Interactive Cognition

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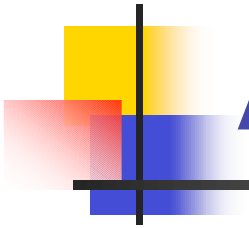


A Conceptual Trap

- Heraclitus
- Parmenides
- Empedocles, Democritus
- Aristotle
  - Substance/Atom Metaphysics
    - Aristotle: substance, element

Consequences of the Trap

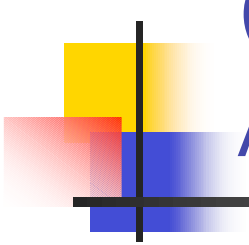
- Stasis is the explanatory default
- No emergence
- Metaphysical split between
  - Substance/Atom; Cause; Fact And
  - Intentionality; Normativity; Modality

Only Three Possibilities

- Two Realms:
  - Aristotle
  - Descartes
  - Kant
  - Analytic Philosophy
- All is mental
  - Idealists: Hegel, Green, Bradley
- All is fact and cause
  - Hobbes
  - Hume
  - Quine
  - The contemporary “scientific” world

Hume's Argument

- No norms from facts —
  - No valid way to derive normative statements from factual statements
- Triggered Kant's move to a two realm metaphysics
- And Analytic two realm attempt
  - Analytic attempt at normative realm in terms of modality/logic/convention failed



Contemporary:

All is Cause and Fact, and maybe Modality

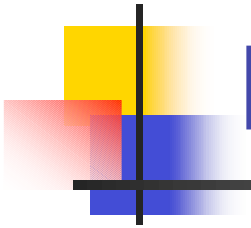
- E.g., Representational Normativity
  - Representational error
- Fodor: Nomological; asymmetric dependency
- Millikan: Evolutionary causal history of selection; presupposes normativity of usefulness
- Dretske: Best explanation; presupposes normativity of explanation
- Cummins: Structural; presupposes normativity of goal

Hume's Argument is Unsound

- Terms in conclusion only by definition from terms in premises
- Abbreviatory definitions permit back translations through the definitions
- So any valid conclusion can be translated into a statement solely in premise factual terms
- ∴ No valid normative conclusion

It Makes a False Assumption

- But abbreviatory definition is not the only valid form of definition
- There is also implicit definition
  - Beth's theorem
    - Implicit definition is of greater than or equal power
  - Implicit definition blocks back translation
  - Implicit definition voids the empiricist presupposition of Hume's argument
    - Meaning not constructed out of empiricist inputs

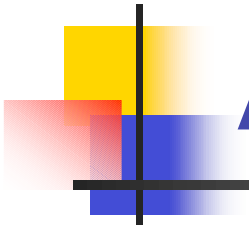


Back to Process

- Permits emergence
  - Kim
- Point particles would never hit each other
- Quantum field theory: no particles; all is process

Back to Process II

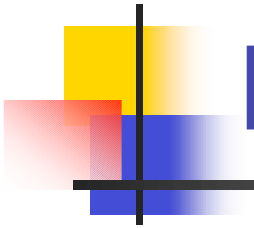
- Change is the default: stability requires explanation
- Two kinds of process stability:
  - Energy well stability
  - Far from equilibrium stability
- A fundamental asymmetry between them
  - FFE requires maintenance



Autonomy

- Self maintenant systems
  - Minimal autonomy
  - Candle flame
- Recursively self maintenant systems
  - Bacterium

- Note: definition in terms of conditions to be met — implicit definition, not empiricist definition



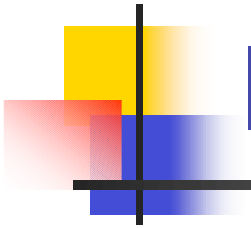
Normative Function

- Contributions to the stability, the continued existence, of FFE systems serve functions for (are useful to) those systems

