Deleuze and the Brain
Ontology and Neuropolitics

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Deleuzean naturalism

• Modest naturalism: using the same concepts in the physical, biological and social realms
  – Geomorphology / Meteorology
  – Biology / ecology
  – Historical political economy
  – Sociology / psychology / neurology

• Materialist, but not eliminative or mechanist
  – “machinism”: non-reductive imbrication of realms
  – Nature is ordered AND creative, open, flexible
  – Consciousness is real, but often not politically important
  – “political physiology”: above, below, alongside subjects
Deleuze’s differential process ontology

• Virtual “multiplicities” or “Ideas”
  – Differential elements (“there is no single X”)
  – Differential relations (linked rates of change)
  – Singularities (turning points)

• Intensive processes integrate multiplicities
  – Metastable field of individuation
  – Intensive process of individuation

• Actual products hide their intensive morphogenetic processes and their virtual multiplicities
# Deleuze and Dynamical Systems Theory

<table>
<thead>
<tr>
<th>Deleuzean Terms</th>
<th>Material System</th>
<th>Model</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontological status</td>
<td>Function</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virtual (&quot;pre-individual&quot;)</td>
<td>Domain / capacities</td>
<td>State / phase space</td>
<td>Manifold</td>
</tr>
<tr>
<td>Intensive (&quot;impersonal&quot;)</td>
<td>Field of individuation</td>
<td>Metastable field</td>
<td>Attractor layout</td>
</tr>
<tr>
<td></td>
<td>Individuation process</td>
<td>Processes</td>
<td>Trajectories</td>
</tr>
<tr>
<td>Actual</td>
<td>Conditions</td>
<td>States</td>
<td>Points</td>
</tr>
<tr>
<td>Haecceities / Assemblages</td>
<td>Situations</td>
<td>Degrees of freedom</td>
<td>Dimensions</td>
</tr>
<tr>
<td>Habits</td>
<td>Patterns of behavior</td>
<td>Attractors</td>
<td>Limits</td>
</tr>
<tr>
<td>Line of flight</td>
<td>Threshold</td>
<td>Bifurcator</td>
<td>Singularities</td>
</tr>
<tr>
<td>Body w/o Organs</td>
<td>Transformative conditions</td>
<td>&quot;edge of chaos&quot;</td>
<td>Fractals</td>
</tr>
<tr>
<td>Counter-actualization</td>
<td>Transformation of domain / capacities</td>
<td>Change of attractor layout</td>
<td>Change in distribution of singularities</td>
</tr>
<tr>
<td>Empty BwO (ATP)</td>
<td>Death</td>
<td>Chaotic region</td>
<td>Randomness</td>
</tr>
</tbody>
</table>
The Key Idea, or Deleuze’s “ontological difference”

- Virtual = changeable and differential patterns and thresholds = “potentials” = repertoire
- Intensive = processes = “individuations” = resolutions of virtual differentials when thresholds are reached
- Actual = sedimented habits = “properties” = substantial or reified view
Overturning Platonism

• Against a fixed virtual & “incarnation”
  – Individuation has priority over differenciation
  – Counter-actualization changes the virtual

• Against a priori preferences
  – Being a “flow enthusiast” only reverses Platonism
  – Instead you need to (cautiously) experiment

• Against hylomorphism:
  – No need for transcendent sources of order
  – Self-organizing material systems can account for natural order and novelty

  – Against “tracing”:
    – Must account for empirical identity by transcendental difference: genesis of experience, not mere conditions
Virtual “multiplicity,” “Idea,” or “abstract machine”

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

Virtual multiplicity: distributed “developmental system” in which DNA is immanent
Field of individuation: metastable field of cytoplasmic gradients, relative cell position, etc.
Processes of individuation: folding, invagination, cell differentiation
Actual product: stably differentiated adult “hides” its morphogenetic processes and virtual multiplicity
Drosophila embryo morphogenesis
Neurodynamics

MICHEL LE VAN QUYEN, Disentangling the dynamic core: a research program for a neurodynamics at the large-scale. Biological Research 36.1 (2003) (Santiago)
Neurodynamics

<table>
<thead>
<tr>
<th>Time</th>
<th>No Perception</th>
<th>Perception</th>
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<tr>
<td>0 - 180 ms</td>
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<td>180 - 360 ms</td>
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<td>360 - 540 ms</td>
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<td>540 - 720 ms</td>
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</table>

