Inference

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Abstract

Chris Mole (2016, 2018) gives an account of inferences as *epistemic encounters* with propositions. That account escapes Susanna Siegel's (2019) objections to the Reckoning Model of inference, and by recognizing an intermediary phase in the process of inference between awarenesses of premise(s) and conclusion(s), provides explanatory resources not afforded by Siegel's preferred "Response Hypothesis". These resources enable Mole to draw a sharper epistemic distinction between inferences and merely inference-*like* mental episodes. But his analysis of the intermediary phase raises what we might call *the problem of prior cognition*, whereby it appears that something's being knowable by inference requires someone's prior awareness of it.[1] Here I argue that Mole's account suffers from an apparent instability. I suggest a strategy for resolving the instability, inspired by Wilfrid Sellars' "bootstrapping" of observational knowledge.

Profiling Inference

Epistemic dependence

What is it to be an inference? Here is a first stab: it is to be a mental episode characterized by an epistemic dependence of component psychological entities, which is typically but not always asymmetric. For example, when one reasons from prior knowledge of inclement weather – *it is raining, [so] the grass is wet* – awareness that the grass is wet depends on awareness that it is raining. This same dependence holds when one *thinks* in reverse – *the grass is wet, [since] it is raining* – but not when one *reasons* in reverse from prior knowledge of turf conditions: *the grass is wet, [so] it is raining.* In the latter case, awareness that it is raining depends on awareness that the grass is wet, and *this* dependence holds when one thinks in reverse: *it is raining, [since] the grass is wet.* These dependencies are epistemic ones - the characterizations of these mental episodes reflect rational, as opposed to natural, relations of psychological components. Borrowing terminology from Mole: inferences are *temporally achiral*, but typically *epistemically chiral*, mental episodes.[2]

Self-sufficiency for knowledge

Sound inferences from prior knowledge have a particularly striking epistemic profile: they appear sufficient for new knowledge, but known entailments appear insufficient for them. For a contrived illustration, suppose little Alice already knows that Leo is a lion, but knows nothing about mammals (in general), then comes to know at time t about mammals, including that lions are mammals. If Alice infers over the interval $[t, t']$ that Leo is a mammal, Alice knows at t' that Leo is a mammal. Good for Alice - she does not need do anything *else*. Everything required for her to attain some new knowledge goes into $[t, t']$. But if Alice does not infer that Leo is a mammal, new knowledge cannot *make* her infer it. She could see every mammal, know every entailment pertaining to lions or mammals, yet still not *draw* the inference, remaining obstinately unaware of Leo's mammalhood. Alternatively, suppose Alice is acquainted with the golden triangle, has a clear and distinct idea of its angular ratio, and knows at t that being triangular entails being trilateral. If she infers over $[t, t']$ that the golden triangle has three sides, she gets a better grasp at t' on the golden triangle. Yet she *may not* draw the inference. It will be convenient to package these appearances as the apparent *self-sufficiency* for knowledge of sound inference from prior knowledge. An account of inference should shed some light on this apparent self-sufficiency.

Conformity to principles

Conformity to an accepted principle of inference is neither necessary nor sufficient for a mental episode to be an inference. For the unnecessity, consider any admittedly ill-formed inference which you have drawn. For the insufficiency, consider that not every episode over an interval $[t, t']$, where S knows at t that it is raining and S's feet feel cold, and S knows at t' that S's feet feel cold, is an inference. Some mental episodes fitting this pattern are mere mind-wanderings. For insufficiency given a less tenuous epistemic dependence, consider that not every episode over an interval $[t, t']$ where S knows at t that S's car is in Lot A2, and S knows at t' that S's car is in Lot A2 or in Lot B2, is an inference. Some mental episodes fitting this pattern are forgettings. When they are forgettings, what S knows at t' depends epistemically on what S knows at t, and supposing S to be a classical logician, the sequence of knowings exhibits the form of a valid argument accepted as such by S. We should be able to distinguish inferences from cases of mind-wandering and forgetting, but conformity to accepted principles of inference cannot fund the distinction between inferences and such inference-like but non-inferential mental episodes.

The Reckoning Model and Response Hypothesis

On what Siegel (2019) dubs the Reckoning Model of inference (RM), the psychological components of inferences are mental states, and an episode is an inference in virtue of being a state-transition, between epistemically discernable basal and upshot states, mediated by a reckoning state.[3] I will

speak of subject S realizing a token-of-a-type mental state as S *thinking that...*, and adopt a schematic form for special intermediaries: — *is licensed (given ...)*. The RM can then be stated in such a way as to respect the epistemic chirality (and typical temporal achirality) of inferences: S inferring Δ from Γ is a response by S, who thinks Γ, to thinking that Δ is licensed (given Γ).

The explanatory role of reckoning states

At first sight of the RM, a certain sort of skeptic observes that, supposing S thinks Γ, S *may not* respond by thinking Δ to thinking that Δ is licensed (given Γ). Taking the skeptic's bait, a proponent of the RM might reply that S responds by thinking Δ to thinking that Δ is licensed (given that Γ *and* Δ is licensed (given Γ)). To which the skeptic will retort: supposing S also thinks that Γ *and* Δ is licensed (given Γ), S may not respond by thinking Δ to thinking that Δ is licensed (given that Γ *and* Δ is licensed (given Γ)). The skeptic's challenge thus recurs. Such a reply to the skeptic leads straight to a Tortoise and Achilles-style regress (Carrol 1895), with a more complex reckoning state, demanded at each stage, failing to do the intended explanatory work.

