On Epistemic Integration: Toward an Analysis

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Outline

Motivating Interest in the Topic
  – Interdisciplinary Philosopher
  – Introducing the Toolbox Project
  – One Lesson from the Toolbox Project

What is the Problem?
  – From the Perspective of Interdisciplinarity
  – From the Perspective of Philosophy

Pursuing a Solution
  – Monism > Pluralism
  – Three Claims

Toward an Analysis

Concluding Thoughts
What Is the Problem?

From the Perspective of Interdisciplinarity

• Just what is *epistemic integration*?

• Look to those who work on interdisciplinarity—e.g., the National Academies defines interdisciplinary research this way:

  Interdisciplinary research is a mode of research by teams or individuals that *integrates* information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice (NAS 2004, 2)
What is the Problem?

The Defining Feature?

• “Integration is widely regarded as the primary methodology of interdisciplinarity” (Klein 2011, 283)
  – A “making whole” of different disciplinary elements (e.g., languages, concepts, models, methods, frameworks) that is sui generis and involves collective, iterative explanation and problem solving

• “Harnessing differences” – Bammer (2013)
  – Different “disciplinary and stakeholder perspectives” must be “harnessed as part of the knowledge synthesis” (42)
  – The characteristic feature of IDR is the bringing together or integration of differences
What is the Problem?

Can There Be a General Theory of Integration?

• The Principle of Variance: There is “no universal formula for integration” (Klein 2011, 293)
  – There are too many variables to consider: focus, goals, scope, complexity, type, means
  – “The [ID] process is not algorithmic” but “heuristic and constructivist” (Klein 2011, 296)

• Other Reservations
  – Holbrook: the emphasis on integration in accounting for ID communication is not necessary (Holbrook 2012)
  – Stone: the emphasis on integration in ID theory reflects a discipline-based logic that is not necessary (Stone 2012)
What is the Problem?

The Problem in One Form

• From one prominent perspective on interdisciplinary theory and the science of team science,
  – Integration *defines* interdisciplinary activity, but
  – There is no accounting in general for integration

• Perhaps, though, this is just a problem for interdisciplinary theory?

• What we’re after here is a *conceptual analysis*, so we should look to philosophy to provide illumination...
What is the Problem?

Beginning with the Word

• Think about contexts in which ‘integrate’ and its cognates are used
  – Mathematical, social-political, technological, philosophical, etc.
  – They are many and heterogeneous

• Focusing on the philosophical context:
  – Integration in various contexts and forms prompts philosophical curiosity
  – Understanding phenomena *as* integrated represents a philosophical advance
What is the Problem?

Integration in Philosophy

- Philosophy of biology: evo-devo, Darwinian synthesis
- Philosophy of mind: perception, the binding problem, learning
- Philosophy of action: collective intentionality, joint action
- Philosophy of language: name reference, joint construal
- Epistemology: belief revision, accounts of understanding
- Metaphysics: mereological fusion, relation between properties and objects
What is the Problem?

Integration in Philosophy

• What is integrated?
  – Objects
  – States (e.g., perceptions, propositional attitudes)
  – Concepts
  – Propositions
  – Data
  – Methods
  – Explanations
  – Theories
  – Fields/Disciplines

Information
What is the Problem?

Integration in Philosophy

• So the term and related terms (e.g., ‘synthesis’, ‘fusion’, ‘merging’, ‘unification’) show up in a variety of places in philosophy

• Preliminary observations:
  – It applies to things that differ in kind and scale
  – It is found across the full range of philosophical fields
  – It involves different modes of combination:
    • Those that wash out difference (e.g., compound – consciousness, integrative pluralism)
    • Those that preserve difference (e.g., mixture – name reference, understanding)
Integration in Philosophy

• The Prevalence of Metaphor: figures drawn from other contexts are used to reconceptualize and redescribe integration

• Examples:
  - Interplay
  - Compound
  - Bring Together
  - Amalgamate
  - Synthesize
  - Merge
  - Combine
  - Fuse

• One characteristic that seems common is *combination*, but this is not an analysis—more of a metaphorical shell-game (Boix Mansilla 2010)
What is the Problem?

