Interactivism:

From Parmenides to Persons

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Abstract

Interactivism began as a solution to the skeptical problem in epistemology. That solution, however, involved deep presuppositions that were in conflict with the dominant metaphysics of contemporary studies of the mind and the person (the most fundamental of which began with the Pre-Socratics), from philosophy to psychology to artificial intelligence and robotics. Uncovering those presuppositions and conflicts, and developing alternative models that are consistent with the presuppositions of interactivism has created a systemic theory and philosophy that begins in metaphysics, and spans from biology through studies of the mind and person, including the emergence of social realities and social beings. This tutorial will present a surview of the history and scope of interactivism, with special focus on selected topics, such as the emergence of normativity, representation, development, consciousness, language, rationality, and persons.

What a Factual World we Live In

From Parmenides to Quine

Parmenides:

Change is not possible, because A changing to B would require disappearance of A and emergence of B

Empedocles, Aristotle:

Substance is that which remains unchanged during change, thus avoiding emergence

This has remained the basic metaphysical framework since.

But, substance metaphysics makes **process** difficult

E.g., no change is the default for substance.

And makes **emergence** impossible – no way to get fifth substance out of earth, air, fire, and water, only new mixtures

Furthermore, substance is factual

This leaves **normativity, modality, intentionality** as a realm not included with substance — a deep strain on **naturalism**: how to integrate?

Integrating Fact and Normativity

There are only a few general possibilities:

Two realms:
- Aristotle
- Descartes
- Kant
- Analytic philosophy

All intentional:
- Hegel
- Green
- Bradley

All is substance and fact:
- Hobbes
- Hume
- Quine

The possibility of normativity etc. being ***emergent*** out of fact (substance) is precluded: substance metaphysics precludes emergence.

We are today in the Hobbes, Hume, Quine world that cannot integrate normativity

"I'm not interested in those mystical things." major psychologist

Mind, however, is Normative

But we *cannot* ignore normativity etc. because it is central to mind (not to mention biology):

- function
- representation
- learning
- development
- rationality
- sociality
- language
- and so on.

Multiple Conceptual Problems

Process: All sciences have moved from substance to process
- Must extricate process conceptions from substance frameworks
- Fire
- Heat
- etc.
- Except for biology (to some extent) and modeling of the mind:
  - E.g., Functions as properties of entities (parts)
  - E.g., Emotions as blends of four basic emotions (earth, air, fire, and water?)

Emergence: a notion in increasing use, even in physics
- but substances cannot emerge
- Kim's argument precludes causally efficacious emergence, but it presupposes a substance or particle metaphysics

Normativity: ubiquitous in biology and mentality
- But it cannot be part of an integrated naturalism given a substance or particle metaphysics

Special case of modality:
Internal relations: essential relations (and properties)
- e.g., arc of circle relation to center of circle
- attacked by Russell; expunged by Quine
- but all relations external is a vestige of the 'independent subsistence' notion of substances (Aristotle)
- many properties not explainable otherwise (e.g., representational homuncularism is forced by external relationship between representation and content)

A process metaphysics, however, permits emergence – new process organizations with new properties – and, as I will show, the emergence of normativity in particular.

Process and Science

Every science has passed through a phase in which it considered its basic subject matter to be some sort of substance or structure.

Fire	Phlogiston
Magnetism	Magnetic Fluid
Heat	Caloric
Life	Vital Fluid

Every science has passed beyond that phase, recognizing its subject matter as being some sort of process.

Except sciences (and philosophies) of the mind.

Process:
Jaegwon Kim's Dilemma Between Emergence and Naturalism

Either naturalism is false, or genuine emergence does not exist

If higher level phenomena are not supervenient, then we have dualism and **naturalism is false**

If higher level phenomena are supervenient, then all causality is resident in the lowest level supervenience base of basic particles

Higher level causal regularities are just the working out of the causal dance of the particles within whatever configuration they have with each other

Higher level organization is merely the stage on which the basic particles engage in their causal interactions

Therefore, all higher level phenomena are causally epiphenomenal, and **emergence is false**

Diagnosis

Particles participate in organization; particles do not have organization

Organization per se is not a legitimate locus of causal power

Rejoinder: there are no particles

Everything is quantum fields

Fields are inherently processes

Processes are inherently organized

A point process is an incoherent notion

Everything that has causal power is organized, and has the particular causal power it does by virtue of its organization

Organization cannot be delegitimated as a locus of causal power without eliminating causality from the world

Organization *is* a legitimate locus of causal power

Different organization, including at higher levels of organization, can have different/novel/**emergent** causal power

Kim's argument is a reductio of particle metaphysics
Models of emergence must be framed within a process metaphysics

