

Deleuze's contribution to an enactive approach to biology

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“The Future of the Embodied Mind”

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Conceptual framework of the talk

- Enactive biology
 - Autopoiesis
 - Adaptivity
- Developmental Systems Theory
- West-Eberhard, *Developmental Plasticity and Evolution*
- Deleuze's ontology (esp. w/r/t Simondon)

Four registers

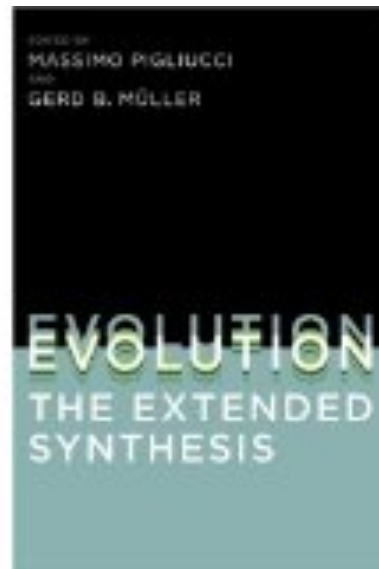
- Autopoiesis:
 - structural / logical / topological
- Adaptivity:
 - physiological / behavioral
- DST and W-E:
 - developmental
 - evolutionary
- What connects them all?
 - Oyama: nature as product and nurture as process
 - Varela: “Laying down a path in walking”
 - Simondon: “Maintenance of metastability”
 - Deleuze: “Counter-effectuation”

Friends and enemies

| Enaction / DST | Distributed / differential | Interactive / nonlinear | Immanent / self-organizing |
|---------------------------------|----------------------------|--------------------------|----------------------------|
| | | | |
| Computationalism / Genocentrism | Localized / self-identical | Uni-directional / linear | Transcendent / hylomorphic |

The basics

| | Variation | Heredity | Selection |
|--------------------|--------------------------------|-------------------------------------|--|
| Neo-Darwinism | Genetic mutation | “genes” / DNA | Outside-in |
| Extended Synthesis | Development / Endosymbiosis | Epigenetic / Somatic / Social | Co-evolution (aka niche construction) |



Plan of the talk

- Part 1: Deleuze's ontology
- Part 2: Deleuze and enaction
 - 2a: Organic space-time
 - 2b: Organic subjectivity
- Part 3: Deleuze and DST / West-Eberhard

Part 1

Deleuze's process ontology

- A formula
 - *Intensive* processes
 - Follow *virtual* patterns
 - To produce *actual* products
- Individuation = integration of differentials
 - Neuronal assemblies do not pre-exist assembly, but are integrations of a field of potentials
 - Potentials or “dispositions” to such assemblies are virtual relative to the assembly process

Deleuze's 4-fold “ontological difference”

- Virtual “differentiation”
 - Changeable patterns and thresholds
 - Change via “counter-effectuation”
- Intensive “individuation – dramatization”
 - Metastable fields or “eggs”
 - Dynamic processes or “dramatization”
- Actual “differentiation”
 - Classification via “extensive” properties or habits
 - Substantialized or reified view