The Problem in Another Form

• From the perspective of philosophy,
  – Integration functions as a kind of explanatory lens on problems across the conceptual spectrum
  – We don’t have anything in general to say about it

• Thus, we find evidence in word and action for the conclusion that integration does not admit of a general account, despite its conceptual centrality
Monism > Pluralism

• Should we just take this to be a sign that pluralism about integration is the way to go?

• Perhaps, but here I would like to follow the methodological dictum of Anscombe:

  “Where we are tempted to speak of ‘different senses’ of a word which is clearly not equivocal, we may infer that we are in fact pretty much in the dark about the character of the concept which it represents” (Anscombe 1957, 1)
Examining Epistemic Integration

• How to begin? Anscombe continues: “There is, however, nothing wrong with taking a topic piecemeal” (Anscombe 1957, 1)
• The piece I’m interested in is *epistemic integration*
  – As noted above, this is the type that is featured in interdisciplinary activity
  – It is also a prevalent type in philosophical treatments
• I’ll present and defend three claims about epistemic integration that are intended to advance us toward an analysis
Examining Epistemic Integration

- How can we think about *epistemic integration*?
- Adopt a “big tent” interpretation that does not limit us merely to work in epistemology
- Provisionally, take epistemic integration to be:
  - A type of combination process that is essentially dependent on or has immediate implications for how agents function in representing the world
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Examining Epistemic Integration

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• Adopt a “big tent” interpretation that does not limit us merely to work in epistemology
• Provisionally, take epistemic integration to be:
  – A type of combination *process* that is essentially dependent on or has immediate implications for how *agents* function in *representing* the world
  – Information will figure importantly into this
  – Not all of the contexts of integration are epistemic, e.g., contexts in metaphysics and outside of philosophy
Integration in Philosophy, Again

- **Philosophy of biology**: evo-devo, Darwinian synthesis
- **Philosophy of mind**: perception, the binding problem, learning
- **Philosophy of action**: collective intentionality, joint action
- **Philosophy of language**: name reference, joint construal
- **Epistemology**: belief revision, accounts of understanding
- **Metaphysics**: mereological fusion, relation between properties and objects
Claim 1: Nested Levels of Epistemic Integration

• Epistemic integration can be seen as operating at multiple, nested levels:

  Subpersonal → Personal → Mutual → Collective → Dispersed

• Assumptions:
  – Take the agent to be a central feature of epistemic integration contexts
  – Specifically, take the agent to be the central integrator
  – As such, the involvement of the agent in epistemic integration becomes the principle for distinguishing levels
Claim 1: Nested Levels of Epistemic Integration

• Detailing the levels:
  
  • *Individual*. Agents are the locus of epistemic integration processes that operate within them and (in some cases) because of them
    
    – *Subpersonal*: There are those integration processes (e.g., perception, consciousness, belief revision and update) that seem to be built in to agents—the integration happens sub-personally, beneath intentional control
    
    – *Personal*: Others (e.g., learning, understanding) more clearly feature intentional control, at least to some extent
Claim 1: Nested Levels of Epistemic Integration

• Detailing the levels:
  
  • *Social*. Others involve groups; these can be stratified in terms of the degree to which agent control is relevant to the processes of integration
    
    – **Mutual**: The agent is indispensable (e.g., joint construal, joint action)
    
    – **Collective**: The agent is a contributor but is partially dispensable (e.g., collective intentionality, collaborative projects)
    
    – **Dispersed**: The agent is a contributor but is fully dispensable (e.g., theoretical unification, disciplinary development)
Claim 1: Nested Levels of Epistemic Integration

• These need not always be operative
  – Waking life involves the individual level processes
  – Collaborative, interdisciplinary activity is a situation in involving simultaneous integration at all levels

