

Making up Minds: Sensorimotor Dynamics, Social Cognition, and Consciousness

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Broad research project:

Investigate relations between **consciousness** (both perceptual and emotional), and

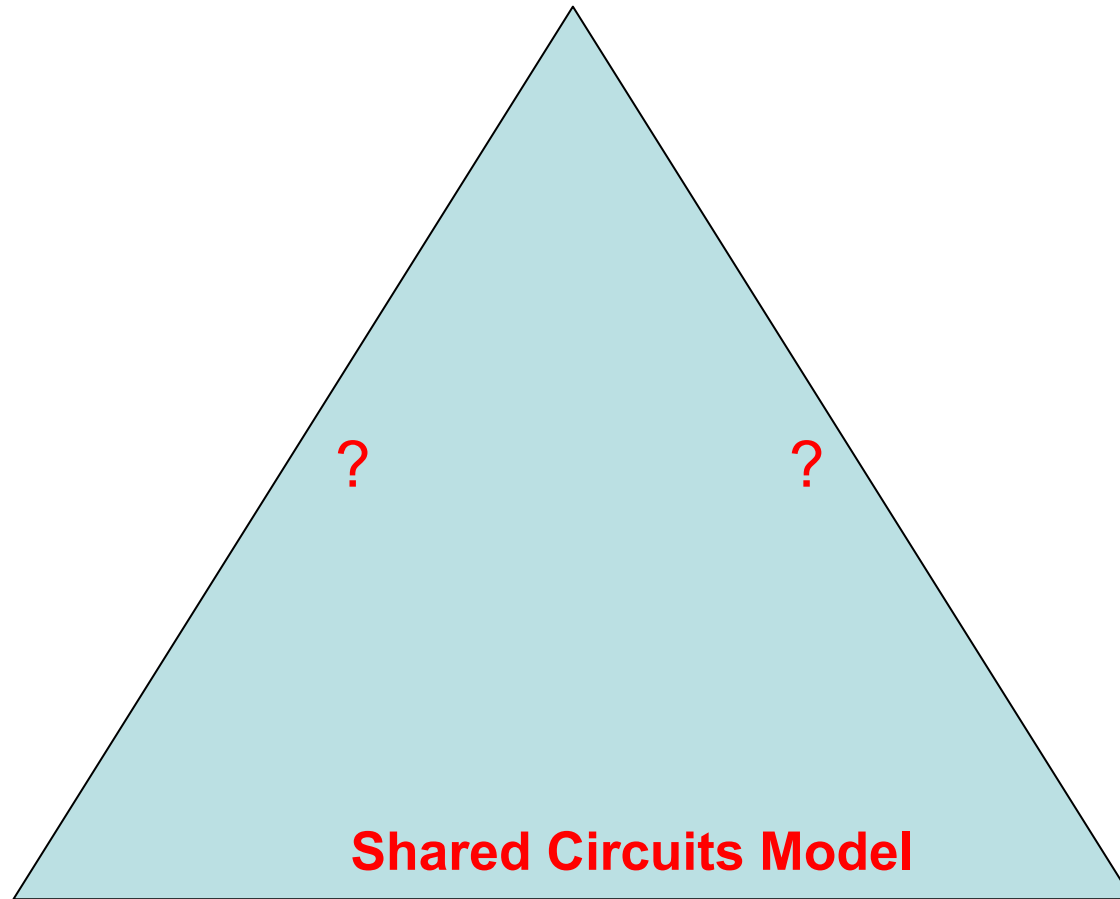
- 1. instrumental action** and the **sensorimotor dynamics** that make it possible
- 2. social cognition** and the **social mirroring dynamics** that make it possible,

building on the links between 1. and 2.
developed in the Shared Circuits Model.

What are sensorimotor dynamics?