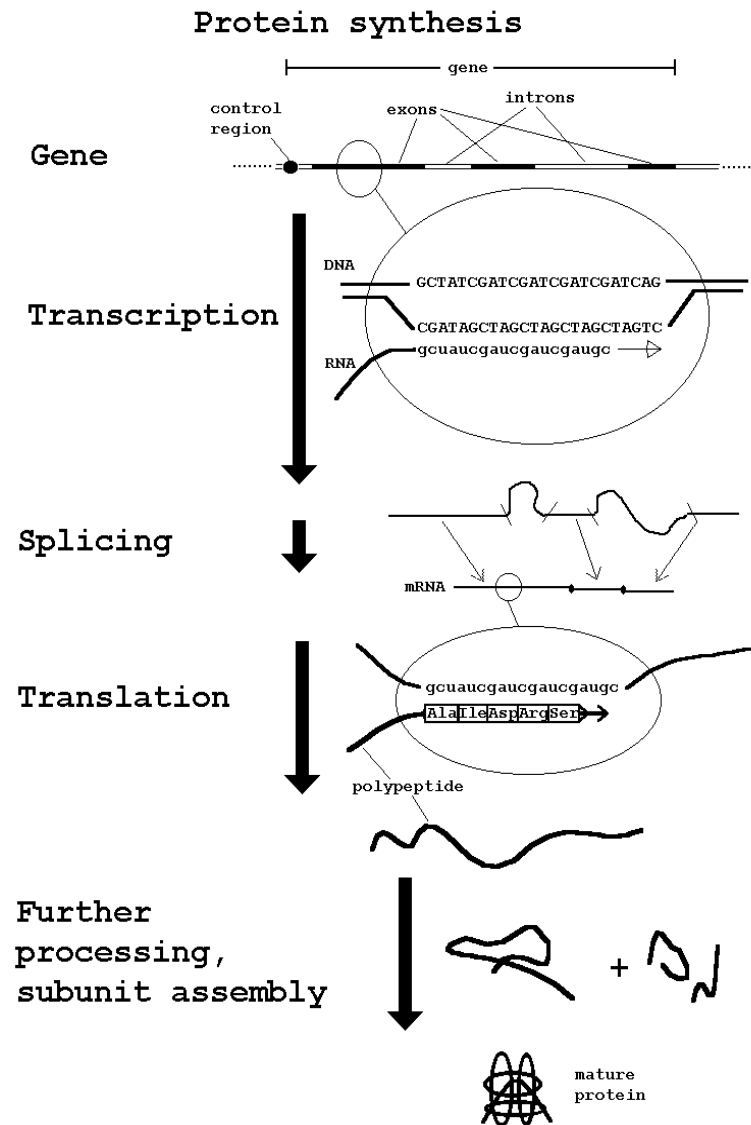
Counter-effectuation

- Contra Platonic Ideas / Kantian transcendental
- Deleuze must allow for intensive processes to change virtual patterns (for future processes)
- Cf: Varela's "mutual bootstrap" (1999: 302)
 - trajectories changing attractor landscape
 - "laying down a path in walking"
- Enables maintenance of metastability
 - "possibility of always staying close to regions in phase space that have multiple resources" (302)

Retroactive construction of “potential”

- Aristotle's *Metaphysics*: “clearly actuality [*energeia*] is prior to potentiality [*dynamis*]” (9.8 .1049 b5)
- Deleuze: “potential” is virtual, that is, fully differential, so there is no priority of actuality
- Rather, “potentials” are constructed retroactively, following experiments in intensive individuation
- Spinoza: “we don't know what a body can do”

From hereditary to functional gene



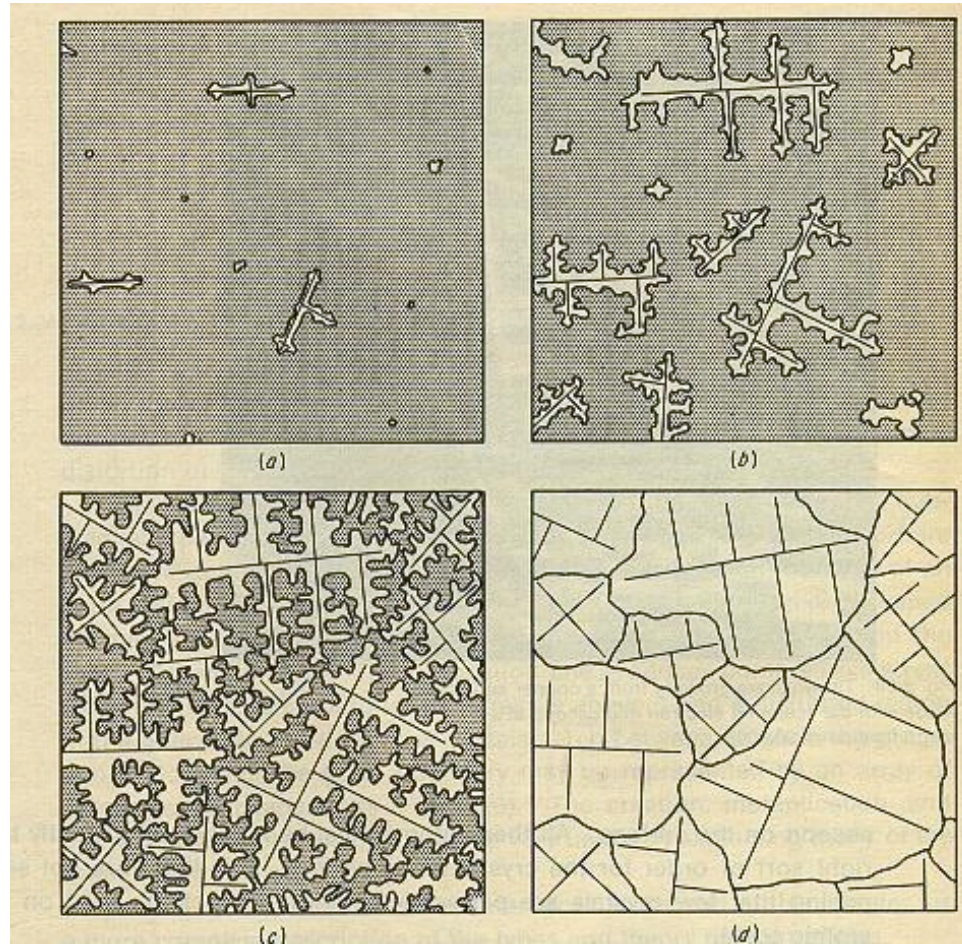
Consequences of revised view of protein synthesis