• All of these involve information combination that generates more comprehensive output that has immediate implications for how we understand agents to represent the world
Claim 2: The Ubiquity of Epistemic Integration

• Epistemic integration is a ubiquitous aspect of agency – that is, any context that involves agency will involve epistemic integration

• Assume the nested levels structure described above

• The Argument

  P1. Information is ubiquitous

  • It impinges on us as individuals and as members of larger systems (e.g., teams, collectives)
Claim 2: The Ubiquity of Epistemic Integration

P2. Agency requires that we process information and locates us in broader information networks

- Take the agent to be (at least in part) an information processing engine (cf. Perry 2002)
- Further, as part of larger systems, we contribute to the networked distribution of information that underwrites the development of broader perspectives and bodies of knowledge
- We are information networks, and we are nodes in information networks
Claim 2: The Ubiquity of Epistemic Integration

P3. To process information in these ways, we must organize it into practical structures (e.g., plans) that enable action (as opposed to mere behavior)

• Agents are rational, goal-directed systems that must filter, compile, and process this information to support intentional activity

• A necessary condition on agent success: information must be organized into practical structures that enable action
Claim 2: The Ubiquity of Epistemic Integration

P4. This organization requires integrating new information with old

- This follows from the dynamic nature of planning and action
- It is also a feature of agents because of the presence of feedback loops

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C. Epistemic integration is a ubiquitous aspect of agency
Claim 3: Epistemic Integration as Regulative Ideal

• Epistemic integration is a regulative ideal
  – It isn’t guaranteed, but it is required for effective and efficient information processing and successful goal pursuit
  – As such, it can be understood as a success condition on agency operative at the levels indicated above
Claim 3: Epistemic Integration as Regulative Ideal

• This is not a universal view of epistemic integration
  – Brigandt rejects this at the level of theories (Brigandt 2010)
  – He addresses the issue in the context of theory change in biology, which is at the *dispersed* level above

• I would like to argue that it is in fact a regulative ideal at all levels, including the dispersed social level
  – The reality of integration as a precondition on *effective* practical agency implies this claim of Brigandt’s is mistaken
  – By failing to see the ubiquity of information and the consequential ubiquity of integration, he fails to see it as an *apriori* condition to be achieved in every context
Claim 3: Epistemic Integration as Regulative Ideal

• The Argument

P1. Successful agency at the individual levels requires that we integrate information to structure action

P2. Success at the social levels also involves integration of information in the form of more complex representations, such as interpretations, explanations, and theories
Claim 3: Epistemic Integration as Regulative Ideal

- The Argument
  3. Integration of information is an essential part of the success conditions for activity at all levels

P4. If (3), then integration is a regulative ideal for activity at all levels

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C. Integration is a regulative ideal for activity at all levels
Claim 3: Epistemic Integration as Regulative Ideal

• One might fail to see this if one thinks that we integrate only when we are confronted by ostensibly incommensurable elements that must be combined
  – Integration: Reconciliation → Resolution
  – This requires work, and it is something we notice and in many cases perceive as difficult
  – At the individual level, though, we are built to integrate, with many evolutionary solutions to integration problems
  – The same is true at the social level—developing theory in support of explanation requires integration (O’Malley & Soyer 2012)
Claim 3: Epistemic Integration as Regulative Ideal

• **Concern**: Perhaps all that matters is that the results in these cases be *integrated*, and so *coherence* (say) would be the regulative ideal and not the process
  
  – This more static way of looking at it is more in line with the claims made in the philosophy of biology literature
  
  – *Tentative Response #1*: given that we are dealing with agents who are dynamic in character, how this gets done is crucial
  
  – *Tentative Response #2*: attention to process will be required when the reconciliation phase of integration is foregrounded
Can There Be a General Theory of Integration?