'Mooney' faces

Significant phase locking
Significant phase scattering

Gamma power (\(\sigma\))

DAVID RUDRAUF, ANTOINE LUTZ, DIEGO COSMELLI, JEAN-PHILIPPE LACHAUX, and MICHEL LE VAN QUYEN, From autopoiesis to neurophenomenology: Francisco Varela's exploration of the biophysics of being. *Biological Research* 36.1 (2003) (Santiago)
Deleuze and neurodynamics

• Virtual differential multiplicity = repeatable patterns = repertoire
  – differential or networked elements
    • there is no such thing as the function of "a" neuron
    • beyond neurocentrism: “enactive” cognition or “sense-making”
  – with differential relations (linked rates of change of firing patterns)
  – marked by singularities (as thresholds for new firing patterns)
• Intensive processes = system activity:
  – short-term neurodynamics:
    • “resonant cell assemblies” (Varela); “dynamic core” (Edelman);
      “coordination dynamics” (Kelso)
    • resolutions of differentials in ongoing process leads to selection of
      one of a number of “potential” firing patterns
  – Long-term neurodynamics:
    • Neuroplasticity as development of repertoire of virtual firing
      patterns as result of experience = “counter-effectuation”
Deleuzean contribution to the ontology of neurodynamics


• "in a common non-linear model of olfactory processing ... each odor is represented by a specific attractor ... Thus in this model, perception is based on several coexisting attractors in a multistable system" (733)

• Ontological status of non-actualized, but "co-existing" attractors = virtuality.
• Chaotic attractors are now passé.
• Rather, “emergence of transient functional couplings between distributed neurons."
• Walter J. Freeman: "the transient nature of such dynamical links, rather than presenting a series of well-defined states (attractors), shows metastable (self-limiting and recurrent) patterns of activity" (cited at 737).
• Again, ontological status of a “recurrent” but not currently active pattern? Virtuality.
• Another formulation: attractors that change due to dynamics of the system.

• Varela et al. 2001: “In the brain, there is no 'settling down' but an ongoing change marked only by transient coordination among populations, as the attractor itself changes owing to activity-dependent changes and modulations of synaptic connections” (cited by Cosmelli, Lachaux and Thompson at 737).

• Deleuze's “counter-effectuation”: intensive processes change virtual conditions.
## Deleuze and Neurodynamics

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<th>MODEL</th>
<th>NEURODYNAMICS</th>
</tr>
</thead>
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<tr>
<td>Ontological status</td>
<td>Function</td>
<td>Short term</td>
<td>Long term</td>
</tr>
<tr>
<td>Virtual (&quot;pre-individual&quot;)</td>
<td>Domain / capacities</td>
<td>State space</td>
<td>Differentials of neural function</td>
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<tr>
<td>Intensive (&quot;impersonal&quot;)</td>
<td>Field of individuation</td>
<td>Metastable field</td>
<td>Attractor layout</td>
</tr>
<tr>
<td>Individuation process</td>
<td>Processes</td>
<td>Trajectories</td>
<td>Formation of an RCA</td>
</tr>
<tr>
<td>Actual</td>
<td>Conditions</td>
<td>States</td>
<td>One RCA</td>
</tr>
<tr>
<td>Habits</td>
<td>Patterns of behavior</td>
<td>Attractors</td>
<td>Repetition of RCAs</td>
</tr>
<tr>
<td>Line of flight</td>
<td>Threshold</td>
<td>Bifurcator</td>
<td>Dissolution of any one RCA</td>
</tr>
<tr>
<td>Body w/o Organs</td>
<td>Transformative conditions</td>
<td>&quot;edge of chaos&quot;</td>
<td>Instability</td>
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<tr>
<td>Counter-actualization</td>
<td>Transformation of domain / capacities</td>
<td>Change of attractor layout</td>
<td>Change of virtual repertoire of RCA patterns (&quot;Eureka&quot;!)</td>
</tr>
<tr>
<td>Haecceities / Assemblages</td>
<td>Situations</td>
<td>Degrees of freedom</td>
<td>Extended system</td>
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<td>Empty BwO (ATP)</td>
<td>Death</td>
<td>Chaotic region</td>
<td>Cessation of function</td>
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4EA cognition

- Embodied
- Embedded
- Extended
- Enactive
- Affective
Against myths of the subject

- Self-identical or centralized
- Representational
- Isolated or world-transcendent
- Spiritual or non-naturalist
How can Deleuze help CS take another “next step”?