Hume Focused the Normativity Problem: No Ought from Is

> I cannot forbear adding to these reasonings an observation, which may, perhaps, be found of some importance. In every system of morality, which I have hitherto met with, I have always remark'd, that the author proceeds for some time in the ordinary way of reasoning, and establishes the being of a God, or makes observations concerning human affairs; when of a sudden I am surpriz'd to find, that instead of the usual copulations of propositions, *is*, and *is not*, I meet with no proposition that is not connected with an *ought*, or an *ought not*. This change is imperceptible; but is, however, of the last consequence. For as this *ought*, or *ought not*, expresses some new relation or affirmation, 'tis necessary that it shou'd be observ'd and explain'd; and at the same time that a reason should be given, **for what seems altogether inconceivable**, how this new relation can be a deduction from others, which are entirely different from it. But as authors do not commonly use this precaution, I shall presume to recommend it to the readers; and am persuaded, that this small attention wou'd subvert all the vulgar systems of morality, and let us see, that the distinction of vice and virtue is not founded merely on the relations of objects, nor is perceiv'd by reason. (Hume, 1978, Book III. Part I. Section I. 469-470)

The bold is the extent of Hume's actual argument.

Reconstructed argument:

Only abbreviatory definitions are valid, therefore, conclusions cannot contain terms of a kind not found in the premises.

Note: precludes *all* emergence.

Combine with: 1) empiricist assumption that all knowledge derives from senses, and 2) world of senses is strictly factual.

Conclusion: No "ought" can validly be derived from "is"; no norms from facts.

And, norms are not derivable from, integratable with, the factual, substantive world.

Hume Was and is Wrong

Implicit definition
- Class of models

Introduces meaning without being definable in previous terms
- Therefore, destroys empiricism too

But Hume was logically reconstructing Parmenidean substance problem

Ultimate solution requires shift to process metaphysics, which permits emergence, including emergence of normativity.

Implicit Definition

Beth's theorem: implicit definition and explicit definition of equivalent power

often used as an excuse for ignoring implicit definition

But:

equivalence is extensional only
Beth's theorem holds for first order predicate logic with infinite models

In all combinations of logics and models studied, implicit definition is equal in power to explicit definition or is greater in power.

E.g.
Infinitary logics
Fixed point logics

Finite models

Implicit definition cannot be ignored

The Biosphere: An Emergent Soup of Emergents

This focuses on process, especially far from equilibrium process, and emergence. Biology *is* the natural realm of far from equilibrium emergence.

Normativity emerges in biology too, but its flowering is in the special biological emergence of mind and society. A focus on normativity will follow shortly.

Systems held in far from equilibrium conditions tend to self-organize

This occurs via the amplification of some microvariations into macro-dynamic phenomena, and the suppression of others – a variation and selection process
Benard cells

The earth has been held at far from equilibrium conditions for a very long time, and has been engaged in self-organization processes continuously, with multiple emergents

Some Early Emergents

A process metaphysics makes *change* the default, and *stability* requires dynamic support and explanation

Two fundamental kinds of stability:
- Energy-well stability — e.g., atom — and
- Far from equilibrium stability — e.g., self-organizing system

Interrelated issues throughout self-organization:
- emergence and stability

Autocatalysis:
- Emergence: random or phase shift (?)
- Stability: metastable – changes in local reactants
- Emergent property: **self-maintenance**
  - Canonical example: candle flame

Stability (persistence of process organization) improved by protective modularization:
- Membrane encapsulization – proto-cells

Still further if membrane is part of self-maintenance process
- Emergent: **infrastructure**
- Membrane stability must be at slower time scale than (some of – e.g., it's own) self-maintenance processes that it is (partially) insulating – must be relatively stable on relevant time scales
- Second emergent property: **historicity**
- Particulars of catalytic organization depend on initial organization
- Third emergent: **metabolism**
- Metabolism: the self-maintenance of infrastructure

Osmotic threat: requires splitting
- Emergence: **replication**

Stability improved if the system can **control** and **regulate** this replication
- This requires **detection** of appropriate conditions
- And **switching** among appropriate regulatory organizations of metabolic and other dynamics
- Emergent: **recursive self-maintenance**
- More generally: **autonomy** (may emerge earlier)
- Canonical example: Campbell's bacterium
- **Note**: this view renders replication (and development and further specializations) as a phase of, and in the service of, the autonomy of the overall system
  - Replication and growth are undifferentiated for autocatalytic processes;
  - They become differentiated with replication

This is autonomy in very much an Aristotelian sense:

> "Autonomous entities rely on themselves both for the realization of their capacities and for their persistence." pg. 213

> "An organism's activity is much more than an expression of what it is; it is also the means by which the organism preserves itself from deterioration." pg. 219

> "Self-maintenance is the preservation that results from an organism's self-directed behavior." pg. 227 (Gill, 1989)

Complex regulation becomes increasingly difficult without differentiated and specialized regulatory resources.

Two Desiderata:

Lack of wear

Unbounded control theoretic informational capacity

Solutions:

Quantum scale

Large scale

(i.e., long and thin)

DNA satisfies these criteria

A regulatory resource for ongoing and conditional, including replication (and development, and ontogenesis, etc.), metabolic and interactive processes.

