

Deleuze and Biology

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Lecture 3

Deleuze's Contributions

- Why bother?
- Development in *Difference and Repetition*
- Evolution in *A Thousand Plateaus*

Why bother?

- Professional
- Concept of the virtual
- Helps us think potentiality in distributed / differential systems (e.g., extended gene regulation networks)
- Thus contributes to philosophy of biology

- General philosophical interest
- Naturalism
- Not physicalism or mechanism, but machinism
- “No kingdom within the kingdom”
- Same concepts for physical, biological, and “alloplastic” realms
- Multiplicity of “nature”
 - Neither a “brutalization” of ethics and politics
 - Nor a “sentimentalization” of nature

- How can biology help us with Deleuze?
- Genetic accommodation via environmental induction of developmental plasticity and phenotypic adaptivity gives us a concrete model of counter-effectuation

Development in *DR*

- No longer the conditions of possibility of rational experience
- But the genetic conditions of real experience
- Indi-drama-different/ciation
- Differentiation = structure of Ideas
 - Differential elements, diff. relations, singularities
- Differentiation = divergent actualization
 - Products with extensive properties
 - Spatial and qualitative properties

Dramatization

- Intensive morphogenetic processes
- Spatio-temporal dynamisms
- Process of individuation
- E.g., embryological development

Individuation

- Priority over actualization / differentiation
- Determines the differential relations to be actualized
- Field of individuation
- E.g., the egg with its gradients

Three ontological registers

- The actual (organism)
- The intensive (field and process of individuation) = “impersonal”
- The virtual (Ideas) = “pre-individual”

The virtual in biology

- Relative to hereditary genes, functional genes are virtual
- They are the end-product of processes
 - They have to be actualized from DNA strings
 - Via a distributed gene regulation network
 - In processes of individuation

Distributed / differential systems of gene regulation

- Differential elements
 - Genes in networks of genes
 - Cells in fields of cells
 - Niches in ecological systems
- Differential relations
 - Linked rates of change
 - $\Delta X / \Delta Y$
- Singularities: thresholds for qualitative change
 - Thus functional genes are “multiply realizable” from hereditary genes
 - Proteins are “multiply realizable” from functional genes

Four-fold order of reasons

- “the egg provides us a model for the order of reasons: differentiation – individuation – dramatization – differentiation (organic and specific” (251 / 323; trans. modified).
- Individuation = *field* of individuation
 - Egg, BwO, Simondon’s “metastable field”
- Dramatization = *process* of individuation
 - Integration / resolution
 - Embryological development

The priority of individuation

- “individuation precedes differentiation in principle ... every differentiation presupposes a prior intense field of individuation” (247 / 318)
- Beware the “tendency to believe that individuation is a continuation of the determination of species” (247 / 318)
- “any reduction of individuation to a limit or complication of differentiation compromises the whole of the philosophy of difference.... An error ... analogous to that made in confusing the virtual with the possible” (247 / 318)

A prescient critique of genetic reductionism

- “the nucleus and the genes designate only the differentiated matter – in other words, the differential relations which constitute the pre-individual field to be actualized; but their actualization is determined only by the cytoplasm, with its gradients and its fields of individuation” (251 / 323).

Non-resemblance: against “tracing”

- Species and parts do not resemble
 - Differential relations and singularities
 - Or intensive processes which determine them
- “the egg destroys the model of similitude”
(251 / 323)

The “principal difficulty”

- “this field of individuation is posited only formally and generally ... it seems therefore to depend upon the species” (252 / 324)
- The “individuating difference” must be seen as an “individual difference” (252 / 324)
- Lucretius’ formula: “no two eggs or grains of wheat are identical” (252 / 324)

Counter-effectuation

- “individuation is the act by which intensity determines differential relations to become actualized, along the lines of differentiation and within the qualities and extensities it creates” (246)
- “L’individuation, c’est l’acte de l’intensité qui détermine les rapports différentiels à s’actualiser, d’après des lignes de différenciation, dans les qualités et les étendues qu’elle crée” (317)

- The expression of Ideas in intensities “introduces a new type of distinction into these relations and between Ideas a new type of distinction” (i.e., from co-existing to relations of simultaneity or succession).
- “all the intensities are implicated in one another, each in turn both enveloped and enveloping, such that each continues to express the changing totality of Ideas, the variable ensemble of differential relations.”
- “each intensity clearly expresses only certain relations or certain degrees of variation. ... those on which it is focused when it has the enveloping role” (252/325).

