Review of Manuel DeLanda, *Intensive Science & Virtual Philosophy* (London: Continuum, 2002). 242 pages.

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Manuel DeLanda's new book is an important event in Deleuze scholarship, as it explicates the main lines of the relation between Deleuze's philosophy and an important method of contemporary scientific work, so-called complexity theory (also known as dynamical systems theory). DeLanda has considerable expertise in this field, using complexity theory as background for his two previous works, *War in the Age of Intelligent Machines* (Zone Books, 1991) and *A Thousand Years of Nonlinear History* (Zone Books, 1999). What makes *Intensive Science & Virtual Philosophy* one of the best works on Deleuze I've read -- even beyond DeLanda's exceptional clarity in explicating mathematics, physics, and biology -- is the three-fold way he maps form and content, so that his book performs Deleuzean functions even as it explains them.

1) DeLanda provides a doubled difference, a *differentiation* and *differenciation*, of Deleuze. While DeLanda certainly provides a straightforward explanation of the process Deleuze calls counter-actualization (moving from the actual to the virtual), he does so not by an interpretation of Deleuze's full philosophical output, but by a *reconstruction* of the ontology and epistemology of *Difference and Repetition* and *The Logic of Sense*: 'This line of argumentation ... is, in fact, not Deleuze's own, although it follows directly from his ontological analysis' (39). As DeLanda puts it: Deleuze's world rather than his words. But this folds Deleuze back on himself, giving us a virtualization of Deleuze, moving from the actual productions of Deleuze (his books) to the *differentiated* structures of his production process (the network of his concepts) in order to produce a new, divergent, *differenciation* (DeLanda's book). By virtue of being a book on Deleuze, of course, this product has itself the all-important fold of explaining the structures of all processes (or more precisely, explaining that all processes are structured, and that the structure of the realm of those structures, the virtual, can itself by explicated).

2) DeLanda provides a *problematization* of Deleuze. Here again we have several folds. First of all, DeLanda *explains* that for Deleuze, posing a problem requires indicating what is relevant or important ('singular'), and that such problematization (as opposed to axiomatization, the proposing of laws which can be judged by the adequacy of the solutions they provide) is the very method of philosophy itself. But in the course of the book, DeLanda *shows* what is important in Deleuze, the attack on essentialism: '[Deleuze] must at least be given credit for working out in detail (however speculatively) the requirements for the elimination of an immutable world of transcendent archetypes' (80), while *proceeding* problematically: 'While the specific *solution* which Deleuze proposes may turn out to be inadequate, he should get credit for having adequately *posed the problem*' (102; emphases in original).

3) One last fold. DeLanda not only *explains* the Deleuzean notion of affect as the ability to

form heterogenous assemblages, he also attempts to *bring out* a new affect in the Deleuze community (working groups, collaborative book projects, and so forth) with analytic philosophers of science, philosophically minded scientists, and Deleuzean philosophers. It remains to be seen of course if this potential will be taken up by these groups, but this book provides one of the best current potentials for concrete connection among analytic and continental philosophers and working scientists (along with, I believe, the potential connection with cognitive science in Brian Massumi's latest work, *Parables for the Virtual: Movement, Affect, Sensation* [Duke University Press, 2002]).

It will be a test of the Deleuze community to see how we respond to the challenge of this book. We must, to be sure, examine DeLanda's work carefully, testing the extent of this violence, the adequacy of his reconstruction. DeLanda himself readily admits the 'violence' (6) to which his reconstruction submits the texts of Deleuze: there is much more to Deleuze than just ontology; the effects of the collaboration with Guattari are overlooked; Deleuze's style is violated by fixing his terminology. But if we slide into a scholasticism and do nothing but badger DeLanda on textual details, then we will have, I think, betrayed the pragmatism of Deleuze. To use the terminology of *Anti-Oedipus*, DeLanda is constructing a machine, he's trying to get something to pass among analytic and continental philosophers and scientists, and part of our response should be to connect with the process of the book, to tinker with its flows and channels, rather than simply judging the properties of the book as a product. We have to follow DeLanda along the lines of his counter-actualization and work in the virtual Deleuze he lays out for us, a virtual Deleuze that occupies a certain zone in the plane of immanence that philosophy constructs and that, as DeLanda shows, forms a zone of indiscernibility with analytic philosophy of science.

The structure of the book is straightforward. Chapter 1 details the mathematical-formal ideas about the virtual structures of intensive dynamical processes. Chapter 2 deals with the spatial aspects of differential morphogenesis (the process of producing individuated products) while Chapter 3 deals with the temporal aspects of differential morphogenesis. Chapter 4 outlines Deleuze's problematic epistemology, the requirement to devalue axioms and truth in favor of problems and importance or relevance. An Appendix deals with 'Deleuze's Words', laying out equivalences or at least resonances among the terms DeLanda uses in reconstructing *Difference and Repetition* and *The Logic of Sense* and the terms of *A Thousand Plateaus*, *Anti-Oedipus*, and *What is Philosophy?*.