A resource exploited in many ways: frame shifts, recombinations of extrons, manipulations of mRNA, etc.

A steady state dynamics involving maintenance and repair, not a stable molecule

This involves a shift of agency to the processes of autonomy — or, more correctly, a recognition that autonomy ***is*** the locus of agency

Emergent: **entrenchment**

Not the earliest (earlier, e.g., in early metabolic organizations), but, nevertheless, a clear example

Further emergents:

endosymbiosis
large scale ‘interactors’ (as in ‘interactive systems’)
multicellularity — communication inducing specialization of autonomous processes, including metabolism
tissues
organs
nervous system
muscles and skeleton
central nervous system — endogenous activity, cooption of regulatory (communication) molecules, neural ganglia and axonal cables, exploitation of mass effects
differentiated reproduction
embryology and development
sex

Further biosphere modularizations:

species
asexual: stable system-environment
possibly historistic, self-maintenant, entrenched
sexual: in addition, modularization of reproduction
ecosystems

One lesson: variation and selection processes

- are not necessarily historistic,
- do not necessarily involve phenotype-genotype distinctions,
- generated biological evolution rather than being restricted to it,
- can participate in the emergence of entities and properties.

Another lesson: the far from equilibrium self organization of the biosphere, via historistic variation and selection, and with all of its subsidiary emergences, is the emergence of biology.

The Hierarchy of Normative Emergences

Ethics
Personality - psychopathology
Rationality
Values
Language
Sociality
Reflexive Consciousness
Emotions
Learning
Representation
Function

Initially, I address the first two: function and representation.

Normative Emergents: Function and Representation

Function

Any contribution to the autonomy of an autonomous system is functional for, serves a function for, that system — it improves (the likelihood of) its stability or persistence

This is a model of serving a function that is relative to particular systems

Heartbeat of a parasite functional for the parasite, but dysfunctional for the host

The normativity derives from the persistence of far from thermodynamic equilibrium systems

It is easy to get distinctions in physics, but extremely difficult to get asymmetric distinctions of the sort exemplified by functional-dysfunctional

Normative asymmetry here is derived from the thermodynamic asymmetry between energy well stable process organizations and far from equilibrium stable process organizations: Energy well stabilities do not require intervention to remain stable

Far from equilibrium stabilities do require intervention in order to maintain far from equilibrium conditions and remain stable — an isolated far from equilibrium system goes to equilibrium and thus ceases to exist

Contrast: Etiological Models of Function

Millikan: A part having a function is constituted in the evolutionary ancestors having the right sort of selection history.

But two identical systems can have differing histories — Millikan's two lions example

Only current state of the system can be causally efficacious

Millikan's model, therefore, and any etiological model, is causally epiphenomenal

It is not a successful naturalization of function

Multiple other problems, but this suffices:
E.g., circularity of the normativity of function being derived from the normativity of selection

Serving a Function versus Having a Function

Millikan focuses on a **part** *having a function*.

Both notions are problematic.

Serving a function, insofar as it is addressed at all, is a part performing a function that it has

The autonomy model focuses on functions as useful contributions, whether from a part or not

This issues a promissory note for the autonomy model to account for having a (proper) function.

What is a part? (I do not pursue this here — note that it is not addressed by etiological models)

Functional presupposition

In order for one process to successfully and regularly serve a function, there may need to be another function served at a particular place and time

A part at that place and time is thereby *presupposed* as serving that function (manifesting that consequence) by the initial process — that is, as having that function relative to the presupposing process, and, therefore, relative the relevant overall system

Track the normative presuppositions

Multifunctionality

Distributed functions

Non-selected functional contributions — leg muscles on long flights contributing to blood circulation

Etc. (Christensen & Bickhard, 2002)

Function as Design versus Function as Usefulness

Having a function constituted in appropriate “design” history

Serving a function constituted in being useful to system autonomy

Representation

Consider a recursively self-maintenant system selecting which interactions with its environment to pursue
Bacterium swimming or tumbling

Recursively self maintenant selections of next activity, and indications or anticipations of possible next interactive flows, involve functional presuppositions about the environment
This is an environment in which the selected or indicated interaction would be appropriate, would contribute to self maintenance

Under some conditions, these presuppositions will be true
Under others, false
This is the primitive emergence of representational truth value
Of representational normativity

Representation emergent in the indications and anticipations involved in the selection of interactive process
Such indications and anticipations can be false

Representation: Some Details

Function of action selection.

Triggering, as for bacteria.

Selection of interaction dynamically presupposes that the environment has those conditions that make it appropriate for that interaction.

Function of action indication.

Multiple possible actions/interactions.

Must be indicated as possible, and selection must occur.

Frog: tongue flick and eat (differentiates fly) and/or jump in water (hawk shadow).

Indication of an interaction as potential dynamically presupposes that the current environment is appropriate for that interaction.