- Control moves
 - from gene “program”
 - to distributed system of genes + cell conditions + other (somatic / social) factors
- Separation of hereditary and functional genes
 - Hereditary genes = string of DNA
 - Functional genes = mature mRNA transcripts
- Flexible regulation of protein function
 - “allostery”
 - Depends on cell conditions

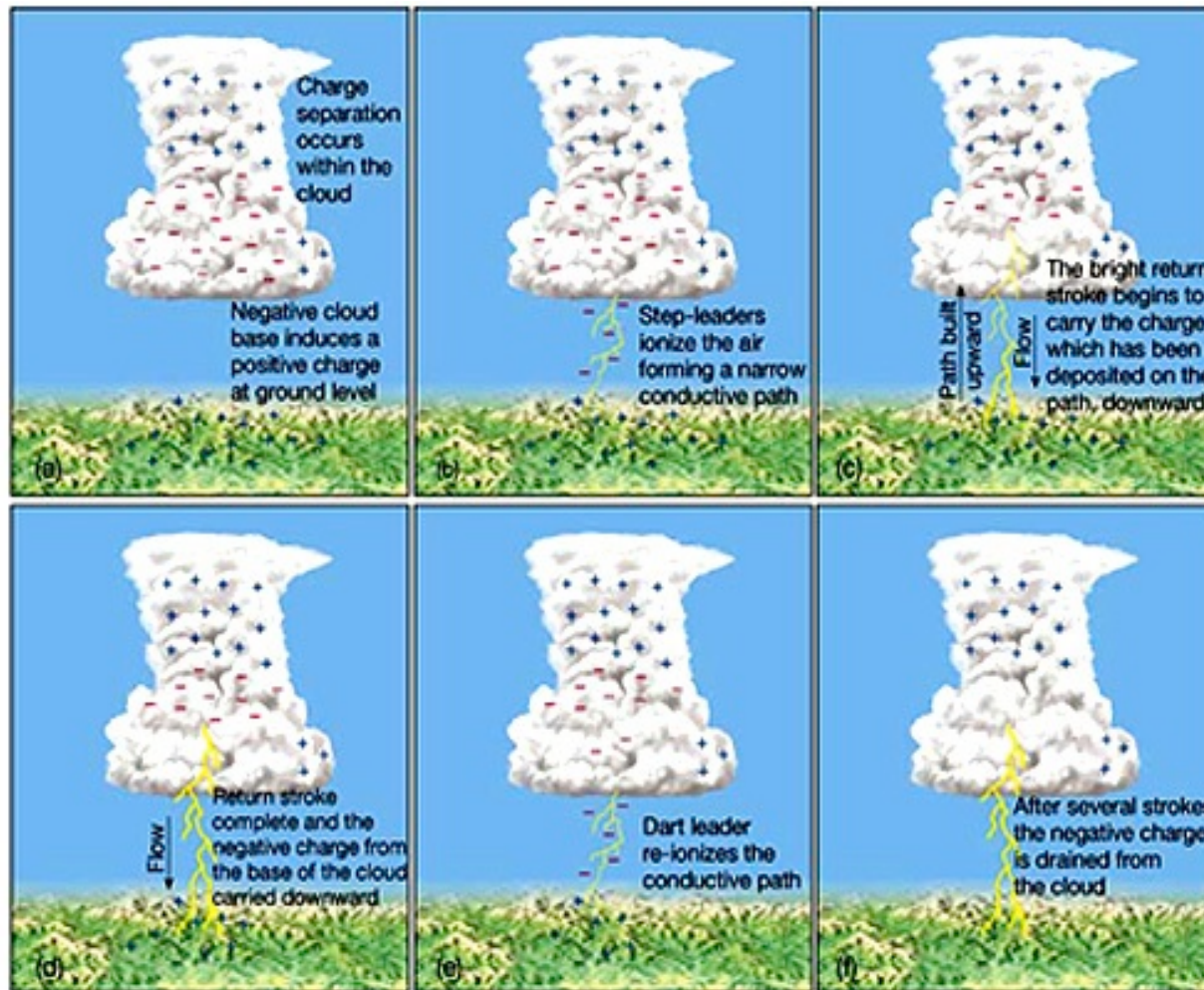
Forecast of key point

- Functional gene constructed in developmental plasticity
- is only potential in “unexpressed genetic variation”
- and precedes actuality (later evolved gene expression networks)

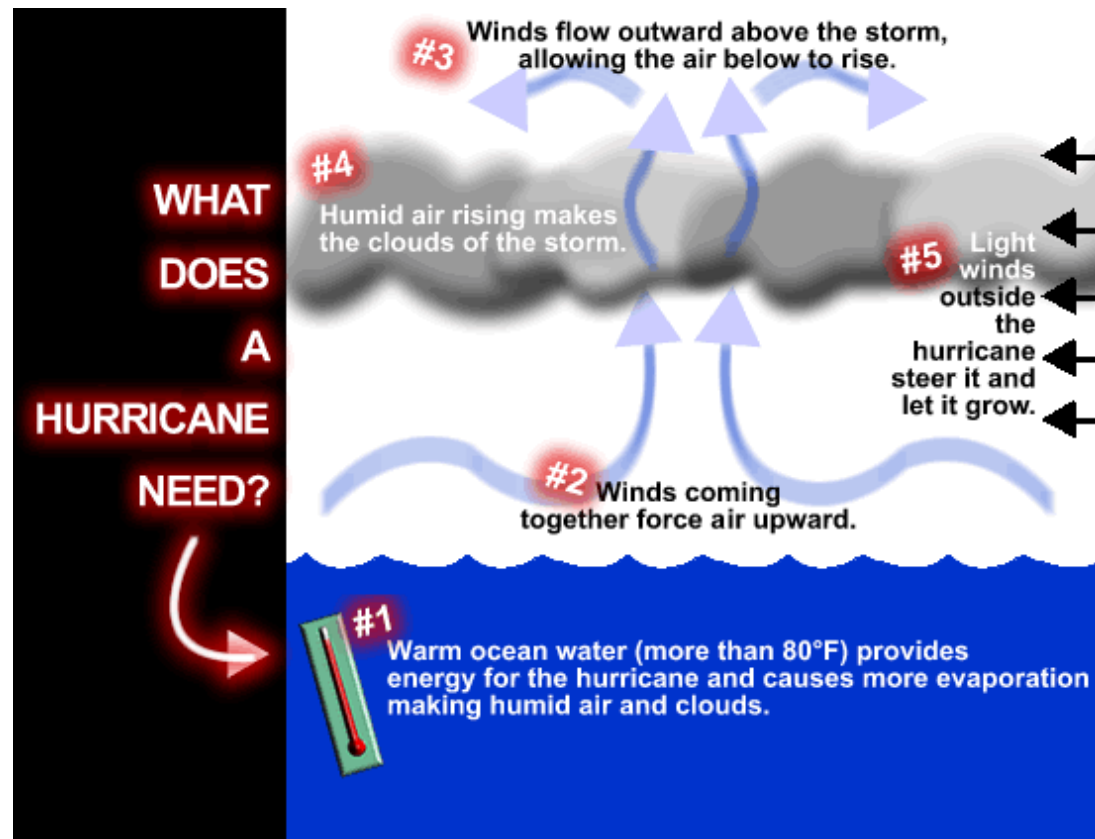
Examples of intensive individuation Crystallization