• The virtual as mode of being of distributed / differential systems
• Political analysis of multiple subjectification practices: “populations of subjects”
• Political affect and social cognition
Populations of subjects

• CS has presupposed “the” subject
• Even if it is now embodied and embedded, it is still an individual / abstract subject
• Opening to the thought of multiple embodiments: Iris Marion Young, “Throwing Like a Girl”
• Young calls into question assumption that cultural scaffolding is always enabling
Multiple subjectification practices

- Virtual field of differential subjectification practices
- Subjectification as impersonal individuation
- The production of “bodies politic”
- DST lets us think bio-political subjectification
- Selection of sets of bio-cultural practices
  - Richerson and Boyd; Sober and Wilson; Bowles and Gintis
Geo-hydro-bio-politics

Virtual multiplicity of geo-hydro-bio-neuro-politics

- Geological: ground slopes, surface friction
- Meteorological: wind, rain patterns
- Hydrological: river currents and channels
- Biological: local flora and fauna
- Social / technical / “political physiology”:
  - Military “force projection”: speed capacity of available transportation assemblages
  - Bureaucratic “striating” practices: mapping, taxing
  - Variable “subjectification” practices: warrior courage / peasant docility
  - Experience-driven neural plasticity
- “Agency” (vs. structure) only in crisis situations
Virtual register: the Idea of the Water Cycle

The World’s Water Cycle
Global Precipitation, Evaporation, Evapotranspiration and Runoff

Precipitation 9 000 km²

Evaporation 9 000 km²

Precipitation 110 000 km²

Evapotranspiration 65 200 km²

Evaporation 562 800 km²

Area of internal runoff 119 million km²

Infiltration

River runoff 42 400 km²

Groundwater flow 2 200 km²

Ocean

Area of external runoff 119 million km²

Lakes

Oceans and seas 361 million km²

Note: The width of the blue and grey arrows are proportional to the volumes of transported water.

The “Earth” as virtual register: Perplication of the “spheres”
Complex nested and coupled cycles of intensive morphogenetic processes

“air” includes water, organisms, and dirt
“water” includes air, organisms, and minerals
“soil” includes air, water, and organisms
organismic processes include air, water, minerals
Geo-hydro-bio-neuro-politics in Hurricane Katrina
The Atlantic Slave Trade

• Atlantic slave trade meshes bio-energy and heat exchange systems

• De-skilling of African peasants for industrial sugar production: Mintz, *Sweetness & Power*

• West African successful agriculture provided the slave trade with its population: Carney, *Black Rice*
Revolution in Saint Domingue

- Crown jewel of French Empire
- Step up in production in 1770s
- Increased importation of “fresh” slaves
- Flight of the *gens de couleur libres*
  - Trinary racial system of Louisiana
  - Mediating role of the free people of color
Toussaint and Dessalines
Agency / personality / consciousness
as important only in crisis situation
Leclerc and Rochambeau
Africans in Louisiana

• Not all Africans came to New World as slaves: Berlin, *Generations of Captivity*
• Early days: Natchez Rebellion (1729)
• 1795: Sugar production in Louisiana begins in earnest after Haitian Revolution
• 19th century cotton production
  – Internal slave trade from the Chesapeake
  – Reproduction of slave populations
The Pointe Coupee slave “revolt”

• 1795: the real “First World War”?  
• During Haitian Revolution and step-up in Louisiana sugar production  
• More of a conspiracy than a revolt  
• Echoes of the Natchez rebellion of 1729  
• Turned from class struggle to race war  
• Political physiology of panic triggers
Louisiana

• Louisiana: the poorest state in the Union?
• 35% African-American pop. (11% national)
  – New Orleans: 66% Af-Am
  – Gretna (immediate suburb): 33% Af-Am
• ‘Money follows high ground’
New Orleans Topography
New Orleans neighborhoods

• Uptown, the big hotels, and the French Quarter -- private security forces
The Superdome and the Convention Center

– The rumors of slave revolt
– A “reversion” to a “state of nature”?
– Perhaps, but to what vision of “human nature”?
Why did pundits turn to Hobbes?
A young man walks through chest deep flood water after looting a grocery store in New Orleans on Tuesday, Aug. 30, 2005. Flood waters continue to rise in New Orleans after Hurricane Katrina did extensive damage when...