The dynamically presupposed conditions are implicitly defined.

They constitute the representational content of the indication, and make the indication an emergent representation.

Those presuppositions can be false - no problem with error.

If they are false, that can be (fallibly) detected by the system itself - no problem with system detectable error.

Representation, then, emerges with the dynamic presuppositions of the function of action indication for the purpose of action selection.

Can only occur for autonomous agents, not for passive input processors.

What about input processing?

Interaction indications must be created appropriately to environment.

This requires sensitivity to/differentiation of environments.

Interactions will proceed in accordance with system organization and the environment being interacted with

— the internal outcome of an interaction differentiates those environments that yield that outcome from those that yield a different outcome

— but without representing anything in particular about those environments.

Such differentiations serve as the basis for setting up consequent indications of interactive potentiality.

Passive such differentiations (with no outputs) can occur as well. They are just not as powerful as full interactive differentiations.

Passive differentiations are input processors.

They are the paradigm of classic correspondence models of representation: they are presumed to represent whatever it is that they differentiate.

E.g., sensory encoding.

Other Kinds of Representation

Representation of the conditions (implicitly) for successful interaction does not look much like paradigm kinds of representation. What about standard kinds?

Object Representation

Conditionalized indications of interactive potentiality

Branching indications

Iterated conditionalizations

Yields (potentially) vast and complex webs of conditionalized indications

Sub webs that are:

- internally reachable
- invariant under manipulations and locomotions

constitute Piagetian representations of manipulable objects

e.g., toy block

Numbers and other abstractions

Levels of knowing

Reflective abstraction

Number: iterative count of control flow — Do X N times.

Also a roughly Piagetian model.

There is no aporia regarding more complex kinds of representation

Anticipation and Representation

It is anticipation that can be false.

It is anticipation that can be detected to be false by the system itself.

Anticipation is future oriented.

Standard models of representation are past oriented.

Anticipation is action and interaction based.

Joins the general pragmatist orientation.

Action base requires

embodied systems.

representation is fundamentally perspectival and contextualized.

All differentiations and interactive potentialities are for a system in a particular location, time, and orientation.

representation is temporally characterized.

Cannot be captured by the purely sequential formalisms of Turing machine theory (or equivalents) or by the decontextualized encodings of formal model theory (or equivalents).

Future orientation requires:

essential involvement of modalities - interactive possibilities, impossibilities, and necessities - in contrast to non-model encoding models.

Anticipation is the core of representation and cognition, and forces multiple important changes compared to standard models.

Three Desiderata for a Model of Representation

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The relationship between representation and content must be:

System internal	Else	Relation to content must be imported
System accessible	Else	Status as representation must be imported
System normative	Else	Normativity must be imported

Interactive Representation as the Fundamental Form of Representation

Interactive representation:

- Naturalistically emergent
  - Not epiphenomenal
- Internally related to its content
  - Does not require an external interpreter
- Functionally accessible
  - Internally related to the functioning of the system
- Inherently normative
  - Truth value
  - The possibility of error
  - System detectable error
    - Therefore avoids radical skepticism

Problems with Alternatives

This model is different in its fundamental assumptions from alternatives available in the standard literature.

I will address:

Millikan
Dretske
Fodor
Cummins

Encodingism

Representation Still Resists Naturalism
Millikan

Etiological, therefore epiphenomenal

X represents Y if it is the function of X to represent Y

Something has a (proper) function if it has the right evolutionary history to have that function — if it has the right etiology

It is the product of an appropriate selection history

Therefore, function is constituted in having the right history

Therefore, function is not constituted in current state

Two lions

Therefore, etiological *function* is causally epiphenomenal

Only current state can be causally efficacious

Therefore, etiological *representation* is causally epiphenomenal

Representation Still Resists Naturalism
Millikan II

Circularity

Content is constituted in the past — the evolutionary history

Not accessible to organism

Error is in misapplication of content to present situation

Not definable in terms of current state;
therefore epiphenomenal

System detectable error is impossible
Therefore error guided behavior and learning are impossible

Content not accessible by organism,
therefore comparison with current situation not possible

But, in any case, comparison with current situation requires representing current situation

And this is the original problem of representation —
circular for the organism
This is the radical skeptical argument

This comparison is possible only for an external observer

Representation Still Resists Naturalism
Dretske

Etiological, therefore epiphenomenal

Learning etiological rather than evolutionary etiology:

X represents Y if it is the function of X to represent Y

Also an etiological model of function

A learning etiology, in this case

Therefore, epiphenomenal

Only in the mind (explanation) of the observer
Circularity or regress

Dretske renders representation in terms of its usefulness in explanations of the system processes

"**C is recruited as a cause of M *because* of what it indicates about F, the conditions on which the success of M depends**." pg. 101

This cannot be a causal "because" — Dretske intends it as an explanatory "because"

But this makes it impossible to model the representations of the explainer

Circularity or regress

Representation Still Resists Naturalism
Dretske II

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Representation Still Resists Naturalism
Fodor

Correspondence models:

informational, causal, *nomological*, isomorphic correspondences

The error problem:

The correspondence exists, therefore the representation exists and is correct.