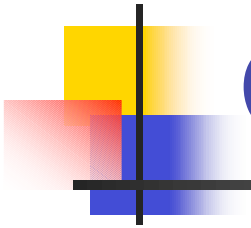
Contrast:
Etiological Models of Function

- Causally epiphenomenal
  - Lion or swampman
- Normatively circular: dependent on normativity of selecting for usefulness in prior generations
- Takes “having a function” as locus for explanation, rather than “serving a function”
  - Creates difficulty accounting for multiple functions, distributed functions, functions served with no organ having that function (e.g., leg muscles on long flights; useful accidents)

Representation and Interaction Selection

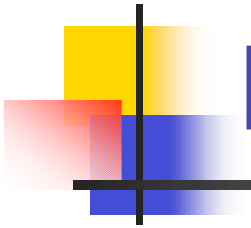


- Recursively self maintenant systems must select interactions
- Selection presupposes that the interaction is appropriate — anticipates that the interaction will or would be appropriate
  - Bacterium swimming or tumbling
- Such presuppositions/anticipations may be true or false — representational truth value



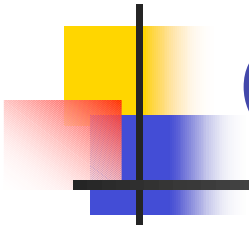
Content

- An interaction may be appropriate under some circumstances and not under others
- Presupposition of appropriateness ∴ constitutes presupposition that those conditions hold
- This is content
  - It is implicit, not explicit



More Complex Representation

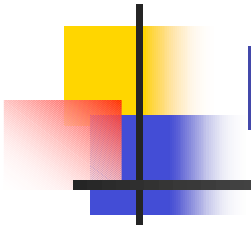
- Webs of branching and conditionally iterated interactive potentialities
  - Situation knowledge
- Subwebs with special properties
  - Internally reachable
  - Invariant under classes of transformations
  - Manipulable objects
    - Piaget
- Abstractions?



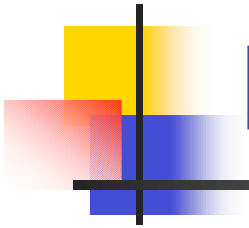
Contact and Content

- Contact
  - Differentiation of situation
    - Past interactive flow and outcomes
  - Basis for setting up anticipatory content
  - Input processing — passive differentiation
    - Perception and Apperception
- Content
  - Anticipated organization of future interactive potentialities

Further Properties of Interactive Representation



- Future oriented
- Pragmatic
- Modal
- Implicit content
- Embodied
- Situated
- …

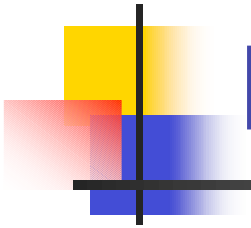


Further Properties II

- Accounting for the possibility of error is easy
- Accounting for the possibility of system detectable error is easy
  - Error guided behavior
  - Learning
  - Inherent representational normativity
  - Radical skeptical argument

Comparison: Encoding Models

- Encoding correspondences
  - Causal, Nomological, Informational, Structural, Conventional
- Genuine encodings
  - Presuppose representation of both ends of encoding relationship and of the relationship itself
    - Morse code
    - Nomological code: neutrino count

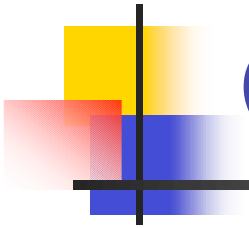


Encodingism

- Assumption that all representation is encoding
- Circular: must already represent other end of encoding relationship
  - Genuine encodings are derivative
- Past oriented
- Identifies contact and content
- Severe difficulties modeling representational error

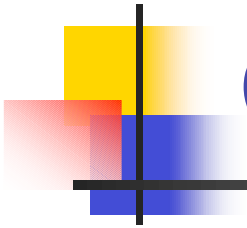
Encodingism II

- Cannot model system detectable representational error
  - Error guided behavior
  - Learning
  - Radical skeptical argument
- Too many correspondences;
- No emergence (innatism);
- Piaget's copy argument
- …