- **Patterns of information flow** along different **input modalities** (vision, audition, touch, proprioception), different **motor outputs**, **actual feedback** from various motor outputs to various input channels (some of which may be within the skin, some pass outside the skin), and ‘predicted’ or **simulated feedback**.
- Simulation can function in SMDs **on-line** during environmental interactions, or **off-line**, with motor output inhibited.
- Noë tends to place ‘expectations of the sensory consequences of movement’ at the **personal level**, while I think of SMDs in **subpersonal** terms (Hurley 1998).
- In the Shared Circuits Model, social learning & cognition can be enabled by **mirroring the motor causes of observed actions**, in effect **reversing predictive simulations of the observable effects of motor output**.

Consciousness



Action: instrumental action,
rational agency, control,
sensorimotor dynamics

Social cognition: mindreading,
mirroring of action and
emotion, expressive action

Consciousness

Absolute vs. comparative explanations

synaesthesia

SMD vs. 2VS

Consciousness as interface between basic motivation and instrumental cognition (Dickinson)

Instrumental vs. classical and explicit vs. implicit (blindsight, etc.)

Nonverbal paradigms for assessing animal consciousness based on instrumental rather than metacognitive access

Phenomenal vs. access consciousness

Absolute vs. comparative explanations

On-line vs. off-line simulations

Automaticity vs. rational control

Expressive actions, emotional expression, emotional mirroring

Consciousness' role in mindreading

Shared Circuits Model

Action: instrumental action, rational agency, control, sensorimotor dynamics

Social cognition: mindreading, mirroring of action and emotion, expressive action

Further theoretical and philosophical issues

- Intuitions about consciousness
- Explanatory externalism and supervenience
- Causal vs. constitutive
- Emergence

Extended sensorimotor dynamics (SMD) and qualities of experience

- We need to revise traditional conceptions of the role of supervenience in issues about internalism/externalism for qualities of experience
- Supervenience is the **WRONG CONCEPTUAL TOOL** to address these issues (contra eg Block in review of Noë)
- To see why, consider the assumptions of Kim's views on supervenience, often taken as a reference point

Quick review of Kim on supervenience

- Favors strong supervenience (SS) as conceptual tool for investigating mental/physical relations
- SS: $\forall M$ for any (mental property) M , if any x has M then there's some (physical property) P such that x has P , and $\forall y$ if any y has P it also has M .
- Weak S (WS) omits the second ' $\forall y$ '
- Ignores near-worlds nomological S

Kim's internalism: SS must be *local*

- 1993, 177: “Explanatory psychological properties and relations are supervenient upon the current **internal physical properties** of organisms” at same time
- 1993, 183: “I think it is important to be able to defend a form of the thesis that does not go outside the organisms, a thesis that claims psychological states to be supervenient on the ***internal physical states*** of the organism” at a time

Further expression of Kim's internalism

- 1993, 190: actual tree vs. internal representation of tree makes no difference to behavior
- 1993, 289: It's widely regarded as plausible that "the internal cause of physical behavior must be supervenient on the **total internal physical state of the agent or organism at the time.** For it seems a highly plausible assumption that if two organisms are in an identical total internal physical state, they will emit identical motor output"

Underlying Kim's internalism is his **temporal atomism**

—i.e. he ignores dynamics

- 1998a, 36: “The internal cause of physical behavior must be supervenient on the total internal state of the agent or organism **at the time**”. Duplicates at a time will emit identical behavior.
- 1998b: 146: “Someone whose **momentary** neural/physical state is exactly identical with yours will emit the same behavior...”

Kim conceives the mental in terms of properties and states rather than temporally extended dynamic processes

- Extended dynamic interactions between embodied brain and environment are either ignored, or treated as merely part of the history that leads to an internal endpoint state, which is where causal powers of the mind reside
- Extended dynamics may explain how a mental capacity comes to exist, but realizations of it are internal and momentary

Problems with this picture from dynamic perspective

(Hurley, 'Varieties of Externalism', forthcoming,
Extended Mind, R. Menary, ed)

1. The magical membrane problem and the 'causal/constitutive error' error
2. How does the concept of a minimally sufficient supervenience base (MSSB) apply to nomologically coupled systems?
3. Variable neural correlates of a given quality of experience within a brain (not just across species, as Kim allows) show why qualities of experience do not require purely internalist explanation, despite illusions, but open up the possibility of extended dynamical explanation

1. The magical membrane problem

Puzzle: given the strength and prevalence of explanatory gap intuitions, why are internalist assumptions for qualities of experience so strong?

