on the philosophy of gilles deleuze

< DELEUZE AND THE GENESIS OF FORM >

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by Manuel DeLanda

One constant in the history of Western philosophy seems to be a certain conception of matter as an inert receptacle for forms that come from the outside. In other words, the genesis of form and structure seems to always involve resources that go beyond the capabilities of the material substratum of these forms and structures. In some cases, these resources are explicitly transcendental, eternal essences defining forms which are imposed on infertile materials. The clearest example of this theory of form is, of course, religious Creationism, in which form begins as an idea in God's mind, and is then imposed by a command on an obedient and docile matter. But more serious examples also exist. In ancient philosophies Aristotle's essences seem to fit this pattern, as do those that inhabit Platonist heavens. And although classical physics began with a clean break with Aristotelian philosophy, and did endow matter with some spontaneous behavior (e.g. inertia), it reduced the variability and richness of material expression to the concept of mass, and studied only the simplest material systems (frictionless planetary dynamics, ideal gases) where spontaneous self-generation of form does not ocurr, thus always keeping some transcendental agency hidden in the background.

Yet, as Gilles Deleuze has shown in his work on Spinoza, not every Western philosopher has taken this stance. In Spinoza, Deleuze discovers another possibility: that the resources involved in the genesis of form are not transcendental but immanent to matter itself. A simple example should suffice to illustrate this point. The simplest type of immanent resource for morphogenesis seems to be endogenously-generated stable states. Historically, the first such states to be discovered by scientists studying the behavior of matter (gases) were energy minima (or correspondingly, entropy maxima). The spherical form of a soap bubble, for instance, emerges out of the interactions among its constituent molecules as these are constrained energetically to "seek" the point at which surface tension is minimized. In this case, there is no question of an essence of "soap-bubbleness" somehow imposing itself from the outside, an ideal geometric form (a sphere) shaping an inert collection of molecules. Rather, an endogenous topological form (a point in the space of energetic possibilities for this molecular assemblage) governs the collective behavior of the individual soap molecules, and results in the emergence of a spherical shape.

Moreover, the same topological form, the same minimal point, can guide the processes that generates many other geometrical forms. For example, if instead of molecules of soap we have the atomic components of an ordinary salt crystal, the form that emerges from minimizing energy (bonding energy in

this case) is a cube. In other words, one and the same topological form can guide the morphogenesis of a variety of geometrical forms. A similar point applies to other topological forms which inhabit these spaces of energetic possibilities. For example, these spaces may contain closed loops (technically called "limit cycles" or "periodic attractors"). In this case the several possible physical instantiations of this space will all display isomorphic behavior: an endogenously generated tendency to oscillate in a stable way. Whether one is dealing with a socio-technological structure (such as a radio transmitter or a radar machine), a biological one (a cyclic metabolism), or a physical one (a convection cell in the atmosphere), it is one and the same immanent resource that is involved in their different oscillating behavior.

Since this is a crucial issue in Deleuze's philosophy let me explain this point in a little more detail. Deleuze calls this ability of topological forms to give rise to many different physical instantiations, a process of "divergent actualization", taking the idea from French philosopher Henri Bergson who, at the turn of the century, wrote a series of texts where he criticized the inability of the science of his time to think the new, the truly novel. The first obstacle was, according to Bergson, a mechanical and linear view of causality and the rigid determinism that it implied. Clearly, if all the future is already given in the past, if the future is merely that modality of time where previously determined possibilities become realized, then true innovation is impossible. To avoid this mistake, he thought, we must struggle to model the future as truly open ended, and the past and the present as pregnant not only with possibilities which become real, but with virtualities which become actual.

The distinction between the possible and the real, assumes a set of predefined forms (or essences) which aquire physical reality as material forms that resemble them. From the morphogenetic point of view, realizing a possibility does not add anything to a predefined form, except reality. The distinction between the virtual and the actual, on the other hand, does not involve resemblance of any kind (e.g. our example above, in which a topological point becomes a geometrical sphere) and far from constituting the essential identity of a form, it subverts identity, since now forms as different as spheres and cubes emerge from the same topological point. To quote from what is probably his most important book, "Difference and Repetition":

"Actualization breaks with resemblance as a process no less than it does with identity as a principle. In this sense, actualization or differenciation is always a genuine creation."