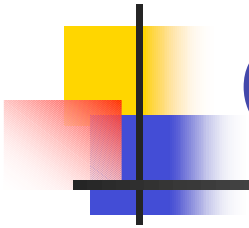
Contemporary Models

- Millikan
- Dretske
- Fodor
- Cummins
  - In all cases, the organism can't know its own content, and, if it could, comparison of content with what is being represented to determine whether there is error is the representational problem all over again — circularity



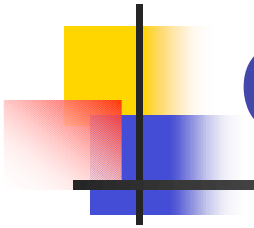
Contemporary Models II

- Symbol system hypothesis
  - Transduced encoding
- Connectionism
  - Trained encoding



Contemporary Models III

- Information processing
  - Information is control theoretic, not epistemic — covariation; amount of control
    - Information does not announce itself, nor what it is with
  - Involved in contact *and* content, but not inherently anticipatory
    - Extended mind assumes information is epistemic

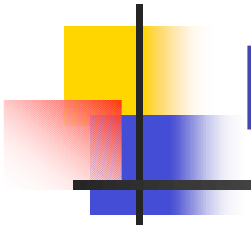


Contemporary Models IV

- Computationalism can only model process in ways that *assume* representation, not that model its emergence
  - Two metaphysical realms of reasons and causes have no place for control and no possibility of normative representational emergence

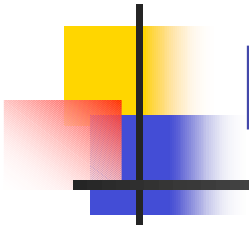
Contemporary Models V

- Dynamical systems
  - Powerful mathematics for process, but needs better framework for FFE, complex local and global topologies of dynamic manifolds, and dynamics of fiber bundle connections
  - Anti-representational
  - But, must select interactions,
  - ∴ must functionally indicate interaction potentialities,
  - ∴ must yield emergent representational truth value



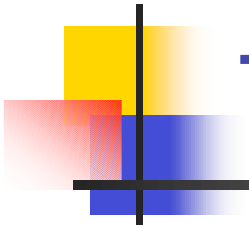
Further Issues

- Perception
- Rationality
- Language
- Memory
- Learning
- Emotions
- Consciousness
- …



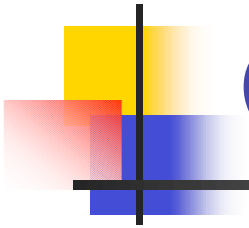
Perception

- Perceiving as interacting
  - Gibson
    - Direct information pick-up
  - O'Regan and Noe
    - Color
- Interaction for the function of apperception — updating and maintenance of situation knowledge



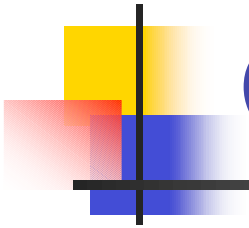
The Brain Doesn't Work that Way

- Endogenously active neurons — oscillatory
- Non-standard neural modulations
- Glia — astrocytes, especially
- Multiple scales of spatial and temporal modulation



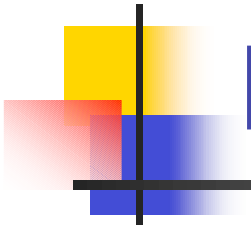
CNS Processes II

- Larger, slower modulations set parameters for smaller faster processes
- Parameter setting is the continuous dynamical system equivalent of programming
- Parameter setting is anticipatory
  - Control of such parameter setting is microgenesis
- Parameter setting has truth value



Cognition and Representation

- Representation, thus cognition, are inherently pragmatic
- They evolved, emerged, in the service of the function of interaction selection
- They are anticipatory, modal, implicit
- Based on differentiation, not correspondence



Embodiment and Cognition

- Cognition and representation are possible only for interactive, embodied, agents