Pending a satisfactory response to the skeptic's challenge, the RM's source of appeal is its putative role in an overall account of mental phenomena, whereby (endurant) mental states are understood to be explanatorily prior to (perdurant) mental processes. Given an account of the form and content of mental states generally, and of various sources of psychological influence, the RM presumptively introduces inferences into a state-based ontology as specific sequences of specific states. Reckoning states are supposed to enable the "stringing together" of simpler states into a "perdurant mental compound" (Mole 2016, p. 122). So the philosopher concerned with foundational issues can get on with explaining (i) how elementary bits of mental stuff come to have the forms and contents that they have, and (ii) how these bits are combined in complexes subjected to (syntactic) transformations and made to answer (semantically) at any given time to the bits of which they are composed.

The response hypothesis

Siegel (2019) raises some noteworthy issues with the RM.[4] Her negative argument aims to show that epistemic dependence of an upshot state on a reckoning state is not necessary for an episode to be an inference; there may only be epistemic dependence of an upshot state on a basal state, with no higher-order representation of a relation relating these.[5] Her positive view is that the bare Response Hypothesis (RH) - that "inferring is a distinctive kind of response to an informational state, or to a combination of such states" which characteristically produces an upshot state - is preferable to the full-blown RM. That is because (i) the RH is entailed by the RM, (ii) the RH does not entail the RM, and (iii) the RH does the explanatory work demanded of the RM without positing any additional complexity - thus leaving it invulnerable to Tortoise-and-Achilles-style regresses.

Siegel's claim that the RH "sheds light on the nature of inference" is dubitable. The RH enables

introduction of inferences, as responses of a distinctive type, into a state-based ontology, and so does the metaphysical work demanded of the RM. Epistemologically, though, the RH only enables us to distinguish the case in which S *infers* that S's car is in Lot A2 or Lot B2 from prior knowledge that S's car is in Lot A2, from the case in which S merely *forgets* where (exactly) S's car is, by adverting to the hypothesis that S infers the disjunction only if S knowing the disjunction is due to a distinctive type of response by S to her knowing a disjunct - namely, an *inference*. This does little to assuage the sense that inference is mysterious - the RH seemingly just labels the mystery. A more illuminating account should give us more purchase on the apparent self-sufficiency for knowledge of the (token) inference from prior knowledge.

Dynamic foundations instead

Mole (2018) differs from Seigel in basing the distinction between inferences and merely inference-*like* mental episodes in intermediary *takings* of a basal state to support an upshot state. This appears to leave Mole's account vulnerable to Siegel's criticisms of the reckoning model. However, Mole argues that takings need not, and should not, be construed as intermediary *states* in which the thinker *represents* (however indirectly) a relation of basal and upshot states.[6] Rather, Mole suggests that we understand takings to be perdurant entities - mental *acts*, in the sense of actions rather than actualities - in which the thinker actualizes an upshot state, and if all goes well, thereby attains new knowledge of how things are. He thus proposes that we appreciate the root difference between inferences and merely inference-*like* mental episodes by accepting the traditional appeal to a special intermediary, but rejecting the state-grounded-processes view in favor of either a flat or process-grounded-states view of the order of explanatory priority with respect to inference.[7]

Epistemic Encounters

Mole's chief motivator for rejecting the state-grounded-process view of inference is an argument, attributed to Ryle, to the effect that if special intermediaries are construed as *states*, the attempt to "leverage" inferences into one's ontology as sequences of states, will inevitably leave some "explanatory residue". That argument runs roughly as follows. What distinguishes e.g. a inference from Γ to Δ from a mere *forgetting*, is involvement of a special intermediary, *that* Δ *is licensed (given* Γ*)*. On the state-grounded-process approach, that special intermediary is a state positioned in a temporal sequence: there is a thinking of Γ, a thinking of Δ, and somewhere in between a thinking that Δ is licensed (given Γ). However, we can imagine cases where the thinker thinks Γ, thinks Δ, and merely *chances* upon the thought that Δ is licensed (given Γ), e.g. while mind-wandering in the intervening period. For any given sequence of contentful mental states proffered as constituting *the (token) inference* from Γ to Δ, we can imagine an identical sequence which is - in Mole's choice terminology - a mere serial "bobbing up" of thoughts. The difference between

the mere serial "bobbing up" and the inference (proper) is an "explanatory residue", inevitably left over by a state-grounded-processes approach to explaining mental phenomena.

With such residue brought to light, Mole proposes that we instead put dynamic (perdurant) entities into a *foundational* role in the domain of the mental. That is, we posit some basic dynamic mental entities, then "leverage" inferences into our ontology on the basis of these, "so as to avoid the need for a stage in our explanation at which purely static mental elements are strung together into a perdurant mental compound" (2016, p. 122). Mole takes *epistemic encounters* to be appropriate primitives, then attempts to distinguish inferences as a species of epistemic encounter. It will be useful to sketch Mole's groundwork for this account.

Intuitions underwriting "epistemic encounters"

An argument for there being some relatively pretheoretic notion in the neighbourhood runs as follows. For any given subject S and time t, S's episodic memories at t must pertain to happenings before t, whereas S's semantic memories at t may pertain to happenings after t. S can for example remember the departure of her plane at t only at times $t+i$ after t, but S might remember at various points $t-i$ before t that her plane departs at t. Since it is intuitively correct that there are epistemic and not merely affective psychological differences between episodic and semantic memories, and between types of semantic memories, our intuitive judgements must be sensitive to something like differences in kind of "epistemic encounter". In summary, those intuitions run: (1) S's episodic and semantic memories at any given time t are all *memories* in virtue of being *knowings* based in episodes ending at some $t - i$ before t; (2) Each of these earlier episodes is one wherein S encounters *something* which is the object of some memory; (3) S's memories differ as to the kind of entity encountered or the way in which it is encountered; (4) S's *semantic* memories differ amongst themselves *not* as to the kind entity encountered, *but* as to the way in which it is encountered; (5) The objects of semantic memories can be encountered in at least three ways; (6) The objects of *pre facto* semantic memories can be encountered in only two ways; Finally, (7) the way in which the object of a semantic memory is encountered reflects epistemically on the subject that encounters it.