Two residents wade through chest-deep water after finding bread and soda from a local grocery store after Hurricane Katrina came through the area in New Orleans, Louisiana. (AFP/Getty Images/Chris Graythen)
Why not to Rousseau?
Or to Hume?
Or why didn’t they just open their eyes?
The solidarity of the people of New Orleans

• They rescued themselves, their loved ones, their neighbors, and often just plain people by simply getting to the Superdome and Convention Center

• They were active until forced into passive waiting by government order
Methodological individualism and Rational Choice theory

- RCT is more than a “theory”
  - it guides atomizing practices
  - and so produces the “truth” of neo-liberalism
  - “methodology becomes metaphysics”

- Satz and Ferejohn, “Rational Choice and Social Theory,” *J Phil* 91.2 (1994)
  - RCT only predictive in constrained / coercive social environments
  - “political physics”: equilibrium models / normalized behavior
A new science of prosocial human nature

• Contra EP / genetic reductionist views, which hold to methodological individualism
• DST: multiple levels of selection, including social patterns of development of affect
• Evolution:
  – Social brain hypothesis (modifying Robin Dunbar to include DST / affect angles)
  – Group selection
• Development:
  – Neonate face-recognition / imitation
  – Social triggers of brain development
Bio-cultural evolution or, the history of affect

- DST: extrasomatic inheritance (reliably reproduced in next life cycle).
- Thus we have bio-cultural evolution (Richerson and Boyd; Bowles and Gintis).
- The units of bio-cultural evolution are sets of cultural practices, as producing affective structures (tendencies to react to categories of events) by tinkering with neuro-endocrine developmental processes.
• Now almost all of us reliably develop a set of basic emotions (rage, sadness, joy, fear, distaste) we share with a good number of mammals.

• Most of us also have prosocial emotions (fairness, gratitude, punishment) we share with primates, given certain basic socializing inputs.

• But in many sets of cultural practices, these prosocial emotions are local: symbolically marked in-group.

• Although some cultural practices can try to expand the reach of prosocial emotions to all humans or even all sentient creatures (with all sorts of stops in between).
• Why is partiality of prosocial emotions so common?
• War has to be one of the selection pressures producing in-group loyalty / conformity (along with and in connection with bio-eco constraints, e.g., disease, famine, etc.)

• We don’t need to go to a “killer ape” hypothesis to recognize this.
• But war has a history. It co-evolves with cultural practices producing affective structure.
• Tribal warfare: virtually all the males of the tribe take part.
• Civilized war come from agriculture-based class society. (Irrigation!)
• Split btw warriors and peasants who support them (and the artisans who supply the arms and the bards who sing their praises).
• Thus the selection pressure is for sets of bio-cultural practices producing specialized affective structures relative to position in society, that is, relative to their contribution to the “war machine.”
• So we can’t assume an abstract affective cognitive subject but have to investigate the history of affect in its geo-hydro-bio-neuro-political context.
• Population thinking: not all humans are socialized: trauma vs innate sociopathy
Homo economicus
Mirror neurons and empathy: a neuroscience of human nature?
Theory of Mind

Theory theory: cognitive inferences from $3^{rd}$ person observation

Simulation theories: $1^{st}$ and $3^{rd}$ person modeling
  - Singer et al. (2004): “Empathy for pain involves the affective but not sensory components of pain,” *Science*.

Phenomenology: $2^{nd}$ person intersubjectivity
The worst of all governments
The worst of all governments

- The spontaneous solidarity of the people of New Orleans and Louisiana
- Was actively stopped by local, state and federal governments
- Racist panic in face of “slave revolt”
  - “Little Somalia”
  - Mud people and sky people
- Neuropolitics of the amygdala:
  - Fear conditioning
  - Racial categorization
Disaster capitalism and the War on Terror

• After Seattle and dot.com bubble
• Search for natural / social crises
• Privatization, deregulation, social cuts and “securitization”
• Klein’s examples:
  – Iraq 2003
  – Sri Lanka 2004
  – New Orleans 2005
Disaster capitalism in NO

• “We finally cleaned up public housing in New Orleans. We couldn’t do it, but God did,” Richard Baker, Republican congressman for Baton Rouge.
“Safe Zone” Initiative: demolish blighted or “public nuisance” housing in a five block area surrounding schools
Fighting back
Social aid and pleasure clubs
Second line in honor of Kufaru (local drummer)
Music and politics together

Marchers head up North Rampart street at Armstrong Park on Saturday. ‘Justice After Katrina’ was sponsored by activist groups banded together as the People’s Hurricane Relief Fund & Oversight Coalition.

N.O. marchers demand action