If we have **no conception of how phenomenal qualities *could possibly* be explained** (as per explanatory gap intuitions), then why is the conditional intuition so strong that **IF they can be explained, it *must* be in terms of factors within a special boundary, internal factors?**

What is so special about this boundary?

Boundaries and errors

Assuming without independent justification the internal/external boundary that generates the **magical membrane problem...**

also generates the **'causal/constitutive error' error...**

The 'causal/constitutive error'

- Supposedly, the error of regarding external factors as constitutive when they are merely causal
- But how is the causal/constitutive distinction drawn, and why are external factors regarded as constitutive in some cases and not others? Cf. content externalism and quality internalism.
- Critics of the causal/constitutive error rarely say, and thus commit the...

The 'causal/constitutive error' error

- The error of objecting, to some forms of externalism, that external factors are 'merely' causal not constitutive, assuming that constitutive factors must be internal and giving no account of why.
- E.g. Block, review of Noë 2004
- This error assumes the internal/external boundary at issue in the Magical Membrane problem, with no independent justification

How should the causal/constitutive distinction be applied to dynamical systems?

- This is a hard question in general
- The concept of causation may not have general application to complex dynamical physical systems--it is arguably a special case (Ladyman and Ross, *Everything Must Go*; cf. Kim's dated conception of physical causation)
- Ignoring this question may lead to assuming temporal atomism, as in Kim, thus ignoring the possibility that qualities of consciousness are best explained in terms of temporally extended dynamics, as kinds of process not properties of states
- Temporal extension can erode assumed boundaries, leads to spatial extension (Dennett 1991)

Causal vs. constitutive?

- Do SMD and ‘active’ explanations of consciousness commit a ‘**causal/constitutive error**’?
- How should this distinction be drawn? Why is it so **often invoked** and so **rarely explained**?
- **Can it be defended** in application to the complex dynamical systems involved in consciousness?—I am skeptical (cf. physics, economics)
- Are there **any good reasons to draw it between perception and action, or between internal and external processes**?
- Some proponents of the distinction commit the ‘**causal/constitutive error**’ error, of begging the question by placing this boundary where it suits their theoretical preconceptions, without giving an independent account of why.
- **Do we need it?** Let’s get on with seeking good explanations; there’s no non-question-begging a priori basis for deciding whether they are ‘merely’ causal or constitutive. Bottom up, not top down methodology.

2. Supervenience-failure vs. explanatory externalism

- How is **explanatory externalism**, as in extended SMD accounts, related to traditional philosophical discussions of externalism in terms of **local supervenience** or its failure?
- Hypothesis: **Supervenience is not the right issue**, for purposes of understanding the roles of environmental interactions in consciousness as a natural phenomenon. **Explanatory externalism does not require local supervenience to fail**, e.g. when internal and external factors are not explanatorily separable (internal not unpluggable, consistently with laws of nature).