Toward a theory of inference

Some elaboration will make (3-7) a bit less abstract. I draw on Mole (2016) but with (5) and (6) develop a distinction for which he is not liable. Whereas S's episodic memories are based in, typically, perceptual encounters with *events*, her semantic memories can be based in (i) perceptual, (ii) interpretive or (iii) inferential encounters with propositions. S's *post facto* semantic memories may be based in an encounter of any one of these types with the object of the memory. But her *pre facto* semantic memories must be based either in inferences, or in interpretations of other perceptually encountered, typically linguistic, states of affairs - e.g. parts of a prognostic report.

Finally, whether the object of a *pre facto* semantic memory is encountered via inference or via interpretation is reflected in its epistemic profile. If S remembers Δ on the basis of inferring Δ from Γ, then S must know Γ, but if S remembers Δ on the basis of interpreting a report made by S' who infers Δ from Γ, only S' need know Γ, and S need only know that reports by S' are reliable. An example will draw out the implications of this last difference.

Suppose patient S is terminally ill and remembers, to her dismay, that she will die in 3-6 months. Her remembering this depends on her remembering a physician's report. The physician who remembers that S will die in 3-6 months on the day of S's follow-up, relies on prior knowledge and the facts of the case. Barring medical advances, the patient may yet change her epistemic situation by undermining her belief in the reliability of the physician's report. Further, she can avoid this situation altogether, by doubting the reliability of the report at the point of interpretive consumption. She may demand a second opinion. This shows that something else is required of the subject to acquire an interpretation-based *pre facto* semantic memory. Schematically: S *knows* Δ on the basis of interpreting a report by S' to mean Δ *only if* S also takes it that reports by S' are reliable.

Does the physician have a similar option for changing his epistemic situation? He may alter his position *in retrospect* by undermining (e.g. in argument with other experts) the token-of-a-type inference via which he came to know that S will die in 3-6 months. Yet he cannot avoid his situation altogether. The physician is authoritative with respect to the prognosis. The expert community of which he is member is authoritative with respect to the correctness of the inference. The physician *knows* when he (first) produces the report that S will die in 3-6 months as a result of knowing the facts of the case and about the disease, and in this position (correctly) *inferring* that the patient will die in 3-6 months. His awareness of the prognosis is knowledge *even if* he does not take it *that* the inference is sound (or otherwise rational). To demand that the physician take it *that* the inference is sound - or think *anything* pertaining to the inference itself - in order to know via the inference that S will die in 3-6 months, places an impracticable burden of self-monitoring on him. To demand as much generally would make for too narrow a theory of knowledge to cover the full range of *explananda*. This is not to say that one who attains new knowledge by inference from prior knowledge is *precluded* from self-monitoring, just that self-monitoring is not *necessary* to attain knowledge, and so to aquire an inference-based *pre facto* semantic memory. Regarding the apparent self-sufficiency for knowledge of sound inference from prior knowledge, we have, schematically: S' *knows* Δ by inference from Γ *since* S' knows Γ and S' correctly infers Δ from Γ. But if the foregoing is right, we must add: S' correctly inferring Δ from Γ does not imply that S' monitors his inference.

Looking ahead, Mole ultimately holds that for an episode in which S knows Γ and comes to know Δ *to be* an inference from Γ to Δ, something else *is* required, but on the part of Δ, not S. In other words, it turns out that S *infers* Δ from Γ *only if* Δ does some work. Further, Mole suggests that when Δ does this work, S infers Δ from Γ *if* S does some work. The work of Δ remains a bit

mysterious. The work of S is *taking it* that Δ is licensed (given Γ). Thus, supposing that Γ entails Δ, from Mole's account as I understand it, we get: S knows Δ by inference from Γ if S knows Γ, Δ does some work, *and* S *takes it* that Δ is licensed (given Γ). For Mole's account to be tenable, a stable position needs to be carved out on which S can *take it* that Δ is licensed (given Δ) without any prior awareness of Δ, so that S may *insodoing* first become aware of Δ. After presenting his attempt at carving out such a position, I isolate an apparent instability. The initial incision is what I will just call *the argument for asymmetry.*

The argument for asymmetry

Mole argues that there is an asymmetric dependence of epistemic encounters with events on epistemic encounters with propositions. Another morbid example will draw out the argument for dependence. If S remembers the second 9/11 attack (around 2001-09-11, 13:03:02 UTC), e.g. on the basis of an event (around 2001-09-11, 14:01:01 UTC) in which she encountered the attack as presented on television, then S probably remembers of a certain plane *that* it exploded on impact with a tower. On the other hand, if S remembers nothing pertaining to the attack - not even that a plane hit a tower - then S probably does not remember the attack. In short: one is in a position to have memory-based knowledge of the attack only if in a position to have memory-based knowledge of some proposition(s) pertaining to the attack. More generally: "one can remember an event only if one can remember some proposition pertaining to it" (2016, p. 128). As episodic memories require semantic memories, epistemic encounters with events require epistemic encounters with propositions. Such is the argument for dependence.[8] Note, however, that one *can* remember an event without remembering any propositions pertaining to *encountering* that event. *Flashbulb* memories, e.g. of the 9/11 attacks, are *anomalous* in their being suffuse with perceptually-prompted *semantic* memories pertaining to the event of one's *getting the news.* Likewise, though one certainly knows of an event if they remember that they were at *xyz* when they saw it on *abc*, we are rarely in such a condition of self-monitoring.

