

The Discreet Charm of Material Inference

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Abstract. Sentences used to make assertions are usually considered to consist of a form and a matter (or a content), and it is the form that is the subject matter of logic. Some arguments (inferences) consisting of such sentences are valid in the sense that they can never lead us from true premises to a false conclusion. This validity is often held for produced by the arguments' form. But there seem to also be arguments that are valid not because of the form, but rather because of the matter. A lot of logicians and philosophers argue that such arguments cannot be valid. In this paper, I argue that this view is misguided, that there are in fact materially valid arguments. Moreover, there are material arguments that are, strictly speaking, not valid but are still indispensable for our coping with the world – impeccable validity is a nice quality, but it takes arguments out of the reach of reality. I am convinced that material arguments and inferences are essential, the formal ones being only their shadowy superstructure.

Keywords. Material inference; logic; logical hylomorphism; observation categoricals; logical expressivism; scandal of deduction.

Sentences and arguments as having form and content

It seems to go without saying that from the viewpoint of logic, a sentence, or a proposition expressed by the sentence, has a *form* and it is this form that is essential for logic. "I think one might describe philosophical logic (...)", writes Russell (1919, p. 47), "as an inventory, or if you like a more humble word, a 'zoo' containing all the different forms that facts may have." (Forms of propositions, according to Russell, are derivative to forms of facts.) And Russell also indicates how to get a grip on the form. Our language contains words "merely expressing form or connection¹, not mentioning any particular constituent of the proposition in which they occur" (p. 9), so these words can be used to make the form palpable.

Neither Russell nor his philosophical fellow-travelers paid much attention to that component of a proposition that is not its form. Of course, given the terminology known from the history

¹ This is odd: logical words do not *express* form, they rather *constitute* the form. Cf. Peregrin (2000).

of philosophy, it is natural to call this component *matter* (or perhaps *content*). This has led us to what Catarina Dutilh Novaes (2012, p. 395) aptly dubbed "logical hylomorphism as we know it", which has become a received logical wisdom. She characterizes it by a list of points, including the following:

1. In every argument, there is something that corresponds to its form and something that corresponds to its matter.

...

4. The form of a valid argument is that in virtue of which it is valid.

5. Given that logic is the systematic study of the validity of arguments, it is essentially concerned with forms of arguments.

The next question that arises in this context, of course, is what is the form of an expression. We saw that Russell gave us a hint; and Dutilh Novaes, again, thinks that nowadays the received wisdom contains an explicit answer (*ibid.*):

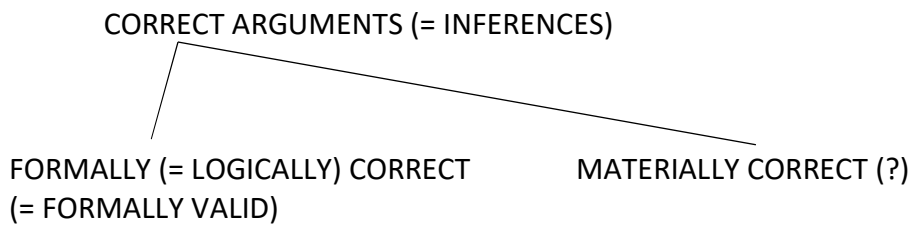
2. The form of an argument is related to a proper subset of the set of its vocabulary, in a given disposition; the matter of an argument is related to the complement set of the subset corresponding to its form.

3. The form of an argument can be rendered by means of a schema.

It follows that to find out whether an argument is valid, we must translate it into the language of logic and then transform the translation into a schema by leaving out all extra-logical expressions. Then we find out whether logic sanctions this schema.