Questions about counter-effectuation

- Does the selective “focus” by which intensities clearly express only certain relations itself introduce changes into the realm of Ideas?
- In other words, is counter-effectuation creative?
- Does experimentation with intensive individuation processes link together new combinations of differential relations, thereby forming new Ideas, and expressing new potentials of the virtual?
- Does “determines the differential relations to be actualized” (which I prefer as a translation of “à s’actualiser”) = renders them determinate in the sense of linking together previously unrelated relations?
- If so, do we thereby avoid a Platonism in which the Ideas are already determined and expression is mere copying of already made linkages of relations?

Biological counter-effectuation

- Developmental plasticity is the creativity of the phenotype and environment (NOT the genotype and environment).
- Environmentally induced adaptive phenotypic change takes the lead in genetic accommodation
- Selection of new life cycle comprising the extended system of regulatory gene network and recurrent environmental conditions
- These new creations were only "virtual," that is, only potentials of the extended system
- Including unexpressed genetic variation

Developmental plasticity as the priority of individuation

- The individuation process takes the lead
- It creatively produces a novelty
- Genes are followers, not leaders
- Genetic bookkeeping follows developmental plasticity and phenotypic adaptivity
- W-E's process is a perfect example of the biological reality of creative counter-effectuation

Conclusion to discussion of *DR*

- Peter Hallward: “there is no more an interactive relation between this virtual or composing power and its actual or composed result than there is *between* a given set of genes and the organism that incarnates them” (52; emphasis in original).
- But organisms do not "incarnate" genes. There is a distributed / differential (virtual) system of feedback among genes and multiple epigenetic factors guiding development.
- This virtual system is divergently (and creatively) actualized via intensive individuation processes in which environmental induction of novel phenotypic traits take the lead and stabilize new gene regulation processes (biological counter-effectuation).

Transition to ATP content / expression 1

- Substance of content: amino acids
- Form of content: order of amino acids in a protein chain
- Form of expression: overcoding provided by tRNA (as part of gene expression network), which picks out an amino acid according to the triplet codons it gets from the mature mRNA transcript
- Substance of expression: the completed protein (a new emergent functional structure)

Content / expression 2

- Substance of content: the protein
- Form of content: the order in which that protein is selected in building a cellular structure (e.g., the membrane)
- Form of expression: that part of gene expression network responsible for the cellular structure under construction, and is thus responsible for organizing the protein's role in the cellular metabolism
- Substance of expression: the complete cell structure as it functions in cell metabolism (e.g., the completed membrane)

Differences between DR and ATP

- DR: focus on genetic accommodation as counter-effectuation
- ATP: focus on environmental induction
- This makes sense as DR is about individuation as actualization of virtual
- Whereas ATP is about a “flat” ontology of different rhythms of intensive processes

Milieus

- Milieus: vibratory / rhythmic / coded material field for bodies (strata) and territories (assemblages)
- 4 milieus for each body or territory
 - Exterior
 - Interior
 - Intermediary
 - Annexed (or “associated”)

Rhythms and codes

- Codes determine order
 - Rhythmic repetition in a milieu
 - Materials entering a body (content / expression)
- Rhythm is the difference between codes
- Margins of decoding
 - Supplements (cf. “unexpressed genetic variation”)
 - Transcodings (cf. “serial endosymbiosis”)

Territories

- Territorialization is an act affecting multiple milieus and rhythms
- Territories depend on decoding
- Territories spread out members of species
- And thus intensify relation of organism and its milieu, allowing for faster evolution
- “territorialization ... lodges on margins of code ... and gives the [species] the possibility of differentiating itself” (322 / 396)