• We believe the answer to this question is yes—there is a universal formula for integration
  – Integration implies reconcilable difference that admits of resolution at some level
  – We favor a polyparameterized theory of integration that takes it to be a multi-dimensional phenomenon

• The idea would be to develop a very general analysis that applies across the spectrum of integration episodes and then specify it in various ways for the epistemic context
Some Theoretical Structure

- **A Simple View**: Where $A \neq B$, $S$ integrates $A$ and $B$ just in case
  - (i) *Reconciliation*: $S$ takes $A$ and $B$ to be integrable, and
  - (ii) *Resolution*: $S$ brings $A$ and $B$ into relation $R$, where $R$ is determined by $S$ relative to interests and purposes
Some Theoretical Structure: Binary Models

- **Consumption**: A > B
- **Transformation**: A > C
- **Combination**: A > AB
- **Annihilation**: A > __
- **Serialization**: A > A → B
- **Subsumption**: A > B
- **Conservation**: (The Null)

Toward an Analysis
Concluding Thoughts

Principal Claims

• Integration, and epistemic integration in particular, are topics worthy of general philosophical examination

• Epistemic integration:
  – Involves agents as integrators
  – Is a ubiquitous aspect of agency
  – Operates at levels stratified in terms of agent control
  – Is a regulative ideal of agency at those levels

• It is possible to develop a theory of integration that can be specified to apply to epistemic integration

• Such a theory can inform our understanding of IDR
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References


Toward an Analysis

Some Theoretical Structure

• **Assumptions:**
  – Integration as a process is ubiquitous and multi-level
  – Integration involves combining things taken to be integrable; this implies a *reconciliation* stage and a *resolution* stage:
    • At the reconciliation stage, the things in question are determined to be integrable (relative to interests and purposes)
    • At the resolution stage, the things are combined
Some Theoretical Structure

• **A Simple View:** Where $A \neq B$, $S$ *integrates* $A$ and $B$ just in case
  
  – (i) *Reconciliation:* $S$ takes $A$ and $B$ to be integrable, and
  
  – (ii) *Resolution:* $S$ brings $A$ and $B$ into relation $R$, where $R$ is determined by $S$ relative to interests and purposes
Some Theoretical Structure

- **A Simple View, Formalized:** Where \( A \neq B, I_S(A, B) \leftrightarrow \)
  - (i) **Reconciliation:** \( \exists R_1(SEL_S(R_1, r) \& APP_S(R_1, <K_A, K_B>)) \)
  - (ii) **Resolution:** \( \exists R_2(SEL_S(R_2, r) \& APP_S(R_2, <A, B>)) \)

- Here, \{A, B, ...\} is the set of *integrable things*, \{K_A, K_B, ...\} are *kinds* to which members of the first set belong, \( R_i \) stands for *relations*, \( r \) stands for *reasons*, SEL is *selects*, and APP is *applies*.

- We ignore the temporal dimension for now.
Some Theoretical Structure

• *Read this:* S integrates A and B just in case
  – (i) S reconciles A and B by bringing the kinds to which they belong under a relation $R_1$ that S selects relative to pragmatic interests $r$ (i.e., by establishing that A and B are the right kinds of things to be integrating given S’s reasons), and
  – (ii) S resolves A and B by bringing them under a (possibly different) relation $R_2$ that is selected relative to the same reasons.
In Search of a General Theory

Some Theoretical Structure: Binary Models

- **Consumption**
  - $A \rightarrow B$

- **Transformation**
  - $A \rightarrow C$

- **Combination**
  - $A \rightarrow AB$

- **Annihilation**
  - $A \rightarrow B$

- **Serialization**
  - $A \rightarrow A \rightarrow B$

- **Subsumption**
  - $A \rightarrow B$

- **Conservation** (The Null)
  - $A \rightarrow B$

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Some of the above processes are reversible. For example:

- $B \rightarrow A$
- $C \rightarrow A$
- $AB \rightarrow A$
- $B \rightarrow B$
- $A \rightarrow A$
- $B \rightarrow B$

These reversible processes are marked by arrows pointing in both directions.