It is easily shown that one can encounter a proposition pertaining to an event without encountering the event to which the proposition pertains; barring retrocausal influence, it must be so when S remembers before t that her plane departs at t. But to establish asymmetry, it needs to be argued that one can epistemically encounter a proposition without epistemically encountering *any* event. Again, when S has memory-based knowledge before t that her plane departs at t, her knowledge is based either in an inference or in an interpretation. If S's memory that her plane departs at t depends epistemically on her taking her travel agent's report to be reliable, S's encounter with the proposition depends also on a perceptual encounter with the event of the travel agent's report. Generally, for any *interpretive* propositional encounter, one can identify an event – perceiving of a *token* – which is both necessary for that encounter to occur and *itself* an epistemic encounter with an event – a *tokening.*

For asymmetry, then, one must hold that there are *inferential* propositional encounters which do not require an epistemic encounter with any event. For any inferential propositional encounter, one *can* identify an event which is necessary for the encounter to occur, but here plausibly the only event necessary is the (token) inference. We are thus confronted with an epistemological choice-point. Supposing Γ entails Δ, S knows Γ at t, and S infers Δ over the interval $[t, t']$, ought we say S knows Δ at t' only if S knows *of* S inferring Δ over $[t, t']$? A affirmative answer implies symmetry: if the episode being an inference by which S comes to *know* Δ, implies that S knows *of* the episode *that* Δ is, in the instance at t', licensed (given Γ), then symmetry of the dependence follows. But if, as suggested of the physician's inference, the upshot of an inference may be knowledge in the absence of knowledge of *any* proposition pertaining to the inference, asymmetry follows. The argument for asymmetry thus hangs on the denial that self-monitoring of one's inference is necessary to attain knowledge by inference from prior knowledge.[9]

Formal Determination

From the arguments for dependence and asymmetry, Mole extracts a necessary and sufficient condition for epistemic encounters with events: S epistemically encounters an event e if and only if S *somehow* epistemically encounters a proposition p pertaining to e and the *how* of S's encountering p is influenced by e.[10] For perceptual encounters with events and matters of fact pertaining to those events, the required influence is plausibly always a *causal* influence. S comes to be in a position to know truths or believe falsehoods about an earlier event in virtue of the causal influence of that event or its participant objects. So it is when e.g. S observes photographs sequentially projected onto a screen and thereby gets into a position to know something about the event photographed. However, Mole sticks his neck out in extracting from the discussion of epistemic encounters with events a schematic necessary condition on epistemic encounters generally:

> A subject epistemically encounters [an entity] x only when that subject's x-regarding conduct proceeds in a way that is determined by the form of x (2016, p. 129).

Two implications are worth noting immediately. First, when the object of an epistemic encounter is a *proposition* and the encounter is inferential or interpretive, it is supposed to be the form of a proposition which determines the *how* of the encounter. Yet propositions *qua* abstract entities "are metaphysically ill-suited to the job of *causing* things to happen" (2016, p. 131). In response to this conundrum, Mole distinguishes two types of impact of the intelligible order on the thinker.[11] Since "[t]he determination relation [in the propositional case] cannot be a straightforwardly causal one" he allows that "there is some other way - some not straightforwardly causal way - in which the object of an epistemic encounter can determine the form of one's conduct" (2016, p. 131). Second, the above condition on epistemic encounters apparently precludes anything *becoming knowable* via an epistemic encounter, because - as Mole puts it - "*anything* that can be epistemically encountered,

whichever sort of epistemic encountering is in question, must *already* be in a position to determine the form of one's epistemic conduct" (2016, p. 150). As I understand it, Mole's response to this conundrum rests on an implicit distinction between two senses in which an entity e can be a *potential* object of knowledge. In the *absolute* sense, *every* actual entity e is *always* a potential object of knowlege for *us*. But in the *relative* sense, only entities which a subject S is in a position to think about at time t are potential objects of knowledge for S at t. In other words, entity e is a (relative) potential object of knowledge for S at t only if S has a *prior representation* of e at t. Given something like this distinction, Mole attempts to make room for epistemic encounters with absolute but not (yet) relative potential objects of knowledge. Thus he argues that formal determination by an entity e of the e-regarding conduct of S at t does not require that S have a *prior representation* of e at t. Finally, in approaching our *initial* epistemic encounters *via inference* with absolute potential objects of knowlege, Mole suggests that formal determination by e does not require that *anyone* in the epistemic community have a prior representation of e.

Inference as Epistemic Encounter

Self-sufficiency revisited

Recall the argument for conformity to an accepted principle of inference being insufficient for a mental episode to be an inference. The signal cases were mind-wandering and forgetting. When I think sequentially: *it is raining*, *it is raining and my feet feel cold*, *my feet feel cold*, the fact that I accept, out of principle, the inference from *it is raining and my feet feel cold* to *my feet feel cold*, does not of itself qualify the episode as an inference. At intermediary points in this sequence I might chance upon the thought of conjunction elimination, and the thought that I accept this principle. But chancing on these thoughts does not make the mind-wandering into inferring. Alternatively, suppose I know and recite to myself after parking, *my car is in lot A2*, but later to my dismay can only muster *my car is in lot A2 or in lot B2*. If in the intervening period it occurs to me that what I know of my car's whereabouts entails the disjunction given disjunction introduction, *and* that I accept this principle, my knowing this about myself does not entail that my knowing the disjunction is the result of *inferring* it. I may know all this but still *forget* where my car is. Lastly, what distinguishes inference from mind-wandering and forgetting cannot be that one who infers has knowledge of what is inferred. Given that I have privileged epistemic access to how my feet feel, I may well chance upon knowledge that my feel feel cold when mind-wandering. The signal difference is that one who infers *thereby* comes to know something, and this feature of inference should be accounted for by regarding inferences as epistemic encounters with propositions.