A word about the terminology. In case of *particular arguments*, we primarily talk about their *correctness/incorrectness*. An *argument schema* will be called *valid* iff all its instances are correct. (We will also encounter a concept of validity that does not fit into this format, as it applies to particular arguments, namely *truth-preservation validity*.) An argument that is an instance of a valid schema may be, secondarily, also called *valid*. Especially an argument with a valid logical form is called *logically valid* or *logically correct*. An argument which is correct (or valid), but not logically correct (valid) will be called *materially correct* (*valid*).

Thus, so far we have



We need not dwell on the concept of form and of formal inference, for this is something that has received a lot of attention since Russell's pioneering writings.² Not so the concept of matter and of material inference, which is not, by a long margin, discussed as frequently.³

However, it is not without interest to note that Tarski's path-breaking paper about logical consequence (Tarski, 1936) already included a discussion of a notion of material consequence (though, as we will see later, it does not quite align with what is mostly taken as material arguments today).

Let us consider an example. Take the argument

[A1] All dogs are animals

Fido is a dog

Fido is an animal

A translation of it into a language of logic that springs to mind is:

[A1'] $\forall x(\mathbf{Dog}(x) \rightarrow \mathbf{Animal}(x))$

Dog(Fido)

Animal(Fido)

Turning this into a schema, again, is straightforward:

[AS1] $\forall x(P(x) \rightarrow Q(x))$

P(a)

Q(a)

² Let me mention at least a few book-length treatises: Sainsbury (1991), Preyer, G. and Peter, G. (2002), or Iacona (2018).

³ Though it does not escape attention altogether: see, e.g., Kapitan (1982), Read (1994), or Kuukkanen (2023).

This argument is a theorem of first-order predicate logic, as it is, for that matter, of higher-order logic and probably any logic in which this formalization makes sense. The fact, however, is that there is nothing like *the* language of logic. In non-trivial cases, we must decide into which logical language to translate. Consider the argument

[A2] Fido is loyal

Loyalty is good

Fido has a good property

The most straightforward schematization of this argument appears to lead us into the language of second-order logic:

[A2'] **Loyal(Fido)**

Good(Loyal)

$\exists p. \mathbf{Good}(p) \wedge p(\mathbf{Fido})$

This, however, presupposes that **Good** expresses a property of properties, which would render such formulas as **Good(Fido)** ungrammatical. We may want to mend this by introducing the "nominalization" operator \sim mapping predicates on terms:⁴

[A2''] **Loyal(Fido)**

Good(\sim Loyal)

$\exists p. \mathbf{Good}(\sim p) \wedge p(\mathbf{Fido})$

Or we may try to regiment the whole argument within first-order logic, perhaps introducing the binary predicate **Is**, connecting an individual with any property (construed as an element of the universe of discourse) it has:

[A2'''] **Is(Fido, Loyal)**

Is(Loyal, Good)

$\exists x. \mathbf{Is}(x, \mathbf{Good}) \wedge \mathbf{Is}(\mathbf{Fido}, x)$

Hence, the choice of logical language into which we translate the given argument is a free parameter of the analysis.⁵ But there is one more parameter: it is the boundary between

⁴ Cf. the discussion given by Chierchia (1982) and Turner (1983).

⁵ A thorough discussion of the criteria of adequacy of such regimentation can be found in Peregrin & Svoboda (2013).

logical and extralogical vocabulary. The boundary is notoriously vague. (Is the *Is* of [A2''] a logical constant? I think yes, but if somebody were to protest, I am not sure I could convince them.⁶)

The moral we should take from these considerations is that a logical form of a sentence or an argument is not something fixed and unambiguous. Whether an argument is valid because of its form depends on which language we choose to materialize the form, how we choose to materialize it and where we choose place the boundary between logical and extralogical expressions of the language.

As we have already stated, we will use the term *formal validity* for this concept of validity, defined through the form, for there is also a different way to grasp validity: an argument is valid iff its premises cannot be true without the conclusion being also true. The valid argument is thus, in this sense, *impeccable*, it cannot lead us from truth to falsity, not even in the most marginal cases. It is clear that formally valid inferences are truth-preserving, but are, conversely, all truth-preserving inferences formally valid? Do the two definitions of validity coincide? I think not but let me leave this for the next section.