Lightning



Hurricanes

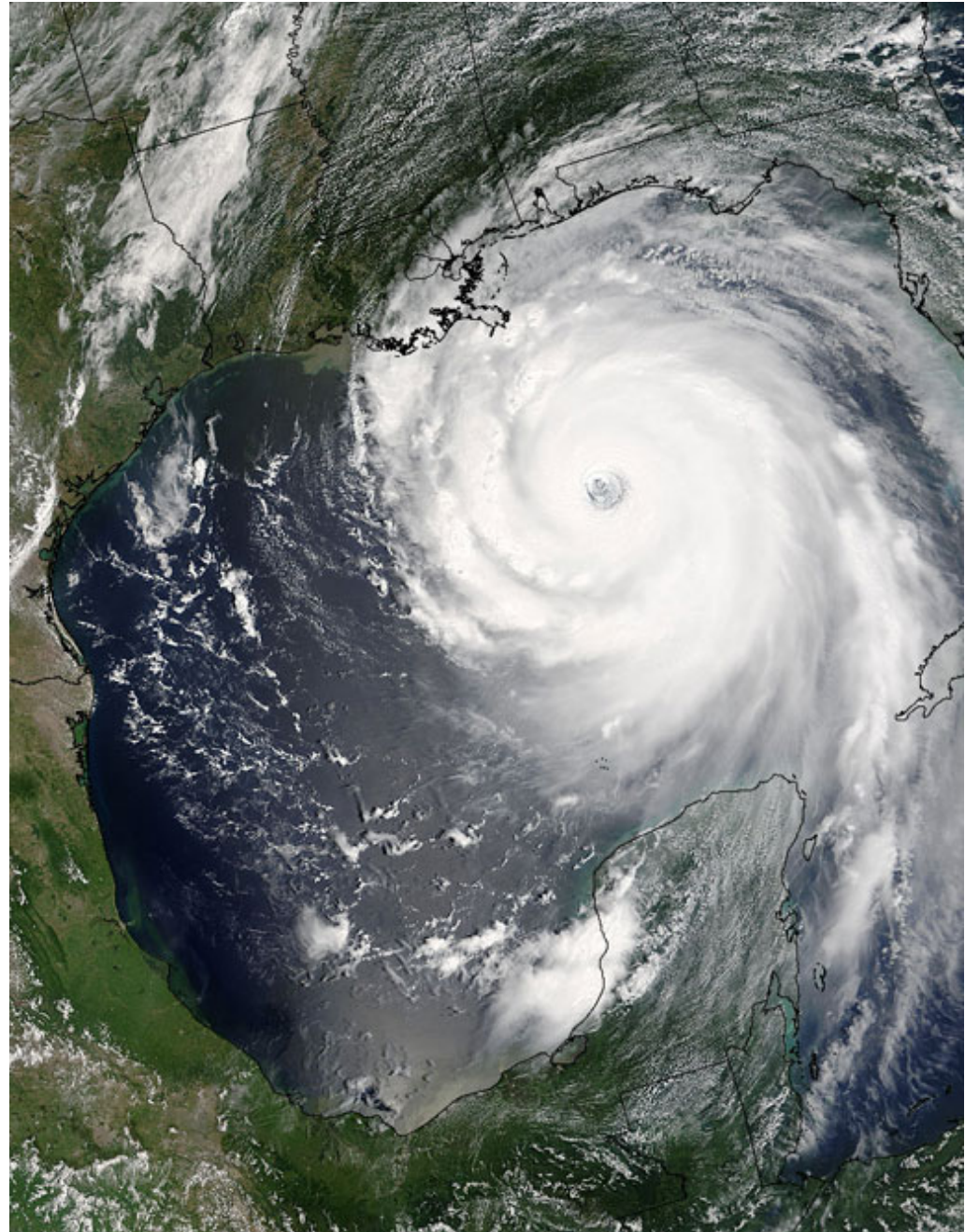


Differential elements: wind / water currents (from differences in temperature / pressure gradients)