Minimally sufficient supervenience base and nomological coupling

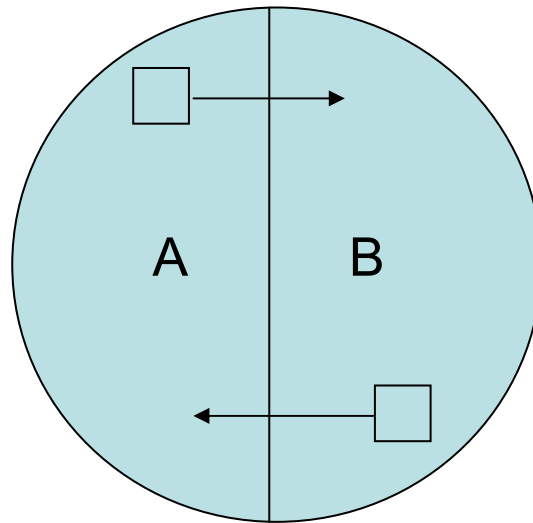
- Local supervenience is often expressed as the claim that the minimally sufficient supervenience base (MSSB) for a given type of experience is an internal physical state
- How does the concept of a MSSB apply to dynamically coupled systems? I.e. in which the parameters of one are the variables of the other and vice versa?

Nomological coupling

- We're interested in **nomologically** coupled systems, just as we're interested in natural minds, consistent with the laws of nature, not merely in our conceptions of the mind (which may not apply to minds as they naturally are)
- Nomologically coupled systems are not explanatorily separable, given the laws of nature; it is irrelevant to understanding qualities of experience as natural phenomenal that nomologically coupled systems may be decoupled in far-out conceptually possible worlds where the laws of nature don't hold

Nomological coupling and supervenience?

Quality C



Nomological coupling and supervenience?

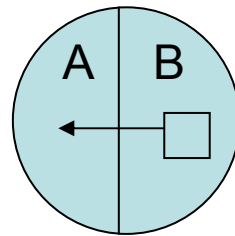
- Suppose A and B are nomologically coupled, such that whenever A undergoes process x, B undergoes process y and vice versa.
- Suppose that whenever processes x and y obtain in the coupled systems A and B, quality C is experienced
- A and B could both be internal, or one might be external

For example

- Suppose whenever brain system A undergoes process x, brain system B undergoes process y, and vice versa, and that whenever this happens quality C is experienced by the animal or person whose brain and body are at issue
- Then is A or B the MSSB for C?
- What if B is a body/environment system?

What is the MSSB?

- Is A or B the MSSB for C? Or are both? If the latter, why isn't one regarded as merely providing causal inputs to the other? Arbitrariness issue: which one?
- How does the answer differ if the nomological link is unilateral: whenever B undergoes process y, A undergoes process x?



3. Variable neural correlates of consciousness (NCC)

- NCC can vary within one brain, not just between species (as Kim allows), suggesting a kind of subpersonal disjunctivism that undermines arguments from illusion/mistake to internalism and admits explanations of qualities in terms of extended dynamics
- Consider a typical internalism argument from illusion

Internalist argument from illusion

- Local illusions share specific quality with veridical experiences, despite differences in environment
- There must be a purely internal way to explain the shared quality of experience, given external differences (even if we can't understand how).
- If external factors not needed to explain specific qualities of experience, they aren't needed to explain global phenomenal state either.
- If global phenomenal state can be explained internally, it should supervene non-trivially on internal factors, eg for neural twins in supervenience thought experiment, where external factors differ.

WHY LOCAL ILLUSIONS AND HALLUCINATIONS DO NOT SUPPORT QUALITY INTERNALISM

This argument seems to support internalist intuitions about the neural twins despite explanatory gap concerns.

But it makes a false claim at step 2: sameness of quality despite external differences does not require purely internal explanation

Neural correlates of a given quality type can vary

- between illusions and veridical experiences
- between token veridical experiences of the same type, before and after perceptual adaptation
- across normal development within one brain, given normal neural plasticity:

Domesticating variable neural correlates

Variable realizations of mental states in aliens have been used to argue for functionalism against 'tissue' views.

But variable neural correlates aren't just for Martians—they begin at home.

Childrens' brains are quite different from adults'. Some brain areas produce 100,000 synapses per second in infancy; interaction-driven pruning follows throughout development.

Explanatory externalism and variable neural correlates

What explains sameness of quality types when there are variable neural correlates as well as different external factors?