Nothing presented in this section should be novel and surprising. But a moral which stems from it, I am convinced, needs – in view of what I am going to argue for – to be underscored. The moral is the following: if we see sentences or arguments as having a form and a content (in the way they are usually seen, and aptly summarized by Dutilh Novaes as "logical hylomorphism as we know it"), then the form and the content are *continuous* in the sense that the boundary between them is fuzzy.

The form/matter distinction may seem to invoke a dramatic discontinuity. Indeed, form appears to be something rigid and unyielding, while matter appears to be amorphous and malleable. Therefore, the formal and the material inferences also appear to be two very different kinds – the first of them being hard and nonnegotiable, the second soft and flexible (which is also why material arguments, in contrast to formal ones, tend to be non-monotonic). But we see that this picture is amiss: the formal/material distinction, as exposed above, does not detach two distinct natural kinds of inferences as it is a largely artificial divide.

⁶ Note that we could use \in instead of *Is* and write *Fido* \in *Loyal* instead of *Is(Fido, Loyal)*. For a general discussion of the problem of logical constants, see Gómez-Torrente (2002).

Are all valid arguments formally valid?

Consider the following argument

[A3] Fido is a dog

Fido is an animal.

Is it valid? It is certainly not formally valid. It is an instance of the schema

[AS3] X is a dog

X is an animal,

but the schema contains extralogical terms (*dog*, *animal*), and it will not be sanctioned by logic alone. But is it not, despite this, valid in the sense of truth-preserving?

Many logicians would say that it is not, and that if it looks valid, it is because we see it as merely a shortened version of [A1]. (The term *enthymeme*, going back to Aristotle, is often invoked here.⁷) Only formally valid arguments are valid, these logicians would claim, some others may *look* valid, but are not.

But why is this? I think that everybody would agree that the sentences of which an argument (unlike an argument scheme) consists must be meaningful. That means that the words *dog* and *animal*, in [A3], must be meaningful – and indeed we take them as well-known English words with their well-known meanings. And given the meanings, [A3] appears to be impeccable: nothing can be a dog without being an animal. Therefore, [A3] appears to be valid without assuming an additional covert premise.

Hence, there is a case for recognizing a validity other than a formal one; and *material* would be the obvious term to call it. Indeed, the conclusion of [A3] does not follow from the premise only because of logical words, it does not follow from it because of its form. Thus, if we stay with the usual hylomorphism, we should say that it is because of its matter.

In the paper we already mentioned, Tarski proposes the following terminological distinction (p. 194):

The sentence X is derivable from the sentences of the class K [= {Y₁, Y₂, ... Y_n}] if and only if the sentence Z [= the conditional sentence (the implication) whose antecedent is the conjunction of the sentences Y₁, Y₂, ... Y_n and whose consequent is the sentence X] is a logical thesis (i.e. is derivable from the axioms of logic);

⁷ See Hitchcock (1985).

the sentence X follows formally from the sentences of the class K if and only if the sentence Z is analytic;

the sentence X follows materially from the sentences of the class K if and only if the sentence Z is true.

This means that X follows materially from Y_1, Y_2, \dots, Y_n iff X is true or not all of Y_1, Y_2, \dots, Y_n are true. I think that the majority of logicians would consider such a connection to be too weak to warrant talking about following from or about consequence at all – so we would seem to have to add a stronger necessary condition than the extensional implication. On the other hand, the sufficient condition, as we will see, seems to be stronger than usual today – this is because Tarski's notion of formal following covers all analytic cases, not only the logical ones (in the case of which Tarski talks about "derivation"⁸).