Differential relations: linked rates of change of those currents

Singularities: (e.g., 80 degree water temperature; various points in relation of wind / water

Hurricane as intensive process actualizing the virtual “Idea”



“The world is an egg”



Deleuze and development

- Virtual multiplicity:
 - Distributed / differential developmental system
 - in which DNA is only one immanent factor
- Metastable field of individuation:
 - cytoplasmic gradients, relative cell position, etc.
- Intensive processes of individuation:
 - Folding, cell differentiation, habit formation
- Actual product:
 - differentiated adult with fixed properties / habits
 - Hidden morphogenetic processes / virtual multiplicity
 - Revealed in crisis situations: “road not taken”

Part 2: Deleuze and enaction

- 2a: organic space-time
- 2b: organic subjectivity

Jonas and organic space-time

- Needful freedom constitutes a living present
 - “self-concern, actuated by want, throws open ... a horizon of time ... the imminence of that future into which organic continuity is each moment about to extend by the satisfaction of that moment’s want” (Jonas 2003: 85).
- Organic space is founded by organic time
 - an organism “faces outward only because, by the necessity of its freedom, it faces forward”

Deleuze and organic space-time

- 3 syntheses: *Difference and Repetition*, Chapter 2
- Baseline:
 - Instantaneous presentation and disappearance:
“objectively” as matter and “subjectively” as sensation
- Passive syntheses (contraction or habit producing a living present)
 - Organic syntheses (metabolism synthesizing matter)
 - Perceptual synthesis (imagination synthesizing sensation)
- Active synthesis (memory as recollection and thought as representation synthesizing perceptions)

Organic temporality: The living present

- Each organism, in its “viscera” (that is, its metabolism), is a “sum of contractions, of retentions and expectations” (DR 99 / 73)
- Living present of retention and expectation
 - retention = “cellular heritage” of history of life
 - expectation = “faith” that things will repeat

Simondon

- Individuation from a metastable field
 - pre-individual
 - but poised for individuation
- Individuation = always-ongoing maintenance of metastability between individual and milieu
- Essence of life:
 - “characteristic polarity of life is at level of membrane”
 - “life exists as an aspect of a dynamic topology which itself maintains the metastability by which it exists”

Simondon 2

- A living present constituted by the membrane:
 - interior past & exterior future face off in a “polarity of passage and refusal”
- Never reify the membrane:
 - “the present is that metastability of the relation between interior and exterior, past and future.”
- Organic space-time is a departure from Kant:
 - “Topology and chronology are not a priori forms of sensibility, but the very dimensionality of the living being as it individuates itself”

Part 2b: Organic subjectivity

- Deleuze: organism as “larval subject”
 - “priority” of organic to perceptual syntheses
 - as different levels of passive synthesis
- Enaction shows
 - Organic and perceptual syntheses always linked
 - Adaptivity in metabolism-based chemotaxis
 - (Egbert, Barandarian, DiPaolo 2010)
- So Deleuzean “priority” of organic syntheses is merely logical

Resonance of Deleuze and adaptivity

- Adaptivity allows a diachronic emergent self
 - Serial, rhythmic, and dynamic
 - “self-extinguishing” / “self-renewing”
- Deleuze
 - “larval subject” is never self-present
 - Passive syntheses are differential
 - each is a series with its own rhythmic period;
 - each series is related to other series in same body;
 - and each corporeal series is related to other series in other bodies,
 - which are themselves similarly differential
 - the series of syntheses of bodies can resonate or clash

Conclusion to Part 2: Deleuze and enaction

- We have downplayed some of Deleuze's radicality.