And Deleuze goes on to discuss processes of actualization more complex than bubbles or crystals, processes such as embryogenesis, the development of a fully differenciated organism starting from a single cell. In this case, the space of energetic possibilities is more elaborate, involving many topological forms governing complex spatio-temporal dynamisms:

"How does actualization ocurr in things themselves?...Beneath the actual qualities and extensities [of things themselves] there are spatio-temporal dynamisms. They must be surveyed in every domain, even though they are ordinarly hidden by the constituted qualities and extensities. Embryology shows that the division of the egg is secondary in relation to more significant morphogenetic movements: the augmentation of free surfaces, stretching of cellullar layers, invagination by folding, regional displacement of groups. A whole kinimatics of the egg appears which implies a dynamic".

In "Difference and Repetition", Deleuze repeatedly makes use of these "spaces of energetic possibilities" (technically refered to as "state spaces" or "phase spaces"), and of the topological forms (or "singularities") that shape these spaces. Since these ideas reappear in his later work, and since both the concept of "phase space" and that of "singularity" belong to mathematics, it is

safe to say that a crucial component of Deleuzian thought comes from the philosophy of mathematics. And, indeed, chapter four of "Difference and Repetition" is a meditation on the metaphysics of the differential and integral calculus. On the other hand, given that "phase spaces" and "singularities" become physically significant only in relation to material systems which are traversed by a strong flow of energy, Deleuze philosophy is also intimately related to that branch of physics which deals with material and energetic flows, that is, with thermodynamics. And, indeed, chapter five of "Difference and Repetition" is a philosophical critique of nineteenth century thermodynamics, an attempt to recover from that discipline some of the key concepts needed for a theory of immanent morphogenesis.

At the beginning of that chapter, Deleuze introduces some key distinctions that will figure prominently in his later work, specifically the concept of "intensity", but more importantly, he reveals in the very first page his ontological commitments. It is traditional since Kant to distinguish between the world as it appears to us humans, that is, the world of phenomena or appereances, and the world as it exists by itself, regardless of whether there is a human observer to interact with it. This world "in itself" is refered to as "nuoumena". A large number of contemporary thinkers, particularly those that call themselves "postmodernists", do not believe in nuomena. For them the world is socially constructed, hence, all it contains is linguistically-defined phenomena. Notice that even though many of these thinkers declare themselves "anti-essentialist", they share with essentialism a view of matter as an inert material, only in their case form does not come from a Platonic heaven, or from the mind of God, but from the minds of humans (or from cultural conventions expressed linguistically). The world is amorphous, and we cut it out into forms using language. Nothing could be further from Deleuzian thought than this postmodern linguistic relativism. Deleuze is indeed a realist philosopher, who not only believes in the autonomous existance of actual forms (the forms of rocks, plants, animals and so on) but in the existance of virtual forms. In the first few lines of chapter five of "Difference and Repetition", where Deleuze introduces the notion of "intensity" as a key to understand the actualization of virtual forms, he writes:

"Difference is not diversity. Diversity is given, but difference is that by which the given is given...Difference is not phenomenon but the nuoumenon closest to the phenomenon...Every phenomenon refers to an inequality by which it is conditioned...Everything which happens and everything which appears is correlated with orders of differences: differences of level, temperature, pressure, tension, potential, difference of intensity". {2}

Let me illustrate this idea with a familiar example from thermodynamics. If one creates a container separated into two compartments, and one fills one compartment with cold air and the other with hot air, one thereby creates a system embodying a difference in intensity, the intensity in this case being temperature. If one then opens a small hole in the wall dividing the compartments, the intensity difference causes the onset of a spontaneous flow of air from one side to the other. It is in this sense that intensity differences are morphogenetic, even if in this case the form that emerges is too simple. The examples above of the soap bubble and the salt crystal, as well as the more complex foldings and stretchings undergone by an embryo, are generated by similar principles. However, in the page following the quote above, Deleuze argues that, despite this important insight, nineteenth century thermodynamics cannot provide the foundation he needs for a philosophy of matter. Why? Because that branch of physics became obsessed with the final equilibrium forms, at the expense of the difference-driven morphogenetic process which gives rise to those forms. But as Deleuze argues, the role of virtual singularities can only be grasped during the process of morphogenesis, that is, before the final form is actualized, before the difference dissapears.