What is usually taken as a stage-setting paper concerning material consequence is Wilfrid Sellars (1953). Considering the argument

[A4] It is raining

The streets will be wet

and its "rephrased" version

[A5] Whenever it rains the streets will be wet

It is raining

The streets will be wet

Sellars writes (p. 313):

After all, are there not such things as enthymemes? And is not the rephrased argument valid on purely logical grounds? Convincing though the retort may be, however, it scarcely amounts to a disproof of the idea that there are *material* as well as *formal* principles of inference, so that instead of merely being abridged edition of a formally valid argument, "It is raining, therefore the streets will be wet" might well be as it stands a valid argument, though warranted by a material principle of inference.

Let me point out that [A4] not only fails to be formally valid, but it is also obviously not valid in the sense of truth-preservation. (Surely we can imagine a situation where streets are not wet even if it rains!) This makes it different from [A3], which is, in this sense, valid. However,

⁸ Strangely, in his tripartite classification, there is thus no room for logical truth, as (potentially) distinct from derivability.

[A4] appears correct in the sense that if we are aware of its limits, we can put it to good use; to reason from its premise to its conclusion appears sensible. Hence even (material) inferences that are not valid may be correct.

It follows that material inferences form a heterogeneous bundle. It includes inferences that are valid (though not valid due to only logical vocabulary) as well inferences that are strictly speaking not valid, as they are valid only "ceteris paribus". As we will see, the former inferences are those that are traditionally called "analytic"; the latter are, thanks to their "ceteris paribus" character, usually non-monotonic. (Thus some material inferences are non-monotonic, though this does not hold about all of them.)

Anyway, since then, some logicians accepted that it makes sense to consider material validity as a specific kind of validity besides the formal one. Thus, Kuukkanen (2023) writes that

there are then three key features used to characterize material inference. Material inference

(a) is non-enthymemic;

(b) depends on non-logical vocabulary for validity;

(c) is non-monotonic.

I think that this delimitation is problematic: (a) is not really a characteristic feature of material inference, it is just a reiteration of the claim that there is something as the material inference – that material inference is not a logical one in disguise. Moreover, (c) is hardly tenable: consider the material inference [A3] – it seems that it is monotone if anything is.⁹ Hence, the only clear condition is (b): insofar as logical form is made up of logical vocabulary, material inference must be (at least partly) supported by extralogical one.

The reason is that in concentrating the formal/material boundary we ignore another boundary which is perhaps much more important: the analytic/synthetic boundary. True, this is a boundary discredited by Quine (1951; 1960), and I have no intention to rehabilitate it. There is no sharp boundary between analytic and synthetic sentences; but none of the boundaries we are talking about here are sharp – certainly not, as we saw, the formal/material boundary. Besides this, a version of the analytic/synthetic boundary can be delimited in "pragmatic" terms, which would be, I gather, acceptable even for Quine: a

⁹ What if we add a premise like *Fido is plush*? Would this not render the inference invalid, and hence render [A3] non-monotone? There are two possibilities: either a plush bear is a bear, and then it is also a (plush) animal, or it is not, and then the additional premise is incompatible with the premise of [A3]. In neither case does the addition disrupt the validity of [A3].

sentence is analytic if the ignorance of its truth value indicates a lack of understanding of some of its parts.¹⁰ Perhaps it would be good, to avoid unwanted connotations, to speak about pseudoanalytic and pseudosynthetic sentences.