The correspondence does not exist, therefore the representation does not exist.

There is no possibility of a representation existing but being false.

There are only two possibilities — the correspondence exists or it doesn't — but there are three representational conditions to model: exists and is correct; exists and is false; does not exist

Fodor's solution: Asymmetric dependency:

False instances of correspondences are asymmetrically dependent on correct instances

Counter-example: neural transmitter and poison

Captures at best functional error

Asymmetric relations among counterfactuals that constitute asymmetric dependency cannot be modeled in terms of current system state.

Therefore, Fodor's model is also epiphenomenal

Representation Still Resists Naturalism
Fodor II

Circularity

Content is constituted in the asymmetric dependency relations among external evocations of (nomological) transduction

Not accessible to organism

Error is in misapplication of content to present situation

Not definable in terms of current state;
therefore epiphenomenal

System detectable error is impossible
Therefore error guided behavior and learning are impossible

Content not accessible by organism,
therefore comparison with current situation not possible

But, in any case, comparison with current situation requires representing current situation

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Representation Still Resists Naturalism
Cummins

Distinction between target and representation
- Error occurs when representation is applied to a target which it does not ‘fit’

Content of representation is a structure
- ‘Fit’ is the relationship of structural isomorphism

Target/Representation distinction is roughly the correct way to account for error
- Anticipated in the interactive model:
  - differentiation/indication
  - contact/content

There is no fact of the matter what the structure is in a physical system
- Car to run a maze
  - Steer wheels with peg running through slot in a card
  - If shifts in the slot are isomorphic with the required turns of the car, then it will succeed in running the maze

But:
- read the domains of magnetization along the edges of the slot, rather than run a peg through it, and the “structure” will be totally different

Structure is a matter of read-out

Which is a functional matter

And is superfluous for influence of system activities

Can always be eliminated in favor of organization of the system processes

Representation Still Resists Naturalism
Cummins II

Furthermore:

If the goal is to hit the side of the maze at a certain point, then the card is no longer a correct “representation”

The normativity of representation is not inherent in the system, but in the observer

And the relevant structure is functional in both
a process influence sense, and in
a normative sense

Neither are naturalized

Problems with Encodingism

Encodingism: the assumption that representation is encoding

Example: Morse code
"..." encodes "S"

Representation constituted in some kind of encoding correspondence
causal, nomological, informational, conventional

Myriads of fatal problems:
All such correspondences are logically external, thus require interpreter, which initiates a vicious regress

Too many correspondences

Possibility of error

Possibility of system detectable error

Skepticism/ idealism

Piaget's 'copy' problem

Incoherence

Possibility of emergence
Innatism is not a solution

Epistemic Contact and Content

Contact

Differentiation of the environment constitutes contact with that environment

It is the basis on which anticipations of interactive potentiality can be set up

Content

Indications of interactive potentiality involve dynamic presuppositions that can be false
And can be discovered to be false

Those dynamic presuppositions constitute representational content
Thus, the indications constitute representations

Encodingism

Standard approaches construe passive differentiations, as in sensory processing, as constituting **encoded** representations of that which is differentiated

This is a conflation of contact and content

Semantic Decision

With contact and content distinguished, which should be called representation?

Contact = representation is the classical position
- But this implies that representation has no truth value
- Plus many additional problems
  - E.g., too many correspondences

Content = representation captures the primary character of representation, truth value

A Macroevolutionary Ratchet:
Knowing, Learning, Emotions, Reflective Consciousness

Interactive Knowing
- Successfully interacting

Learning
- Microgenesis
- Failure of interaction destabilizes local microgenesis
- This suffices for simple learning;
  - heuristic learning, self-directed anticipatory learning, require more sophisticated architectures
- **A direct modification of interactive processes**
- **Increases adaptability**

Emotions
- How to interact with unknown situations — microgenetic uncertainty
- Learning processes too local: need general heuristics for microgenetic uncertainty — e.g., run
- Signal of microgenetic uncertainty generated as input to interactive system
- System can now interact with system condition(s) of uncertainty — successful interactions resolve uncertainty
- Positive, negative emotion: anticipations of success or failure in resolving the uncertainty
- **A direct modification of learning processes**
- **Increases adaptability**

Reflective Consciousness

Emotions interact with uncertainties of interactive processes

Ability to interact with first level interactive processes per se would increase adaptability — e.g., planning

Could arise as increased ability to interact with microgenesis processes that generate first level interactions

Second level interacts with, represents, modifies, etc. first level

A direct modification of emotions processes

Increases adaptability

Knowing, learning, emotions, reflective consciousness constitute basic human species capacities

Adapted to adaptability

These constitute the framework within which other specializations exist, and out of which further emergents develop

Further differentiations, specializations, and emergents:

Perception, Memory, Motivation, Rationality, Sociality, Persons, Personality and Psychopathology, Ethics

These four sections constitute the preliminaries to a current book project:

The Whole Person: Toward a Naturalism of Persons

Apperception and Perception

Situation image
World image

Update of situation image = apperception
    Keeping track of current structure of interactive potentialities and their interdependencies

Based on ongoing interactions and their outcomes
    And on existing situation image
Context dependencies

Any interaction will influence apperceptive processes
    Some kinds of interaction are specialized for apperceptively useful differentiations

Perception = interactions primarily involving evolutionarily specialized neural physiology for apperceptive processes
    Differentiated by modality:
    Vision
    Hearing
    Touch
    Etc.

