

Remote Learning Module for 29 April 2020

Lecture Notes on *The Cerebral Code* – Chapters 10 & 11

Last class we turned our attention to the mechanisms Calvin proposes for modeling the brains of what Dan Dennett called Gregorian Creatures: human beings, and our capacities for abstract thinking and language acquisition. Today we’ll conclude our examination of *The Cerebral Code*, as well as our spring 2020 semester, with a review Chapters 10 & 11, where we’ll review Calvin’s account of how we generate metaphors, and accomplish the tasks of high-level intellection: thinking a thought in the mosaics of the mind.

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— Chapter 10 —

The Making of Metaphor

(1) Immanuel Kant provides our opener, although Kant never said that metaphors polish the conceptual spectacles through which we view the world; Mark Johnson and George Lakoff say this, by way of adapting Kant’s cognitive psychology to their own purposes in *Metaphors We Live By*. Kant’s view was that concepts (which are “empty” without percepts) acquire *content* via a *schematism*. His account, pardon the pun, can be schematized like this:

Sensory Stimulation (the irritation of a sensory surface)	→ Intuition (the forms of sensibility, time and space)	→ Schematism (organization of the understanding)	→ Concepts (Identity, Necessity, Unity of Apperception)	→ The objects of empirical experience
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(2) What Johnson and Lakoff do is adapt the role of the Schematism (the production of the *synthetic a priori* judgments of experience) in Kant’s account to their own purposes, by replacing Kant’s Concepts of the Understanding with *mapping functions*, such that a *literal* source domain is mapped 1-1 on to a *metaphorical* target domain. The target domain is metaphorical language.

(3) Kant supposed that we can *know in advance* how the objects of our empirical experience (or experience of objects in the world) *must be* in order for us to know them as objects rather than as figments of our imaginations (for example, objects must have identity over time, and causal events are instances of necessitation). These concepts, in other words, *structure* our experiences. So too, Johnson and Lakoff suppose that metaphors structure our experiences. One of their favorite examples is the metaphor, “love is a journey.” Given this metaphor, we know in advance that when a loving relationship becomes routine, we can say we are “stuck in a rut.”

(4) Furthermore, just as Kant had held that concepts of the understanding are *universal* across all human beings (sometimes nowadays called the *transcendental machinery of the mind*), Johnson

and Lakoff hold that the “metaphors we live by” derive from our bodily being in the world. Because, for example we are all upright creatures, our metaphors will show a preference for “up” over “down.” There are plenty of examples: when we’re feeling poorly, we might say we’re *down* today; when we’re literally poor, we might say we’re *down* and out; when we’re anxious to engage in a task, we might say we’re *up* for it. However, they do not seem to have accounted for contrary cases like these: it’s bad to have one’s head *up* in the clouds, and better to have one’s feet planted firmly *down* on the ground; or, when we say, anticipating a good time, let’s get *down*. Be that as it may, Calvin is looking to adapt Johnson and Lakoff’s model to his own empirical purposes.

(5) In short, he’s looking to “ground” metaphors in the material substrate of chaotic attractors, so that source domains are pervasive schemas, and schemas are hexagonal spatiotemporal patterns of neural activity. The gist of his idea is itself a metaphor: *layers of middlemen*: layers, that is, of representations standing between our consciousness and the real world, resulting from cloning competitions among attractors. Planning-ahead attractors work according to the Somatic Marker Hypothesis: they provide short-cuts among domains. Thus, metaphors are bits of literal language *moonlighting* after their regular work is done: one pattern comes to stand for another, so that short-cuts among schematic representations are literally short-cuts for turning on various hexagonal arrays.

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— Chapter 11 —

Thinking a Thought in the Mosaics of the Mind

(1) Bringing his reflections to a close (baseball metaphor: rounding third), Calvin notes that his hexagon model accounts for more than mere awareness; it’s after bigger fish. (These metaphors sure are everywhere, aren’t they?) In a nutshell (another metaphor), the hexagon model, he claims, allows us to explain how we solve non-routine problems where *decision* follows after *deliberation*.

(2) The tasks of a good theory are, in Calvin’s estimation, economical description plus predictive power; and he thinks the hexagon theory has both virtues: its descriptions yield good coverage with minimal but sufficient detail, and it does predict features not yet observed, so it can be confirmed or falsified, as the case may be. Here is a quick digest of the main features of the hexagon theory. It:

- Describes — Hebb’s dual trace memory
- Describes — Widely distributed synchrony in cortex
- Predicts — Synchronized triangular arrays extending their reach
- Explains — Why short-term memories can fail to go to long-term
- Describes — Redundancy of memory
- Predicts — Simple associations of sensory schemas with movement programs
- Predicts — Convergence zones via the superposition of active firing-patterns
- Predicts — Expert regions

- Describes — Recurrent excitation and explains why it is associated with NMDA synapses
- Predicts — How a “mantra” can serve to prevent temporary attractors from forming
- Describes — *Déjà vu* as premature closure
- Describes — The neural equivalents of mutation and deletion in the cerebral code.

(3) The central confusion to avoid in modeling the cerebral code on the Darwinian Schema is that of mistaking variation for selection: we must cleave to population thinking. Thus, we look for ephemeral copying competitions unfolding over a short, milliseconds to minutes, time-scale. The primary elements in a thought process, then, are (a) *spatiotemporal patterns of active firing among pyramidal neurons*, and (b) *attractors embedded in the connectivity*.

(4) Just as we saw in Churchland and Damasio, models of this kind will typically be tested by way of explanations of various pathologies. For example, on the hexagon theory, *déjà vu* occurs from over-excitation, fewer pathways, and not many variants, so that the unfamiliar will seem familiar (because that’s how it feels when things are familiar—not many variants). Bipolar disorders can also be explained on the hexagon model, with manic stages occurring via analogies to climate change and geographic parcellation.

(5) The hexagon model also has conceptual consequences: we shall, following Hume, be compelled to abandon the very idea of our having a “unity of consciousness” as illusory. Our conscious states are rather no more than a series of temporary winners of cloning competitions: our centers of consciousness shift about—there’s always a winner, but not always the same choir, or team, because the various shaping-up competitions proceed in parallel.

(6) Last, but certainly not least: the hexagon theory provides a mechanistic outline for a Universal Grammar. The “big language step” (from *Homo erectus* to *Homo sapiens*) took place roughly a quarter of a million years ago, and consisted in the emergence of language (syntax) from proto-language (without syntax). This step, Calvin adduces, was accomplished by the advent of recursive embedding and stratified stability: cloning forms a set of parallel alterations, such that one will establish hegemony only if linked patterns are also activated. They are these very linked patterns that individuate the parts of speech, from which syntax emerges. Thus, here we are.

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— Epigraph —

For the reason why the mind was joined to the senses by our Maker is not only so that Man should maintain himself, which many species of living things can do far more cleverly without the aid of even an irrational mind, but also so that from those things which we perceive with our eyes to exist we should strive towards the causes of their being and becoming, although we should get nothing else useful from them.

—Johannes Kepler, *Mysterium Cosmographicum*, 1596

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And so, we conclude our studies in the Philosophy of Mind. The months ahead will not be easy, but we will, I am sure, persevere, armed not just with metaphors and models, but courage, hope, and intelligence. Be well everyone: stay strong, stay safe, and above all, stay put.