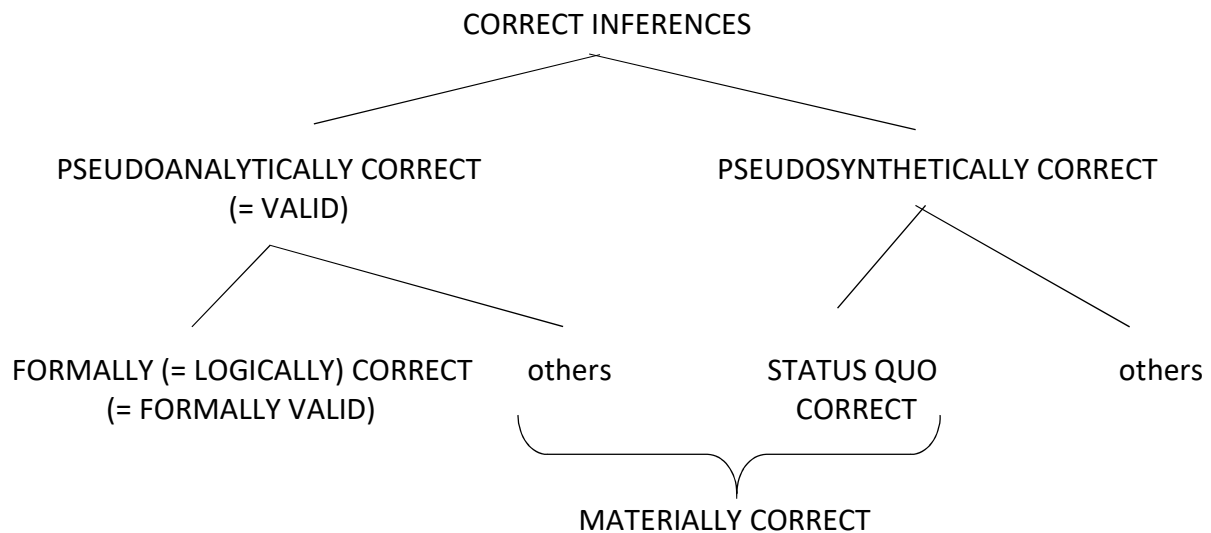
In an artificial language we can distinguish between analytic and synthetic sentences because the truth values of the former are the consequences of explicit definitions, while those of the latter are not. Quine's point was that as natural language is mostly not based on explicit definitions, this distinction is dubious. But this does not mean that some words and inferences are not more involved with the semantic infrastructure of language (and not knowing how to handle them indicates an ignorance of language), while other have more to do with the extralinguistic world. (In Quine's words, some are central to the web of our language, other are rather marginal.)

This reflects the fact that different inferences may play different roles in the constitution of language. The role of some of them is "foundational": they have been introduced to fix the basic conceptual infrastructure of language. [A3] may be of this kind: it helps settle the positions of the concepts of *dog* and *animal* vis-à-vis each other in such a way that its ignorance is taken as a misunderstanding of at least one of these two concepts. In contrast to this, [A4] is more of an inductive generalization of an observation (Quine (1990) calls such sentences *observation categoricals* – more about them shortly), the ignorance of which is an ignorance of fact. (Note that this in no way contradicts the Quinean observation that inferences such as that from *Fido is a dog* to *Fido has lungs* does not clearly fall into any of these two categories.)

I think that this (fuzzy) boundary coincides with the one between monotone and non-monotone inferences. Perhaps it could be even defined in these terms. In any case, it is important to realize that [A3] and [A4] fall into the opposite sides of this boundary. What lies on the pseudosynthetic side of the boundary are material inferences that are correct only *ceteris paribus* – we may call them, together with Peregrin & Svoboda (2017), *status quo correct*. This is precisely why they can be canceled: they presuppose some empirical facts and collapse when these turn out not to obtain.

In this way we have

¹⁰ Cf. Burgess (2004).



Expressivism

Though there is a sense in which the (pseudo)analytic/(pseudo)synthetic boundary is more pertinent than the formal/material one, the latter boundary also plays an important role. But I suggest the role concerns not so much the nature of the respective inferences, as their role within the structure of our languages reflecting the order of our coping with the world.

The theoreticians who accept the enthymematic nature of putative material inferences insist that a logical vocabulary must be in place before we can talk about any inference at all. Following Brandom (2000), I think otherwise: I think that the material inferences are the primary ones and that the logical vocabulary comes into play to make them explicit; and the formal inferences are just the byproduct of the introduction of the vocabulary. Take [A3] or [A4]. Is it conceivable that they would be valid in a language without a logical vocabulary? It depends on what we call a language; but I vote for the positive answer. We equated validity with truth-preservation, hence could [A3] or [A4] be truth-preserving? Again, it depends on what we take truth to be, but again, I vote for yes, though with a proviso.