A source of instability

Mole suggests an account of this apparent self-sufficiency: S knows Δ by inference from Γ *if* S knows Γ, and Δ does some work, and S rightly takes it that Δ is licensed (given Γ). At least, he develops the basis for such an account: S infers Δ from Γ *if* S believes Γ and S takes it that Δ is licensed (given Γ), but *only if* Δ formally determines her epistemic conduct. It will be helpful to separate the "if" from the "only if". Mole (2016, primarily) develops the "only if", with a claim to the metaphysical necessity for inference, given a dynamic-base "leveraging scheme", of embodied mental processes being formally influenced by something extra-mental. Mole (2018, primarily) develops the "if", with an argument to the effect that a *taking*, as intellectual act, reflects epistemically on the thinker in such a way as to be sufficient for their *inferring* something, as opposed to undergoing an inference-*like* mental process in which it just "bobs up". *Encounters* surface the joint at which the "if" and "only if" claims articulate; as real mental processes by which one comes to know how things are, they occupy a liminal position *viz.* the "order of being" and "order of knowing".

To retain inference as a route to *new* knowledge, Mole must say how something knowable but unknown can influence the epistemic conduct of a subject S *prior to* S ever thinking it. If inferences are epistemic encounters of a certain sort, then by the necessary condition on epistemic encounters, the object of the encounter has to play a determinative role, so Mole says that S infers Δ only if Δ formally influences some conduct regarding it. But if a sound inference from prior knowledge *qua* epistemic encounter is to be sufficient for new *knowledge*, the object of the encounter cannot be the "bare" content realized in the concluding phase of the inference. For S to come to *know* Δ, "bare", so to speak, Δ must first present itself to S under some warranting "guise", and S must first encounter the guise under which Δ presents itself. So, Mole says the inference from Γ to Δ is an encounter with the *well-supportedness* of Δ. But if S knowing Δ by a sound inference from prior knowledge does not require that S think *anything* pertaining to the (token) inference, as the argument for asymmetry requires, then S inferring Δ from Γ over interval $[t, t']$ cannot require that S thinks, prior to the realization of Δ at t', *that* Δ is *in that instance* well-supported (given Γ). S must thus encounter Δ under some warranting guise, prior to encountering the warranting guise under which Δ presents itself. So Mole says that the inference from Γ to Δ is an encounter with Δ *as* licensed (given Γ) (or *as* "well-supported"), and that Δ is "among the things that determine the way in which that inference proceeds" (2016, p. 146).

We can better isolate this apparent instability. Mole assumes cognitive equivalence, for S, of encountering Δ *as* licensed (given what S believes), and encountering the proposition *that* Δ is licensed (given what S believes). From "inferences are processes in which a subject epistemically encounters the inference's conclusion, as being entailed (or, at least, supported by) its premises" he reifies to get "inferences are epistemic encounters with the well-supportedness of their conclusions" (2016, p. 145). Surely an epistemic encounter with *the well-supportedness* of Δ (given Γ) is not an encounter

with Δ, but with the proposition *that* Δ is well-supported (given Γ). When one *epistemically*, as opposed to gustatorily, encounters the sweetness of an apple, one does not encounter *the apple* but the proposition *that* it is sweet, just as when one *epistemically*, as opposed to physiologically, encounters the dormative virtue of opium, one does not encounter *opium*, but the proposition *that* it induces sleep. If the inference from Γ to Δ is an epistemic encounter with the proposition *that* Δ is well-supported (given Γ), by the necessary condition on epistemic encounters, it is not Δ but *that* Δ is well-supported (given Γ) which must formally determine some conducting regarding *it*.

If the inference from Γ to Δ is *just* an epistemic encounter with the "inference ticket", not the conclusion, we have at best an account of inference as a route to hypothetical knowledge. A Tortoise-minded skeptic may insist that in knowing Γ and encountering the proposition that Δ is licensed (given Γ), one has not yet come to know Δ. Worse, if the inference from Γ to Δ is an encounter with the inference ticket *and then* Δ, *when* S first comes to know Δ by inference from Γ, it seems she must (i) *already* have encountered Δ, i.e. have a *prior representation* of it, and (ii) by dint of this representation, be monitoring the inference for rationality. If to know Δ by inference from Γ over the interval $[t, t']$, S must first know that Δ, in the instance at t', is licensed (given Γ), then the argument for asymmetry is undermined. But if, on the other hand, we grant that S may come to know Δ by inference from Γ without *yet* thinking that Δ is licensed (given Γ), it seems nothing remains to distinguish the inference from merely stumbling upon Δ (in a good light) while mind-wandering. As I understand it, in view of the latter option undermining the distinction between inferences and merely inference-like mental episodes, Mole commits to S inferring Δ from Γ being an encounter with the inference ticket, i.e. the warranting guise under which Δ first presents itself. To evade symmetry as a consequence, he proceeds to argue that when S encounters Δ under this guise, S need not have a prior representation of Δ. I think this is the wrong tack.

Temporal and epistemic priority

Here is what I think Mole *should* have said. In question is whether the inference is an epistemic encounter with, so formally determined by, the first-level proposition (or propositional aggregate) Δ, or the second-level proposition that Δ is licensed (given Γ). If the former, then S may come to know Δ by inference from Γ without *yet* encountering the proposition that it is licensed (given Γ). If the latter, then *when* S comes to know Δ by inference from Γ, she must have already encountered the proposition that it is licensed (given Γ). The latter implication is problematic, but the former implication merely *seems* problematic. If S may know Δ as a result of inferring it from Γ without *yet* thinking *that* it is licensed (given Γ), what remains to distinguish the inference from stumbling upon Δ while mind-wandering? The answer, I submit, is *someone* in S's epistemic community taking it *that* Δ is licensed (given what S believes) when S thinks Δ. Crucially, given Mole's commitment to inferences differing from merely inference-*like* episodes in virtue of an intellecutal act *on the part of* S, this someone may be S *herself* and the *taking* may be *retrospective*. Thus with inference S

thinking Δ may be *temporally* prior to S thinking *that* Δ is licensed (given Γ), but S thinking *that* Δ is licensed (given Γ) still *epistemically* prior to S knowing Δ.