Panpsychism

- If “world is an egg”
 - then every individuation is “embryonic”
 - even “rocks” and “islands”
- Then “every [individuation] is accompanied by the emergence of an elementary consciousness”

Deleuzean questions 1

- Autopoiesis: synchronic emergence
 - Relegates metastable field to coupled environment
 - Limits transduction to metabolism / repair
 - Focus on conservation of structure
- Adaptivity: diachronic emergence
 - Neglects ontogenesis in favor of adult function
 - Restricts transduction to homeostatic regulation
 - Focus on viability constraints

Deleuzean questions 2

- Emergence vs process of always emerging
 - Adult as limit of developing, as slow (and slowing down), but still “leading edge” of individuation
 - “Emergence” as “product-focus” vs “emerging” as “process-focus”

Deleuzean questions 3

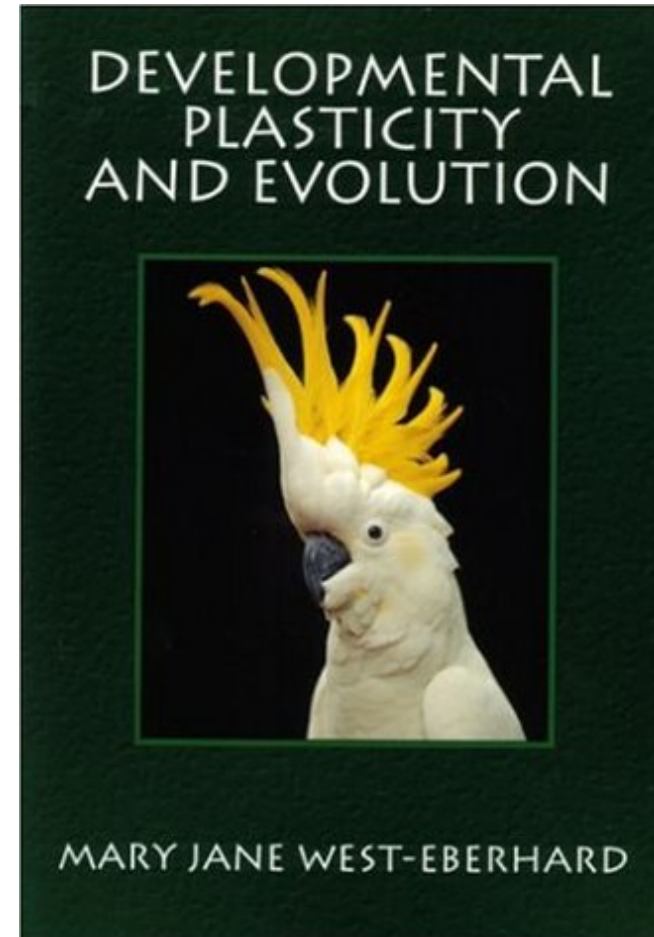
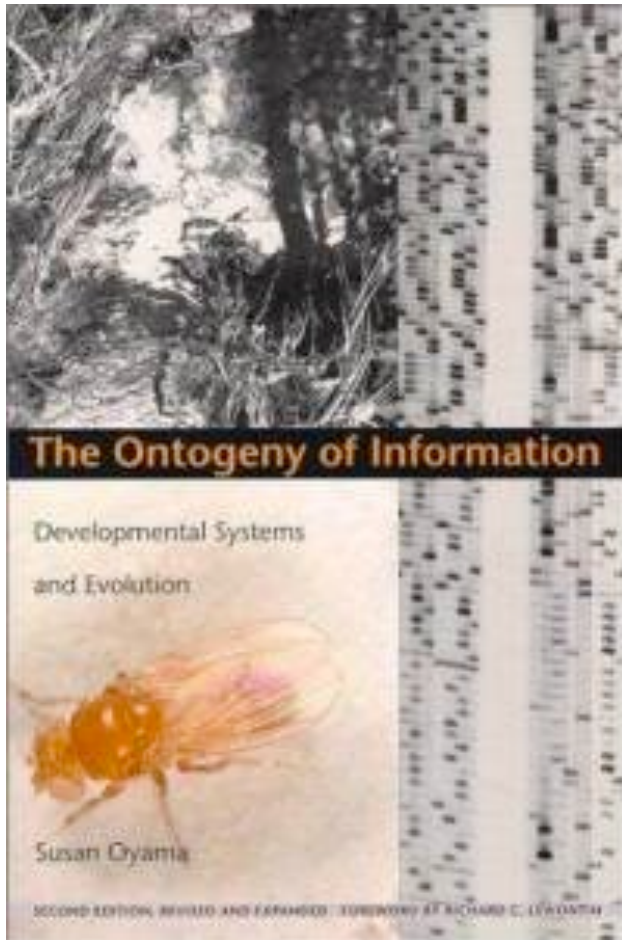
- Normativity and flourishing:
 - Is there room for flourishing vs just avoiding tendencies to limits of viability constraints?
 - IOW, is normativity for DiPaolo's adaptivity just being in the middle, safely away from bad tendencies?
 - Difficult question of optimal adaptedness as brittle
 - Capacity to push limits of viability constraints in “dialogue” with changing environment (co-evolution)
 - Norms / anomalies: Canguilhem