The content of the book is equally straightforward. Deleuzean ontology as DeLanda reconstructs it demarcates three 'levels': (1) *actual* products or beings, with *extensive* properties and qualities; (2) *intensive* processes, or more precisely, morphogenetic processes with intensive properties (systems exhibiting intensive properties are those that (a) cannot be changed beyond critical thresholds in control parameters without a change of kind, and that (b) show the capacity for meshing into 'heterogeneous assemblages'); (3) the *virtual* structures of such processes ('multiplicities' defined by 'singularities'), which collectively form a realm ('the plane of consistency'), the structure of which can be explicated as a meshed continuum of heterogeneous multiplicities defined by zones of indiscernibility or 'lines of flight'. These levels explain the significance of the title: complexity theory explores intensive processes ('intensive science'), while Deleuzean philosophy explicates the virtual realm ('virtual philosophy').

Chapter 1 is entitled 'The Mathematics of the Virtual: Manifolds, Vector Fields and Transformation Groups'. For DeLanda, multiplicities are Deleuze's signature concept, and

they are intended as replacements for essences, which explain the identity of species and the resemblance of species members. Along with typologies, essences deal with the *extensive* properties of beings or products. For Deleuze, *intensive* morphogenetic processes also explain the identity of species and resemblances, but they do so immanently, by using material self-organizing resources. The 'mechanism-independent' structures of such processes are *virtual*, so multiplicities are defined as 'the structures of the space of possibility' of processes (10); in other words, multiplicities account for the regularities of morphogenetic processes.

In the first part of the chapter DeLanda shows how the Deleuzean concept of multiplicity uses two traits of the mathematical concept of 'manifold': a variable number of dimensions and the absence of a higher embedding space for metrization. Because of these features, multiplicities are not general essences yielding examples that resemble each other, but are instead concrete universals capable of divergent actualization. In other words, the same virtual multiplicity can structure different intensive processes that can produce actual products with widely different extensive properties. Furthermore, rather than exhibiting the sharp borders of traditionally conceived essences, multiplicities are meshed together in a continuum yielding zones of indiscernibility, the source of novel 'becomings'.

In the second part of the chapter DeLanda describes the mathematics behind the construction of the key tools of complexity theory: manifolds and singularities, which serve to model state spaces and attractors. DeLanda explains the ontological difference Deleuze proposes, following Albert Lautman, between the establishment of the existence and distribution of singularities (representing virtual attractors) in the vector field of state space (produced through the use of differentiation) and the full definition of them in the phase portrait of state space, which, through the use of integration, is filled with trajectories representing actual states of a system. DeLanda then discusses the modal status behind the theory of Deleuzean multiplicities (virtual and actual versus possible and real) in a careful engagement with possible worlds theories, and concludes with a discussion of the constraints that guide Deleuze's speculation: the need to avoid essentialism – the need for the 'overturning of Platonism'.

Chapter 2, 'The Actualization of the Virtual in Space' can be clearly divided along the lines of actual (or extensive); intensive; and virtual. In the brief section on *actuality / extensity* DeLanda explains, using biological examples, the production of the extensive from intensive processes via 'symmetry-breaking' cascades.

In the section on *intensity* DeLanda first details the non-divisible nature of systems exhibiting intensive properties, and then shows how the notion of intensity can be expanded to include the capacity to form heterogeneous assemblages. He then moves to discuss the concealment of intensities, as exemplified by classical thermodynamics in its focus on the final equilibrium state of systems. But this is only the subjective amplification of an objective illusion, DeLanda claims. The virtual is allowed to manifest itself by studying *far-from-equilibrium* systems, which maintain intensive differences and are hence nonlinear, multi-attractor systems. Here we should pay attention to the coexisting non-actualized (i.e., virtual) attractors while taking care not to yield to the temptation to study them in low-intensity states, which results in the linearization of the system and the concealment of the virtual.

Thus we see philosophy as counter-actualization, the helping of nature in the manifestation

of the virtual. In the final discussion of *virtuality*, then, DeLanda provides a rigorous treatment of the 'philosophical transformation' of the mathematical concepts used in state space construction and information theory to reach the philosophical concepts of multiplicities and the plane of consistency. The concept of multiplicities is purified by transforming state space construction to remove any traces of individuating processes in differentials (pure reciprocal determination rather than functions), singularities (whose existence and distribution are given in the vector field before the full construction of the phase portrait), and series (as infinite ordinal series). The concept of the meshing of the plane of consistency is purified by transforming information theory so that the linked change in probability of actual events that constitutes the emission of a 'quantum' of information becomes virtualized as the simple linkage of changes in the distribution of the singular and the ordinary within a series.