Knowing contradictories by inference

There is reason to loosen this restriction of our resources to a taking *by* S. Consider the physician's knowing as a result of inference that his patient will die in 3-6 months. As noted, the physician, S', attains knowledge simply by inferring from his prior knowledge, and thus given occurrence of the inference he could not have *avoided* being in a position to *remember* that his patient, S, will die in 3-6 months. Yet, the physician may change his epistemic position by retrospectively undermining the (token) inference by which he attained knowledge of the proposition. So the physician may remember, some time after stating the prognosis, that S will die in 3-6 months, then come to *instead* remember that he mistakenly inferred that S will die in 3-6 months, and later remember that S will die in 9-12 months, before giving S the good news. To account for the physician's initial position being *knowledge*, despite his retrospectively denying *that* the prognosis was licensed given what he knew of S's case, we must look to the epistemic activity of some *other* member of his community - in this case, a taking by the patient, a nurse, or someone else who regards him as expert.[12] In the first instance, S' *infers* Δ from Γ in virtue of *someone else* taking it *that* Δ is licensed given what S' believes when S' thinks it. But having achieved reflective distance from his (earlier or later) epistemic conduct, S' may *infer* Σ from Γ in virtue of S' taking it that Σ is licensed (given Γ), where Σ is inconsistent with Δ. Thus S' may *understandingly* draw the inference, in full recognition of his authority as capable of accepting or rejecting a principle of inference therein instituted, and in doing so even come to know something inconsistent with what he knew.

Sufficiency of dyadic cognition

A variation on Mole's own example sharpens the above point. Consider the "student of syntactic algorithms" - call her S - "who is so well drilled that she can execute those algorithms parrot-fashion, as an exercise with its own syntactically driven momentum" (2016, p. 149). Suppose that S begins by producing some string of symbols, γ, she interpets to mean Δ, which she believes to be true. Then in constructing a derivation "parrot-fashion" she transforms γ and, say at t, produces something new - call it δ - which, say at t', she interprets to mean Δ. We may even suppose that S knows that her procedure is *sound*. Mole's claim is that, if for each stage in the construction, what S inscribes at that stage is fully determined by what is written at earlier stages, then S inscribing-then-interpreting δ is not an inference. In the inscribing of δ she "furthers her epistemic position" only to a point at which she can later observe the product of her labour and interpret it. In interpreting δ to mean Δ she "furthers her epistemic position" only to a point at which she can later bring Δ to bear on her epistemic activity. Though the interpretation of δ at t' may be an epistemic encounter with Δ *if* Δ influences the conduct of S over $[t, t']$, the interpretive encounter

does not qualify the episode as an inference. That is, at t' S may encounter Δ as the content of δ, but not as licensed (given Γ). Having interpreted δ to mean Δ, S could later, under the influence of Δ, take it that Δ is licensed (given Γ), thus encountering Δ *as* licensed (given what S believes), and so we may say *inferring* Δ. But if S wraps up her derivation, interprets the final product, says "neato" and forgets Δ an instant later, there has not yet been an inference, on Mole's account.

I think this is not quite right. Suppose S is a novice under the tutelage of master syntactician S' who also interprets γ to mean Γ and δ to mean Δ. My claim then is this: when S thinks Δ by interpreting the empirical product of her labour, S *infers* Δ *if* S' takes it that Δ is licensed given what S believes when S thinks it. So S may be said at t' to have inferred Δ from Γ - or encountered Δ *as* licensed (given what S believes) - *even if* S just says "neato" and forgets Δ. The required "formal influence" by Δ comes in not as a mysterious impact of the proposition on S's conduct, nor as S "envisioning" the realization *of* Δ in what she ultimately produces prior temporally to her producing it, but as S' recognizing in the *habitus* of S a pattern which explains the occurrence of a *specific* mental event then and there.[13]

A final illustration to reinforce the idea. Suppose Sherlock knows that the killer is either A or B or C, and Watson believes that the killer is either A or C. Now suppose they together come to know that C is not the killer, then Watson - by rote - runs some calculations in a notebook and thinks out loud: "A is the killer!". We may suppose Watson has no thoughts about how he got this idea. My claim is that Watson inferred that A is the killer - alternatively, encountered it *as* licensed (given what Watson believes) - *if* Sherlock takes it that what Watson says is licensed given what Watson believes when Watson thinks it. *Watson* need not take it that what he says is licensed given what he believes. But *Sherlock*'s taking it to be so when Watson thinks it positions a *pattern* to be found in Watson's behaviour and the broader epistemic community as a determinant of Watson's coming to occupy a certain epistemic position then and there.

Bootstrapping inferential authority

My gesture towards an alternative approach leaves something to be desired. There is an important difference between merely "going through the motions" and having those motions count as inferences only because others recognize them as rational - to whit, "aping reason" - and understandingly drawing inferences, in full recognition of one's own authority in doing so. A thorough account of this difference would require a much longer essay, but I will point to a model for such an account.

Wilfrid Sellars, most concertedly in *Some Reflections on Language Games*, developed an account of individuals as "bootstrapped" into conceiving themselves as observers. Sellars took empiricist worries about evidence seriously, while accomodating rationalist views on the fundamental role of rules in our understanding of ourselves-in-the-world. His sympathy with rationalism is evident in

his holism, and the oft-cited view that knowledge is a thoroughly normative affair, i.e. that to recognize something as a *knowing* is to locate it in a "space of reasons", which can by understood by analogy with a state-space defined by rules of a game. His sympathy with empiricism is evident in the claim that an individual knower appeals to a special sort of induction to initially justify her claim to being an authority on perceptible aspects of her environment, i.e. shapes and colors of things, etc. The "trick" Sellars turns in this account of observational knowledge, is to argue that the individual "enters into the normative game by meeting its demands" (Brown 2007, p. 354).