Explanatory externalism: In some cases where there are both internal and external differences between instances of a quality type, the best what-quality explanation may appeal to external as well as internal factors

VARIABLE NEURAL CORRELATES (NCs): AN EXAMPLE COMPARING ILLUSORY AND VERIDICAL EXPERIENCES

**(1) NC of veridical no-environmental movement experience
when you move your eyes:**

*dynamical pattern among motor signals, actual visual
feedback, simulated visual feedback*

(2) NC of illusory-movement/paralyzed-eye experience:

*motor signals, simulated visual feedback, no actual visual
feedback*

**(3) NC of veridical earthquake experience, qualitatively the
same as illusory-movement experience:**

*actual visual inputs, no motor signals, no simulated
feedback*

Quality the same in (2) and (3) though NCs differ.

The explanatory priority of veridical cases

To explain sameness of quality given variable neural correlates, we should **start with veridical cases** where NCs vary.

In perceptual adaptation, illusions induced by sensorimotor distortions often adapt away and veridical experience returns.

E.g. Kohler's color-divided goggles: each lens blue to one side, yellow to other. NCs of given experience type differ before wearing goggles and after adaptation.

HOW DOES EXTERNALIST QUALITY EXPLANATION HANDLE VARIABLE NCs IN VERIDICAL CASES?

Explanations of quality type when NCs differ can involve characteristic extended, multidimensional dynamic patterns, including multiple sensory and motor channels plus actual and simulated feedback.

The neural implementations of these higher-order invariant patterns can relocate in response to distortion, yielding variable neural correlates of a given quality type.

Extended SMDs and variable neural correlates

- Extended sensorimotor dynamics (SMD) contribute to explaining qualities of consciousness **in certain cases (not all)**.
- SMD explanations better at addressing comparative than absolute explanatory gap.
- In particular, when there are **variable neural correlates of a given phenomenal quality**:

E.G. tactile experience by the sighted and by the congenitally blind has different neural correlates, involving visual cortex in the latter but not the former case. Shared tactile SMD can explain the shared tactile quality of experience across these cases, despite different neural correlates.

Another e.g.: Kohler's goggles

Suppose experiencing white is associated with a characteristic dynamic sensorimotor pattern before wearing the goggles.

After adaptation, a white object continues to look white as the eyes move across the midline of the goggles, not first blue then yellow.

The neural portion of the sensorimotor dynamic for white is re-implemented, reparameterized to reflect eye movement, etc. (Gibson)

NCs before and after: both participate in the extended dynamic for experiencing white, reflecting among many other things the fact that objects don't change color with eye movement

VARIABLE NEURAL CORRELATES WITHIN EXTENDED EXPLANATORY DYNAMICS

Externalist hypothesis: in some cases a boundary-crossing extended dynamic, rather than just internal factors (including variable NCs), best explains experience type

Feedback loops rope in external factors; degree of extension is governed not by ultimate causes but by the orbits of output-input loops in interactive dynamics

What experience is like can be open to *what the world is like*, as adaptation reflects

VARIABLE NEURAL CORRELATES WITHIN EXTENDED EXPLANATORY DYNAMICS

- **Plausibility of externalist explanation depends on dynamic rather than snapshot character of experience. Internalist intuitions often turn on unargued snapshot assumptions.**
- **Whether extended dynamics best explain a specific quality is an empirical question, case by case.**
- **Neural supervenience doesn't answer this question, since it can hold trivially, when internal and external factors aren't explanatorily separable & internal factors not unpluggable from external.**

Claims I'd like to defend, based on following considerations:

- Nomological explanation, not supervenience, is the conceptual tool needed to investigate how natural minds are made up
- Dynamical explanation is the general form of nomological explanation, and may not map clearly onto the causal/constitutive distinction given complex nonlinear dynamics
- Dynamical explanation is the framework within which externalism about consciousness should be understood. It concerns consciousness as a natural phenomenon, and does not assume an outdated conception of physical causation.