Chapter 3, 'The Actualization of the Virtual in Time', also moves from the actual (extensive), to the intensive and then the virtual. The nature of *extensive* time is set forth by attention to the work of Arthur Iberall, who shows that the characteristic period of nonlinear oscillators can be seen as a nested set of sequences of cycles of different extensions. DeLanda here explains the Deleuzean notions of passive synthesis as the contraction of past and future into lived present, and of Chronos as presence at one time scale resulting from the contraction of past/future at inferior time scale.

The nature of *intensive* time is defined as sequences of oscillations with critical points (singularities) that can mesh with parallel sequences in heterogeneous assemblages (affects), thus rendering the neat symmetry-breaking model for the metrization of time more complex. DeLanda here discusses novelty in evolution as the interplay of singularities and affects on three levels. At the level of the organism, the relative acceleration or deceleration of parallel embryogenetic processes result in phenomena of heterochrony (time-phase shifting) from the interplay of rate-dependent (chemical reaction and diffusions) and rate-independent (genetic information) processes. At the level of ecosystems, DeLanda presents the work of Stuart Kauffman, who sees them as parallel-processing networks 'computing' changing rates of fitness *relations*. Finally, at the level of symbiosis, DeLanda very briefly touches on symbiogenetic evolutionary acceleration, where we see the capacity for affects *par excellence*.

Finally, DeLanda deals with *virtual* space-time as the two-fold work of the 'quasi-causal operator'. In *counter-actualization* we see the extraction of virtual multiplicities from intensive processes by the instantaneous sampling of all actual events at all different time scales. The effect of counter-actualization (the line of flight) is the acceleration of escape from actuality in high intensity nonlinear systems, which are already moving to the virtual by virtue of the effects of their non-actualized attractors. In *pre-actualization* we see the immediate unfolding and assemblage of multiplicities into a heterogeneous continuum, the 'plane of consistency'. By the extension of singularities into series and the creation of convergent and divergent relations among those series the quasi-causal operator is the 'dark precursor', which gives multiplicities a certain autonomy from intensive processes and endows them, even as impassive and sterile effects, with morphogenetic power.

Chapter 4, 'Virtuality and the Laws of Physics', deals with Deleuze's epistemology. For DeLanda, the philosopher must catch up to the objective movement of the quasi-cause. Thus the first action of the quasi-cause, the extraction of a *virtual* event, is equivalent to the defining of what is *problematic* in the *actual* event by study of the structures of the *intensive*

processes that give rise to it. Posing a problem, discerning relevance or importance, is then grasping the objective distribution of singular and ordinary. The second action of the quasi-cause, giving consistency, is equivalent to showing that problems do not disappear behind solutions.

The problematization of physics involves the struggle against the deductive-nomological model of explanation. Echoing trends in analytic philosophy of science, DeLanda calls for the rescuing of causes from their treatment as laws stating constant regularities and for the rescuing of models from the linguistic renderings of them as general laws. The achievements of theoretical physics are then seen not as linguistically interpreted general laws, but as correctly posed problems, that is, the posing of the distribution of what is singular and ordinary (i.e., what is important and not). Deleuze's world is thus not a closed world capturable by sentences, but an open world to be explored.

In the final analysis, Deleuze's epistemology rests on the claim of an isomorphism of ontological and epistemological problems. Once again, we see DeLanda following the line from actual to intensive to virtual. For DeLanda, *epistemological extensity* is the deductive-nomological approach, whereby one deduces models of properties of actual entities from laws and then tests the model by comparing observations to predictions. Although this is a cliché of scientific practice, the deductive-nomological approach lives on, clearly displaying a desire to subordinate the laboratory to logic.

It is in the laboratory, according to DeLanda, that we find *epistemological intensity* in the form of connecting operations to materiality. Using the work of Ian Hacking, DeLanda shows the laboratory as a heterogeneous assemblage of workers, materials, and machines. Laboratory assemblages are thus the epistemological counterparts of ontological intensities, in that the extraction of *virtual* problems requires embodiment in *intensive* assemblages.

We then move to a discussion of *epistemological virtuality*, or in other words, quasi-causes in theoretical physics. DeLanda insists that state space trajectories are not causes, and that only actual events are causes. But state space analysis does provide information about the quasi-causal structures of processes. In other words, the differential relations yielding a vector field capture tendencies of systems by defining the distribution of singularities. These singularities define conditions of the *problem*, while *solutions* (the trajectories produced by integration which populate the full phase portrait) are individuation processes guided by tendencies.

After a brief discussion of the problematic in mathematics, dealing with algebra and group theory (Galois) and differential equations (Poincaré), DeLanda concludes the main part of his book with the briefest summary of his reconstruction of Deleuze's theory of virtuality. The barriers to attaining the virtual are the assumption of a closed, unproblematic world, as exemplified by the predilection for solvability in mathematics and axiomatics in classical physics. Attaining the virtual, on the other hand, lets us know we live an open, problematic world, as shown by the non-linearity of causes and the complex affects they give rise to and by the non-linearity of models which include multiple attractors. Thus we see that in Deleuze's world, as reconstructed by DeLanda in this important book, history matters but the future is open.