For Sellars, perceptual knowings – episodes in the normative order – presuppose, but are not reducible to, posited states of the observer in the natural order, which he calls *sensations*. In short, the ability to sense is innate, but the ability to perceive is acquired. Learning to perceive – i.e. to know about one's ambient environment by one's senses – requires crossing the Rubicon from differential responsiveness, mere noise-making with "thermometer" reliability, to deliberate assertion and justification of claims. The latter requires being able to defend of one's authority to make certain claims in certain circumstances, including ambient lighting conditions, etc. What grounds one's claim to authority in a present report, is demonstrated reliability as a reporter of empirically "basic" facts, e.g. about the colors of crayons, shapes of blocks, and the like, under various conditions. But then, it would seem, we are faced with an insurmountable regress: in order to inductively justify one's *first* claim to authority in making an observational report, one must *already* have an inductive base of authoritative reports in hand.

Sellars' solution to this regress rests on two claims. The first is that mature members of the community bring about *pattern-governed* behaviour in the novice individual, prior to their obeying rules, which forms the inductive base. The second is that the status of an episode as a perceptual knowing is not a natural fact about the episode, but rather the result of *evaluating* the episode, thus locating it in a normative fabric of justificatory give-and-take. Crucially, an episode can be so located, and so be conceptualized as a knowing, *retroactively*. Thus as Brown puts it: "we can retroactively recognize a past report as a case of justified perceptual knowledge even though at the time that the report was made, we lacked either (or both) a sufficient grasp of the normative business of justifying our claims or a sufficient inductive base of similar cases in which our reports proved correct", but having acquired these, "we meet the normative standards applying to knowers... [and] the cases in which we then recognize ourselves as meeting the standards extend back into the past, as well as forward into the future" (2007, p. 357).

I think there is room, in Sellars, to extend this account from perceptual to inferential knowings. The fruits of doing so can be glimpsed, *viz.* the "problem of prior cognition", by appreciating that if the aformentioned change in the facts about earlier episodes were *descriptive*, "it would require a bizarre and implausible kind of retro-causal influence by means of which a subsequent state or activity of the knower could causally alter the facts about his own epistemic past" (Brown, p. 357).

The basic mechanism I think might underpin such an extension, is a Tractarian nod in the direction of Mole's "formal determination", recast as natural-order imposition of combinatorial constraints on neurophysiological processing. Here, I must be brief and suggestive.

Sellars (esp. 1967) held there to be a distinction between *pictorial* and *logical* complexity. His account of predication made use of a fictitious language, Jumblese, wherein the work of predicates is done by arranging names, as a model for pictorial complexity. In Jumblese one expresses a relation of objects a and b by relating an 'a' and a 'b'. Jumblese "sentences" admit a sort of non-logical *amalgamation*, to borrow a term from Jay Rosenberg, which is quite distinct from *conjunction*, and whereby – through constraints on reduction of names-as-symbol-types to names-as-symbol-tokens – one can preserve a representation of unique objects variously arranged by unique name-tokens variously arranged, across various transformations. Most simply, if we represent that x is left y by writing 'xy', then from 'ab' and 'bc' we can form 'abc' by simply reducing types to tokens, and the resulting representation will be accurate if the initial ones are. Late in his life, Sellars articulated his account of predication in tandem with a theory of animal representational systems (1981, 1985). And as Rosenberg later observed, by construing sensory states of organisms on the model of a dialect of Jumblese wherein the representational function is carried by natural, as opposed to conventional, relations of name-tokens, we get "a conception of, e.g. an animal's total visual field at a given time as a single composite state functioning as a 'pictorially' complex representation of its then and there physical environment... [such that] metaphorically, the world 'speaks' to organisms through their senses" (Rosenberg 2007, p. 113). To this, I would only add, we obtain a sort of apish deductive "inference" about the natural order, from the very same combinatorial constraints that make pictorial complexes informative. Again, under the most simple scheme, if we have in hand an 'abc', we obtain new information about the world by simply erasing the 'b', so that we have in hand an 'ac'. My suggestion is simply that such transformations are to an extended bootstrapping argument, as sensations are to the original.

Conclusion

I have argued that we should, with Mole, recognize a sort of special intermediary, which distinguishes inferences from merely inference-*like* mental episodes. I have also argued, internal to the theory presented by Mole, that in avoiding instability, we need not reify the relation of what one comes to know by inference to the fact of their coming to know it. Instead, we may look to epistemic activity beyond that of the lone thinker. The more basic commitment, here, is that while inferences as psychological entities are happenings in the natural order, to conceive of an episode as an inference-based *knowing* is to locate it in a "space of reasons" which extends beyond one's embodied cognitive rapport with their environment. This does not, however, preclude inference from being ultimately rooted in combinatorial constraints, or "formal influence", imposed on us by our environment.

Notes

[1]Thus it seems Mole inherits, along with the ontological riches of Aristotle's *nous poiêtikos*, some epistemological debts to the Platonic Doctrine of Recollection. For an interpretation of Aristotle which draws out this debt to Plato, see Sellars' (1949) interpretation of *De Anima* III.4 - III.8. Mole explicitly recognizes the similarity of his account and Aristotle's appeal to the "active intellect". The most pertinent analogy, given the Sellarsian interpretation of Aristotle, is Mole's commitment to there being "some not straightforwardly causal way" in which propositions, as objects of epistemic encounters, determine the form of a thinker's conduct (2016, p. 131). Aristotle, likewise, is pushed by his view that the intellect "is effected in virtue of something common" (§429^{b}29), to posit a unique kind of action by which the intellect, *qua* that which "becomes all things", is effected. Downstream of this commitment, Aristotle faced a problem in accounting for contemplative knowledge: if the object of potential knowledge is the same as actual knowledge of it, then actual knowledge of an object must already be in place for that object to *become* an object of potential knowledge for a given subject. As Sellars puts it, "somehow we must be thinking of what we are going to think before we think it" (p. 561), and Aristotle posits the active intellect as the locus of this prior thinking. Downstream of his view that formal determination is a necessary condition on epistemic encountering, Mole faces an analogous problem: "*anything* that can be epistemically encountered, whichever sort of epistemic encountering is in question, must *already* be in a position to determine the form of one's epistemic conduct" (2016, p. 150), and this seemingly precludes inference from being a route to *new* knowledge.

