some machines that structure the movement and becoming of other machines. We can sort machines into the different functional roles they play with respect to one another in terms of their gravity or power they exercise so long as we understand that these aren't intrinsic features of machines but features that arise from their relations to one another. First there are what I call the "bright machines". The sun is a bright machine because it organizes the movement of all of the other planets in the solar system. Here on the planet earth, oil and other fossil fuels are bright machines because nearly all technology and life are affected by these energies. It is scarcely possible for anything to function without somehow plugging into flows of fossil fuels, and, of course, the waste produced by these energies is transforming the entire climate, which, in its turn, affects all life on this planet. Insofar as oil is such a bright machine, this entails that politics, both national and international, comes to be organized around fossil fuels as well. We call the current age the "anthropocene" to capture the sense

in which humankind is now the organizing principle of the entire planet, but perhaps it would be better to call it the “petrocene”.

If bright objects organize the movement and becomings of other machines, then those machines caught in the gravity of a bright machine are satellites. A machine is a satellite when its paths of movement and becoming are structured by another machine. They are, as it were, caught in the orbit of that machine. Billions of people are satellites for the bright object of their jobs. Because they must support themselves and their families, and because they have little in the way of alternatives, nearly every decision in their life comes to be structured around the bright object of their employer: when they sleep, when they wake, when they eat, what they do, how they spend their free time (exhaustion from labor substantially transforms how free time is spent), and so on.

If there are bright machines, there are also dim machines. Dim machines are machines that exist in an ecology of machines, but that have a very dim presence in terms of what they can do and how they can act. In social ecologies involving humans the dim machines are often the result of semiotic categories that, in their turn, function as bright machines. A good example of such a category functioning as a bright machine would be that of “citizen”. Put somewhat gruesomely, no matter how thorough we are, an autopsy never reveals the quality of citizenship. Regardless of what the racists say, it is not a quality of genes or biology, nor is it a quality of where someone is in space, nor of those to whom they are born; for a non-citizen, an illegal immigrant, occupies the same space as the citizen and can be born of parents occupying that space. Citizenship is a semiotic machine, a legal machine, that performs, as Deleuze and Guattari articulate it in *A Thousand Plateaus*, an incorporeal transformation of the human body, transforming it from non-citizen to

citizen. Those that inhabit a national social ecology without having undergone this incorporeal transformation are dim machines. They are there, they speak, yet it is a curious speech. It is a speech without voice or sound because they can scarcely participate in that social ecology. As Ranciere puts it, they are the part of no part. Their life is organized around invisibility, attempting to find a foothold in the world while carefully guarding their invisibility lest they be deported.

Then there are the rogue machines. Today astronomers and cosmologists speak of terrifying entities like rogue planets, stars, and black holes that aren't tied to any particular system, but that wander throughout and between galaxies. Rogue machines appear in ecologies of machines as if out of nowhere, reconfiguring all the relationships between machines inhabiting that ecology. Political, scientific, and artistic revolutions are all examples of rogue machines. A revolution is a break, a caesura, in an ecology. Sometimes these events can be for good, at other times for ill. The determination of which really boils down to the reconfiguration of the ecology of machines and whether or not chaos ensues.

Finally there are the darkest and most terrifying of machines: black holes. A black hole is a machine whose mass is so bright, so great, that nothing can escape from its gravity. Drug addictions can be black holes. Certain psychological disorders can be black holes. Some relationships can be black holes. Many of us worry that neoliberal capitalism and the petrocene are black holes. Let us hope that black holes are essentially rare.

The question of politics is two-fold: First, it is the question of how to achieve escape velocity. To escape the bright machine of the earth, a spacecraft must reach a speed of 11.2 km/s. What escape velocities are required to escape the gravity of the bright objects that structure our various social ecologies? Second, there is the issue of what ecology to build

once escape velocity has been achieved. When the spacecraft escapes the earth, it now finds itself in an entirely new ecology, requiring the invention of new machines. Gravity has changed. How will our astronauts sleep in this new gravitational field? How will they eat? How will they drink? Given that their bodies and the properties of their bodies are interactive, how will they prevent them from decompressing in this new environment? How will they make love? You laugh. But things fly apart in a zero-g environments when you've achieved escape velocity. Escape from a machinic ecology entails a whole series of problems to be resolved in response to a new ecology and the invention of another ecology.

It will be noted that there are two dimensions to each of the problems of politics: an epistemic and a design dimension. Had our astronauts not had knowledge of gravity, they would have never achieved escape velocity. They needed to know the specific gravity of earth to know what velocity they had to achieve to escape the planet. But knowledge wasn't enough. Once they acquired this knowledge, they had to engage in design. They had to design engines capable of achieving these velocities. They had to design vessels capable of withstanding these forces. They had to find ways to protect their bodies. The issue was the same once they achieved escape velocity. Not only did they require knowledge of their own bodies and the new ecology they were entering, but they also needed to design suits, vessels, eating devices, breathing devices, bathroom devices, and devices to protect against radiation. Escape requires invention both to escape and once we escape.

The case is no different for our astronauts. If we are to achieve escape velocity from those bright machines that create such sad orbits or ecologies, we need both knowledge and design. We need knowledge of how those ecologies are configured, invention of what is required to achieve escape from those ecologies granting that they aren't black holes,



knowledge of the other side, the new ecology, to which we've escaped, and invention of new forms of life. **[Stop here if time runs out]** I can only briefly mention them here, but there are a variety of sites where knowledge is required and design is needed to achieve escape velocity in assemblages. There is, of course, what I call "semiopolitics".

Semiopolitics is the order of the sign, meaning, law, norms, and narratives. We must act on this to render new types of social assemblages possible. It must not be forgotten that human bodies, animals, technologies, cities, and villages and much more require energy in the form of calories and other fuels to function. There is thus an entire realm of thermopolitics, scarcely explored, that investigates how energies enslave us and what other forms of energy can be drawn to render new action, movement, becomings, and collectives possible. Our lives are structured in so many ways by time; the time of work, of our obligations, of how long it takes to reach one another. There is thus a domain of chronopolitics. There is the way in which features of geography and nature influence social collectives that could be called, in a somewhat unusual way, geopolitics. There is the way in which different technologies both enable new forms of life and enslave us that could be called technopolitics. There is the way in which infrastructure and architecture afford and constrain social relations that could be called domopolitics. And there is, of course, the flesh of bodies, animal, plant, microbial, and human that could, in an unusual way, be called biopolitics. All of these domains are knotted to one another, interacting and modifying each other. They are all domains that require knowledge and design to achieve escape velocity to bring about more sustainable, equitable, just, and satisfying fields of interaction for living and becoming.