This shortcoming of nineteenth century thermodynamics, to overlook the role of intensity differences in morphogenesis, to concentrate on the equlibrium form that emerges only once the original difference has been cancelled, has today been repaired in the latest version of this branch of physics, appropriatedly labeled "far-from-equilibrium thermodynamics". Although Deleuze does not explicitly refer to this new branch of science, it is clear that far-from-equilibrium thermodynamics meets all the objections which he raises against its nineteenth century counterpart. In particular, the systems studied in this new discipline are continuously traversed by a strong flow of energy and matter, a flow which does not allow the differences in intensity to be cancelled, that is, maintains these differences and keeps them from cancelling themselves. It is only in these far-from-equilibrium conditions that the full variety of immanent topological forms appears (steady state, cyclic or chaotic attractors). It is only in this zone of intensity that difference-driven morphogenesis comes into its own, and that matter becomes an active material agent, one which does not need form to come and impose itself from the outside. To return once more to the example of the developing embryo, the DNA that governs the process does not contain, as it was once believed, a blueprint for the generation of the final form of the organism, an idea that implies an inert matter to which genes give form from the outside. The modern understanding of the procesess, on the other hand, pictures genes as teasing out a form out of an active matter, that is, the function of genes and their products as now seen as merely constraining and channeling a variety of material processes, ocurring in that far-from-equlibrium zone, in which form emerges spontaneously.

To complete my characterization of Deleuze theory of the genesis of form, I would like to explore the way in which his more recent work (in collaboration with Felix Guattari) has extended these basic ideas, greatly increasing the kind of immanent resources that are available to matter for the creation of form. In particular, in their joint book "A Thousand Plateaus", they develop theories of the genesis of two very important types of structures, to which they refer with the terms "strata" and "self-consistent aggregates" (or alternatively "trees" and "rhizomes"). Basically, strata emerge from the articulation of homogeneous elements, whereas self-consistent aggregates emerge from the articulation of heterogeneous elements as such. {3}

Both processes display the same "divergent actualization" which characterized the simpler processes behind the formation of soap bubbles and salt crystals. In other words, in both processes we have a virtual form (or abstract machine, as they now call it) underlying the isomorphism of the resultant actual forms. Let's begin by briefly describing the process behind the genesis of geological strata, or more specifically, of sedimentary rock, such as sandstone or limestone. When one looks closely at the layers of rock in an exposed mountain side, one striking characteristic is that each layer contains further layers, each composed of small pebbles which are nearly homogeneous with respect to size,shape and chemical composition. It is these layers that are referred to as "strata".

Now, given that pebbles in nature do not come in standard sizes and shapes, some kind of sorting mechanism seems to be needed to explain this highly improbable distribution, some specific device which takes a multiplicity of pebbles of heterogeneous qualities and distributes them into more or less uniform layers. One possibility uncovered by geologists involves rivers acting as sorting machines. Rivers transport rocky materials from their point of origin to the place in the ocean where these materials will accumulate. In this process, pebbles of variable size, weight and shape tend to react differently to the water transporting them. These different reactions to moving water are what sorts out the pebbles, with the small ones reaching the ocean sooner than the large ones. This process is called "sedimentation". Besides sedimentation, a second operation is necessary to transform these loose collections of

pebbles into a larger scale entity: a sedimentary rock. This operation consists in cementing the sorted components, an operation carried out by certain substances dissolved in water which penetrate the sediment through the pores between pebbles. As this percolating solution crystallizes, it consolidates the pebble's temporary spatial relations into a more or less permanent "architectonic" structure.

These double articulation, sorting and consolidation, can also be found in biological species. Species form through the slow accumulation of genetic materials. Genes, of course, do not merely deposit at random but are sorted out by a variety of selection pressures which include climate, the action of predators and parasites and the effects of male or female choice during mating. Thus, in a very real sense, genetic materials "sediment" just as pebbles do. Furthermore, these loose collections of genes can (like sedimented pebbles) be lost under some drastically changed conditions (such as the onset of an Ice age) unless they become consolidated together. This second operation is performed by "reproductive isolation", that is, by the closure of a gene pool which occurs when a given subset of a reproductive community, becomes incapable of mating with the rest. Through selective accumulation and isolative consolidation, a population of individual organisms comes to form a larger scale entity: a new individual species.