But the *function* of 'perception' is not restricted to such physiological specializations
    Radar
    Sonar
    Brown ring test in qualitative chemistry

Perception is a functional kind of interaction
    Specialized for differentiation/ detection
Perception is *not* a preliminary phase of input/information processing

Perception and Gibson

Perception is basically Gibsonian

It involves interactions of the perceptual systems

The locus of perception is affordances/interactive potentialities

Perceiving is ongoing — there are no snapshot perceptions

Pickup of information is direct
- Differentiation interaction creates internal state with same information concerning affordances as the differentiated condition
- Information in the light concerning the affordances of the lay-out are picked up directly in the creation of internal state from visually interacting with 4D structure of light
  - Parallax
- Error in Fodor and Pylyshyn critique of Gibson:
  - Pickup of information in the light is ***not*** necessarily the pickup that the light is so-and-so (the encoding of the light properties)

However, Gibson's metatheory is problematic
- Homunculus arguments are telling against encoding/information processing models
- Arguments against involvement of memory, learning, inference are valid against encoding versions of these
- But invalid against non-encoding versions, including Gibson's own model
  - E.g., tuning as information past dependence

Also, context dependency of perception does occur
Perception is not *merely* contextless information pickup

Perception and Sensory-Motor Contingencies
O'Regan and Noë

Visual perception of an object will be constituted in fulfilled anticipations of scanning interactions and the flow of process involved in those interactions.

O'Regan and Noë have independently proposed that perception of, for example, color, is constituted in the same sort of fulfilled anticipatory processes, but the pattern of changes that is anticipated derive from the *sensori-motor contingencies* involved in the interaction, including, in particular, the distribution of differing kinds of receptors in the retina.

Just as a toy block will afford various kinds of scanning flows, so also a red patch will afford various *patterns of changes in the patterns* of receptor activity in accordance with visual scans.

Memory

Episodic memory is canonical for encoding models
Not so for interactive models, so how do they account for episodic memory?

The basic framework is that of interactive control organization
Must be emergent in infrastructure of system
Learning modifications — requires some sort of store of modifications in that infrastructure

Representation is emergent in interactive organization
So, anything that can be represented can be stored
Memory issues become, in part, issues of kinds of representation

Tulving / K. Nelson hierarchy of types of memory

Enactive

Semantic

Episodic

Autobiographical

The challenge of episodic memory:
Apperceptive (re)construction.

Higher Order Anticipatory Processes

Higher order anticipations in the service of increasing **adaptability**.

Macro-evolutionary sequence:

Knowing, Learning, Emotions, Reflexive Consciousness

Interactive Knowing

Representation emergent in action selection.

Motivation is the problem of action selection.

Representation and motivation are two aspects of the same underlying system organization.

A system continuously in process, taking into account the organizations of interactive potentialities as its flow of interactive process proceeds. This is a process flow that is inherently:

contentful,

from a point of view,

contextualized and situated.

These are crucial properties of simple, unreflexive **consciousness**, or simple awareness. Even this level of the model can begin to account for some properties of consciousness.

Learning

If interactive **failure yields reorganization** of interactive control processes (in an appropriate way), **then a primitive form of learning can emerge**.

Heuristic learning requires additional powerful process architectures.

This is a modification of simple interactive knowing, and an increase in adaptability.

Emotions

No way available to interact with uncertainty situations other than learning trails.

No generic modes of interacting with uncertain, novel situations.

Uncertainty information available for learning.

Feed this signal into system as an input.

Now the system can interact with its own uncertainty.

Propose: **emotions are interactions with system process uncertainty**.

Positive, negative emotions.

This is a modification of knowing, learning system, and an increase in adaptability.

Contrast: emotions as blends of four basic emotions — might as well be earth, air, fire, and water.

Reflexive Consciousness

Emotions are a partial meta-level interaction with first level system process. Now consider **full meta-level interaction with system process**.

Such **a second level system will be able to**:

Track first level interactive process and organization.

Rehearse particular first level processes and contents.

"**Examine**" first level interactive organization as a means to planning and anticipating the environment.

Such second level processes constitute a model of **reflexive consciousness**.