ATP and biology (so far)

- Re: DST: Territorialization = individual or intra-specific niche-construction
- Re: devo-evo: territories are underdetermined by genetic code (“margin of decoding”)
- Thus allowing for environmental induction
- “it is because there is a disjunction between the territory and the code that the territory can indirectly induce new species” (322 / 396)

More on evolution in *ATP*

- Multiple levels of emergence
- Not just a “molecular reductionism” and a “cosmic expressionism” (Hansen).
- Epistrata: steady states above level of genes and below level of organism
- Parastrata: niche-construction: above organism but below cosmos.

Below the organism and above the gene

- W-E's “modular sub-units” (at many levels)
- Allows steady state of interior milieu = “epistrata”
- “degrees of development” as relative speeds and slowness of morphogenetic processes (gene expression depends on cell conditions)
- Allows developmental plasticity as producing phenotypic variation via environmental induction

Above the organism and below the cosmos

- DST's life cycle
- An emergent morphogenetic field producing viability constraints
- But it is the organism in its niche (not just "organism" as Goodwin would have it)
- DG: associated milieu / parastrata / recurrent assemblage
- Allows genetic accommodation

The biological organism and the political organism

- Hansen writes: DG "redefine life as a thoroughly machinic process, one that expresses itself in heterogeneous conjunctions of singularities which are themselves heedless of biological constraints."
- "Life" includes both non-organic and organic life.
- The "machinic process" = non-organic life.
- Organic life cannot ignore viability constraints
- Theme of cautious experimentation
- Living beings (les vivants) or "bodies" can be taken up into assemblages that shake up habits and inject some flexibility into the "organism" qua hierarchically subjected body politic.

- "the flexibility postulated by Geoffroy's 'Principle of Connections' and by the types of symbioses Margulis discusses ... only arises over large-scale macroevolutionary timescales, not in cases of individual somatic change of the sort that forms the object of D+G's ethology of becoming."
- This confuses the "somatic" (i.e., biological organism) with the political organism, which is the short-term subject of symbioses / becomings / assemblages, etc.

- “It is one thing for D+G to draw on contemporary biology and on neglected historical pathways to underwrite creative involution as an alternative model of macroevolution and quite another thing to apply this model to the behavior of individuals or use it as the basis for a molecular dissolution of the organism.”
- But of course DG apply creative involution to behavior! Behavior is radically underdetermined by the biological organism's homeostatic / homeodynamic / autopoietic viability constraints.
- IOW, the biological organism is NOT the major target of becoming (although yoga, etc., can have physiological effects.)

- HOWEVER, even though you must separate the biological and political organism
- There can be a biological becoming
- As in “neuroconstructivism”
- So while there are physiological constraints, the neuro-behavioral is pretty much wide open for developmental plasticity and phenotypic adaptivity

Human nature

- But plasticity works with inherited forms
- We are not blank slates; there is a human nature
- But it's not (solely) neo-Darwinian competition
- Prosociality as revealed by wide-spread proto-empathic identification.
- Prosociality is primary
- Extreme social conditions (neo-liberalism / shock) are needed to bring competition to the fore.

The big picture in biology

- Eco-devo-evo: Synthesis of W-E and DST
- Provides for multi-level, interlocking, distributed system for cell / organ / system / organism / life cycle development & function in an evolutionary perspective
- IOW, the big bio-picture: repetition and difference on all the spatial-organization and temporal-processual scales of life

The biggest picture: Physical-bio-politics

Eco-devo-evo meets DG plus autopoiesis, process structuralism and serial endosymbiosis

- A naturalist context that shows interlocking physical, biological, and “alloplastic” systems
- Rep / diff of all spatial-organizational and temporal-processual scales of all interlocking, self-organizing physical-bio-political systems
- Biological viability constraints serving political hierarchy (plane of organization)
- Physical-bio-political involutive creativity (plane of consistency)