We can also find these two operations (and hence, this virtual diagram) in the formation of social classes. Roughly, we speak of "social strata" whenever a given society presents a variety of differentiated roles to which not everyone has equal access, and when a subset of those roles (i.e. those to which a ruling elite alone has access) involves the control of key energetic and material resources. In most societies roles tend to "sediment" through a variety of sorting or ranking mechanisms, yet not in all of them ranks become an autonomous dimension of social organization. In many societies differentiation of the elites is not extensive (they do not form a center while the rest of the population forms an excluded periphery), surpluses do not accumulate (they may be destroyed in ritual feasts), and primordial relations (of kin and local alliances) tend to prevail. Hence a second operation is necessary: the informal sorting criteria need to be given a theological interpretation and a legal definition. In short, to transform a loose ranked accumulation of traditional roles into a social class, the social sedimement needs to become consolidated via theological and legal codification. {8}

Is there also a virtual diagram behind the genesis of meshworks? In the model proposed by Deleuze and Guattari, there are three elements in this other virtual diagram, of which two are particularly important. First, a set of heterogeneous elements is brought together via an articulation of superpositions , that is, an interconnection of diverse but overlapping elements. And second, a special class of operators, or intercallary elements, is needed to effect this interlock via local connections. Is it possible to find instances of this diagram in geology, biology and sociology? Perhaps the clearest example is that of an ecosystem . While a species may be a very homogeneous structure, an ecosystem links together a wide variety of heterogeneous elements (animals and plants of different species) which are articulated through interlock, that is, by their functional complementarities. Since one of the main features of ecosystems is the circulation of energy and matter in the form of food, the complementarities in question are alimentary: prey-predator or parasite-host being two of the most common. In this situation, symbiotic relations can act as intercallary elements aiding the process of building food webs by establishing local couplings. Examples include the bacteria that live in the guts of many animals allowing them to digest their food, or the fungi and other microorganisms which form the "rhizosphere", the underground food chains which interconnect plant roots and soil.

The world of geology also has actualizations of these virtual operations, a

good example being that of igneous rocks. Unlike sandstone, igneous rocks such as granite are not the result of sedimentation and cementation, but the product of a very different construction process forming directly out of cooling magma. As magma cools down its different elements begin to separate as they crystallize in sequence, those that solidify earlier serving as containers for those which acquire a crystal form later. In these circumstances the result is a complex set of heterogeneous crystals which interlock with one another, and this is what gives granite its superior strength. Here the intercallary elements include anything which brings about local articulations from within the crystals, including nucleation centers and certain line defects called dislocations, as well as local articulation between crystals, such as events ocurring at the interface between liquids and solids. Thus, granite may be said to be an instance of a meshwork.

In the socio-economic sphere, pre-capitalist markets may be considered examples of cultural meshworks. In many cultures weekly markets have traditionally been the meeting place for people with heterogeneous needs and offers. Markets connect people by matching complementary demands, that is, by interlocking them on the basis of their needs and offers. Money (even primitive money such as salt blocks or cowry shells) may be said to perform the function of intercallary element: while with pure barter the possibility of two exactly matching demands meeting by chance is very low, when money is present those chance encounters become unnecessary, and complementary demands may find each other at a distance, so to speak.

Thus, much as sandstone, animal species and social classes may be said to be divergent actualizations of a virtual process of "double articulation" which brings homogenous components together, granite, ecosystems and markets are actualizations of a virtual process which links heterogenous elements through interlock and intercalation. These virtual processes are, according to Deleuze, perfectly real, a real virtuality which has nothing to do with what we call virtual reality. And yet, because this real virtuality constitutes the nuomenal machinery behind the phenomena, that is, behind reality as it appears to us humans, because this real virtuality governs the genesis of all real forms, it cannot help but be related to virtual realities, not only those created by computer simulations, but also by novelists, filmmakers, painters and musicians. Deleuze's work is, from the beginning, concerned as much with physics and mathematics, as it is with art. But it seems to me, only when we understand the Deleuzian world of material and energetic flows, and the forms that emerge spontaneously in these flows, can we begin to ask "what is a novel or a painting or a piece of music" in this world? In other words, the movement should be from a rich material world pregnant with virtualities, to literature or art, and not from literature (and texts, discourses, metaphors) to a socially constructed world where matter has once again, become an inert receptacle for external forms. It is in this sense, that Deleuze's work constitutes a true challenge to language-obsessed postmodernism, a neomaterialism which promises to enrich the conceptual reservoirs of both science and art and that one day could lead to a complete reconceptualization of our history as well as of our alternatives for the future.~