As is familiar, such a step: 1) constitutes an increase in adaptability over a system capable only of emotions (e.g., planning), and 2) it is generated by a modification and addition to processes already present in emotion systems.

Yet again, we have a next **macro-evolutionary step of increasing adaptedness to adaptability**.

It is worth pointing out that this sequence of knowing, learning, emotions, and reflexive consciousness is in fact the sequence in which these phenomena evolved.

Quality of experience.

The flow of first level interaction is inherently contentful, with the content being about environmental properties.

The **flow of second level knowing** will be inherently contentful, with the **content being about first level properties**.

Among them will be the properties that distinguish one kind of ongoing first level interactive flow from another - the **properties that distinguish one experiential flow from another**.

Such second level analysis and representation is a model of the **emergence of the consciousness of experience**, and of the quality of experience, including, in cases of highly abstract analysis, perceptual qualia.

Qualities of experience, in this model, are **emergences of second level analysis** of first level experience.

They are **not originary and constitutive** of that first level experience.

Qualia, for example, are **not building blocks of perception**, nor of perceptual experience. It is a vestige of mistaken positivistic empiricism to assume that they are.

Motivation

Motivation cannot be the problem of what makes the system do something rather than nothing (substance assumption)

If a recursively self-maintaining system does nothing, if a living system does nothing, it ceases

Motivation must be the problem of what makes the system do this rather than that — the problem of interaction selection

- Cuts across all of the macro-evolutionary levels of knowing, learning, emotions, and reflective consciousness

This is the problem toward which representation is functional, and why representation emerges in evolution (and robotics)

Motivation is the aspect of selection of processes, and representation is the aspect of anticipation in the service of such selection

Motivational emergences:

- Goals
- Endogenously active system with emotions:
  - Exploration
  - Curiosity
  - Competence motivation
  - Mastery motivation
  - Esthetic motivation

Furthermore, such explorations of what is most satisfying will tend to discover and emphasize not only what provides the greatest opportunity externally, but also what fits best with prior kinds of talents and experience in the individual. That is, such explorations will *tend* to develop the potentialities of the person, so long as they are not precluded or blocked by more demanding forms of process. Such a tendency to actualize the potentialities of the person is sometimes referred to as a motivational process itself (Csikszentmihalyi, 1990; Holdstock & Rogers, 1977; Maddi, 1996; Mook, 1996), but it is not so much a direct matter of selection of further activity as it is an emergent tendency of consequences of such selections.

Knowing Levels

Interactive system successfully interacting with its environment is **knowing** (properties of) that environment
Knowledge is capability of knowing

Such a system may itself have properties worth knowing
But, an interactive system is not directly reflexive

Requires second level system interacting with the first

Properties of second level system require third level
And so on — unbounded hierarchy

Must these all be physically distinct levels?

Programs on Turing machine tape could simulate indefinite numbers of levels
With only one machine level
Ascend knowing levels functionally

But requires appropriate symbolic language

Species with only one interactive level can only “think in action”
No ability to develop complex language

Species with two interactive levels can develop true symbols and complex language
Can use language and other symbolic external representation to ascend knowing levels functionally

Further Knowing Level Emergents and Models

Reflective Abstraction
- Externalize and Reflect
- Aristotle and syllogistic forms

Developmental stages
- Second level seems to mature at about 3.5 to 4
- Age 4 transition
- No other domain general transitions

CNS and second knowing level
- Ascending/descending reticular activating system
- Prefrontal to caudate to reticular nuclei in thalamus
- Double alternation

Critical Principles and Rationality

Fundamental Character of Mental Process:

Heuristic constructive variation and selective retention of control and regulation of interactions.

NOT logical rationality.

Will develop vicariants for error to be avoided - internal ‘knowledge’ of selection pressures.

With knowing levels, will develop representations for kinds of error. When articulated, these form the basis for criticism - thus

Critical Principles

Critical principle ascent through the knowing levels:
construction, selection, unfolding

Hierarchies of critical principles about critical principles:

- some affirming lower level critical principles
- some infirming lower level critical principles

Rationality: tendency toward constructive ascent through critical principle hierarchies
Also, the knowledge thus constructed

Construction of critical principle knowledge, and knowledge of how to avoid those errors, constitutes **movement away from error**

- Critical Principles as skeleton of rationality is reflexively justifying
- There is no attempted justification based on movement toward truth

Critical Principle Rationality and the Philosophy of Science

- the rational function of truth and realism in science,
  testing for quarks vs. Reggeons
  not an issue of accepting truth of model, but of testing for failures of truth — truth as critical principle
- the nature of progress in science,
  Aristotle, Newton, Special, General
  place variant, place invariant, velocity invariant, acceleration invariant — a **cumulation** of critical principles, even though radical breaks between theories satisfying those principles
- the rationality of certain induction-like considerations.
  increased warrant from increased testing from ruling out more rivals
  decreasing marginal warrant from iterations of same test
  increased warrant for X from ruling out rival Y, even if by a test not directly relevant to X

Whewell's consilience and meta-consilience as form of support for the Interactive model.