[2]Contrast this character of inference with perceptions and memories of states of affairs. An episode in which sensing the wet grass is prior epistemically to perceiving that the grass is wet is not superimposable without variation of its epistemic profile on any episode in which perceiving that the grass is wet is prior temporally to sensing the wet grass. Nor is an episode in which perceiving that the grass is wet is prior epistemically to remembering that the grass is wet superimposable without variation of its epistemic profile on any episode in which remembering that the grass is wet is prior temporally to perceiving that the grass is wet. In each case a more favorable epistemic profile is had only if the episode has a certain temporal profile. Sense perception and semantic memory, unlike inference, are temporally as well as typically epistemically chiral.

[3]Talk of "premise(s)" and "conclusion(s)" is ambiguous. In a psychological frame, these are understood to be mental entities - neurophysiological states, mental sentence-analogs (types or tokens), or the propositional contents thereof. In a logical frame, they are understood to be either propositional forms embodied in sentences or the propositional contents thereof. I refer to the "basis" and "upshot" of an inference to emphasize the psychological frame. On the *canonical* RM, the thinker is immediately aware, or aware on reflection, of a relation of a basal state and upshot state - e.g. *entailing*, or *being to taken to entail* - which is responsible for the transition, as that to which the thinker responds in transitioning to the upshot state.

[4]Siegel presents counter-examples to the *canonical* reckoning model, wherein a thinker ostensibly lacks epistemic access to awareness of a relation responsible for the transition from basal state ("premise") to upshot state ("conclusion"). Further, she argues, no *non*-canonical reckoning model is both sufficiently motivated and internally stable.

[5]More abstractly: the status of an episode as an inference from Γ to Δ requires epistemic dependence of Δ on Γ, but not of Δ on $\Gamma \rhd \Delta$, where $\rhd$ is some (any) relation (*supporting*, *entailing*, *being taken to support*, *being taken to entail*, etc.).

[6]He writes: "The requirement that there be a taking by the thinker cannot be understood as requiring that the thinker be in some additional state, in which she represents her conclusions as following from her premises. Any requirement of that sort would yield the false conclusion that all inference-performing creatures are monitoring the rationality of the inferences they make... It would also be the first step in a Tortoise and Achilles-like regress, in which this taking-state itself would need to be backed by a further taking-state before it could do the explanatory work for which it was postulated" (Mole 2016, p. 117-118)

[7]"In order to distinguish between inference and forgetting we have needed to say that inference requires a taking of one's conclusions as being entailed by one's premises... this taking must be thought of, not as requiring the presence of an additional *state* that the inference-drawing thinker is *in*, but as requiring an action — a taking — that the thinker *does*... The takings that we need to postulate, in order to distinguish inferences from other belief-changing processes, are themselves perdurant mental entities. To account for this part of the mental domain, we must build, at least in part, from these dynamic foundations." (Mole 2018, p. 165)

[8]This is not to say that an event can influence one's thinking only if one is aware of propositions pertaining to it. An earlier event of which one has no memory (e.g. a bonk on the head) may well exert an influence on one's thinking. It is just to say that one can have memory-based knowledge of an event only if one has (at very least) truth-apt thoughts pertaining to that event.

[9]Mole presents the argument for asymmetry on purely theoretical grounds: "[T]here cannot be any need for this event [which occurs when one encounters a proposition as the conclusion of an inference] to itself be the object of an epistemic encounter. The event that takes place in these cases is just the event of an inference being drawn. If that event itself needed to be encountered then inference would require an encounter with one's own inferring. It would be available as a source of knowledge only in cases where we are in a condition of self-monitoring. Avoiding that result requires us to recognize that there are episodes of epistemic encountering in which the thing encountered is simply a proposition." (2016, p. 128)

[10]That the *how* of the encountering must be influenced by the event itself is supposed to account for one's being unable to epistemically encounter an event, but able to encounter propositions pertaining to the event, before it occurs. Compare: the televising of the second 9/11 attack, *by observation of* which S encounters the proposition that a certain plane exploded on impact, is influenced by the attack itself.

[11]Mole defends this move by noting that propositions may be invoked in other sorts of scientifically-respectable explanations, when the explanandum is not the "triggering of a token event" but rather a "formal aspect" of some *process*. He gives two examples: (i) *that* snow is white contributes to an explaination of the evolutionary process in virtue of which polar bears are white; (ii) *that* 17 is a prime number contributes to an explanation of the evolutionary process in virtue of which the 17-year cicada (*magicicada septendecim*) is developmentally synchronized to emerge and reproduce every 17 years (thereby avoiding recurrent predation).

[12]Looking to the physician himself for the required *taking* would *mis*-locate the contradiction in this case. We have: 'S will die in 9-12 months' contradicting 'S will die in 3-6 months'. We do *not* have: 'that S will die in 9-12 months is licensed (given what the physician knows)' contradicting 'that S will die in 3-6 months is licensed (given what the physician knows)'.

[13]Ultimately, a neurophysiological event, conceived by analogy with overt tokening of an utterance or inscription of a certain empirical character.

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