Transition to Part 3

- Perhaps this is all too harsh / rigid?
- Certainly, adaptivity in physiological / behavioral register is richly consonant with
 - “laying down a path in walking”
 - “mutual bootstrap” of trajectories and attractor landscape
 - “counter-effectuation”
- Let’s move now to consider adaptivity in the developmental and evolutionary registers.

Part 3:

Deleuze and DST / West-Eberhard



Eco-devo-evo

- West-Eberhard, *Developmental Plasticity and Evolution* (Oxford, 2003)
- Developmental plasticity (DP) leads to new adaptive phenotype
 - Via mutation or environmental induction
 - Not Lamarckian: unexpressed genetic variation
- Genetic accommodation

It's *not* “Lamarckian”!

(how did that become a shibboleth anyway?)

- No direct influence of environment on genotype
- Lamarck: adaptive phenotypic changes were source of heritable variants (= adaptive phenotypic changes produce genetic variation)
- W-E: some adaptive phenotypic change via DP calling on unexpressed genetic variation (437)
 - DP does not *produce* genetic variation, but calls upon untapped *potential* of the unexpressed genetic variation
- Deleuze: what is ontological status of “potential”?

Phenotypic and genetic accommodation

- Adaptive phenotype = "two-legged goat effect"
- New phenotype (new DS) spreads
 - When new environmental conditions reliably recur
- New DS might include distributed networks regulating gene expression that call upon *unexpressed* genetic variation
- Genetic accommodation = trait appears w/ or w/o the environmental stimulus.

The key connection

- Singular development
 - W-E's "developmental plasticity"
 - Oyama's "individual developmental system"
 - Deleuzean individuation
- = "adaptivity" in the developmental register
- Counter-effectuation
 - Genes as followers
 - Phenotypic accommodation leading to genetic accommodation

(DD)-DS: distributed, differential developmental system

- Differential elements
 - Genes in networks of genes
 - Cells in fields of cells
 - Niches in ecological systems
 - Multiple social / behavioral practices
- Differential relations
 - Linked rates of change
- Singularities: thresholds for qualitative change

Deleuzean development

- Re 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 expression network
 - So “unexpressed” genetic variation has potential for producing new functional genes
- But it takes the distributed / differential DS to create a novel *functional* gene
- So that potential is not pre-existent qua self-present, but needs to be constructed
- IOW, it’s only “retroactively” potential
 - “we don’t know what a body can do”

Evelyn Fox Keller agrees

- We might “consider the mature mRNA transcript formed after editing and splicing to be the ‘true’ gene. But ... such genes exist in the newly formed zygote only as possibilities, designated only after the fact.”
- “A musical analogy ...: the problem is not only that the music inscribed in the score does not exist until it is played, but that the players rewrite the score (the mRNA transcript) in their very execution of it” (*Century of the Gene*, 63).

Deleuzean evolution

- The individuation process takes the lead
- Genetic bookkeeping follows developmental plasticity and phenotypic adaptivity
- Novelty that changes virtual pattern and thresholds for next generation, ie, that retroactively constructs “potential”
- So, W-E’s process is a example of biological counter-effectuation