What about Logic?

Extensions of implicitly defined representations:
Partitions rather than collections of individualized and individuated correspondences to singulars.

Logic as the study of invariances with respect to automorphisms of individuals —
precisely what is given in implicitly defined extensions.
Tarski, Mostowski, Sher

Because extensions of representations are higher level properties of those representations (Bickhard & Campbell, 1986), formal properties are second knowing level properties (Sher, 1991, 1996a, 1996b):

- "some" = "nonempty extension";
- "every" = "empty complement of extension";
- "and" = "intersection of extensions";
- and so on.

Situation Conventions

Situation Image/Knowledge
World Image/Knowledge

How to interactively characterize, how to apperceive, a situation involving another agent
An agent's interactive affordances depend on that agent's characterization of the situation, which includes that agent's characterization of the first agent.
Each agent's characterization depends on the other's

Schelling: coordination problem
Lewis: convention as solution to coordination problem
    Lewis requires regularities of behavior
  Need conventions for unique coordination problem situations: situation conventions
  Lewis: establishment of conventions via precedent and habituation, thus do not need conventions of language in order to develop conventions of language (contra Quine)

Examples:
  Meeting Tuesdays at restaurant XYZ for lunch
  This is a lecture/class situation

Epistemological reflexivity
- A hierarchy of levels of presupposition underneath the basic situation; conventions for invoking conventions (invocations must solve coordination problem)
- Fallibilistic epistemology

Ontological reflexivity
- A hierarchy of levels of perspective on top of the basic situation
- E.g., marriage ceremony in a play

Situation convention

Institutionalized convention
- General to classes of persons and across times
- Involves conventionalized means of invoking the convention: situation (driving), insignia of rank, etc.

Conventions reduce information costs of coordination
- Costs otherwise usually paid in time, and often making coordination and its results impossible

Reduction in information costs is a major reason for social organization
- E.g., money, civil law, cities

Language

Utterances as encodings of mental contents
- A universal model that cannot work
  - Can't epistemically access different realm with encodings
    - I.e., another's mind
  - No ground for learning such encodings

Utterances as interactions — with what?
- Not directly with other minds
  - Else successful utterance of a command would require that it be obeyed
- Successful utterance involves understanding, but not necessarily accepting, obeying, etc.

Utterances as operations on, transformations of, situation conventions

Productivity requires constructability of full utterances out of parts

Linguistic situation convention as common understanding of discourse and sentence construction status toward transformations of broader situation conventions

Ubiquitous context dependency
- Kaplan: character

Utterances do not have truth value
- They may create representations (comprising situation conventions) that have truth value

Syntax well formedness of encoding strings
Semantics encoding rules — truth value
Pragmatics use to which encoded strings are put

- These are not theory neutral distinctions — they cannot be made within the interactive model
- E.g., utterance might be used to create representation with truth value, which mixes issues classified as semantics and pragmatics

Grammar - variation on categorial grammars

Derivation of Universal Grammar from functional considerations

- Subject-predicate from locality restrictions requiring specification of transformation locus and transformation character
- Koster's UG principles from more detailed examination of locality requirements

Utterances are themselves not encoded transformations

- Epistemological reflexivity of utterance apperception
- Hermeneutic circle
  - Difficult language: old texts, language learning, therapy
  - Creative language, adult or child
    - Poetry
    - Metaphor
    - "I chalked the wall"
    - "I buttoned the phone"

Persons

Persons are an emergent ontology above that of biological human beings.

Intrinsic sociality: temporally complex trajectories of interaction. Humans afford this to each other, and have an intrinsic interest in participating and exploring these possibilities in virtue of exercise and development of their capacities.

Such complexities with others constitute social realities.

Humans have an intrinsic interest in participating in and co-constituting social realities.

If human biology were that of a computer, this would involve no more than lots of social data and rules in the computer storage.

Humans are constituted, however, in their interactive nature.

That interactive nature develops as a massively social ontology, culturally and historically situated and constituted.

Psychopathology

Dysfunctionality and rigidity.

Psychopathology only if we cannot learn our way out of dysfunctionalities: rigidity.

Rigidity is not addressable in standard substance and structure frameworks — structures are inherently rigid.

Autoprotective ways of being in the world.

Central terrors.

Psychopathology is a normative dysfunctionality of development and learning.

Ethics

The potentialities of human existing are not discrete — they involve organization.

E.g., to become the kind of person who enjoys torturing others is (probably) possible for any child, but to become that sort of person precludes becoming a kind of person who can have any deep appreciation of human relating.

Human beings have an intrinsic interest in developing a maximally fulfilling way of being in their world, which world is largely social and cultural.

Eudaimonism

Fulfilling ways of being are virtues.

Not all virtues are inherently social, though certainly many/most will be.

Virtue ethics.

Failures of *development* constitute psychopathology.
Failures of *being* constitute ethical failures.