Suppose that both the premise and the conclusion of [A3] are tied to the situation which they appear to describe in contemporary English, *viz.* to the situation where Fido is a dog and that in which Fido is an animal, respectively. (If you are a representationalist, you may imagine that the two sentences have come to represent the respective situations, if you are, like me, an inferentialist, you may imagine that there emerged rules making it correct to assert the sentences in such situations.) Then we can say that [A3] is correct in the sense that its conclusion is bound to be true whenever its premise is. (The situation tied to the conclusion is bound to obtain whenever that tied to the premise does – on the

representationalist construal the truth equals the obtaining of the represented situation, on the inferentialist to the correct assertability of the corresponding sentence.)

The same holds for [A4] – with the exception that "its conclusion is bound to be true" is to be replaced by "its conclusion is bound to be true *ceteris paribus*" or "its conclusion is most likely to be true"¹¹; and the same for "the situation is bound to obtain". In any case, it seems that it makes sense to talk about the validity of the material inferences in the absence of logical vocabulary. But why, then, do we need the vocabulary? A possible answer, which we are going to argue for, is that we need it to make the material inferences explicit.

Why make the inferences explicit? Because until they are explicit, they can only be followed (or, for that matter, violated), while once they become explicit, they can also be argued for or against. Note that inferential rules evolve, and they tend to evolve to the greater usefulness of those who follow them in their coping with each other and with the world.

Imagine a science fiction scenario in which dogs – or at least the dogs in the area surrounding the community in question – turn out to be, to everyone's surprise, robots. It follows that the inferential rule taking us from *dog* to *animal* needs to be replaced by something like the one leading us from *dog* to *machine*. If the rule were only implicit to its followers' actions, this would not be easy: those who would feel that the rule is no longer appropriate can start to violate it – but violation of a rule is standardly taken to be a mistake, rather than a prompt to undertake a change.

The situation is different once the rule is explicit (in a form like *Dog is an animal* or *All dogs are animals*). We can point to a dog that we have just found out consists of plastic and silicon, rather than meat and bones, to give a reason against it. (And once we have some more acute linguistic means, we can involve the rule into what Brandom (1994) calls *the game of giving and asking for reasons*). Hence the ability to make rules explicit is useful; and thus it is likely that it will tend to evolve. (The title of Brandom's seminal book – *Making it explicit* – indicates that the author sees this ability as in some sense emblematic of us humans.)

Which tools do we need to make inferences explicit? First and foremost, we need something like the English *if-then* or its logical regimentation \rightarrow . Having it, we can make a rule taking us from the premise P to a conclusion C as *If P then C*. If there are more premises, then what may come handy would be something like *and* or \wedge . And then there is negation, which is needed for the purposes of challenging: if we have *not* or \neg , we can articulate assertions as

¹¹ The question how much likely true it must be in order to count as a *status quo* correct inference admits only a pragmatic answer: as much as it makes the argument useful.

Dogs are not animals etc. More elaborate claims (e.g. *Every dog is either an animal or a machine*) are available when we have a more elaborate logical vocabulary.¹²

A host of new, "logical" inferences are bound to emerge together with the logical vocabulary. Thus, once we have the connective akin to *if-then* capable of making inferences explicit, we have inferences like [A5]; when we have, moreover, *or*, we can have

It is raining or it is snowing

It is not snowing

It is raining

or

Every dog is either an animal or a machine

Fido is a dog

Fido is not a machine

Fido is an animal

etc.

The endurable scandal of deduction

As I already said, the standard view is that it is the formal inferences that are important and that material inferences are only imperfect ones, which does do not play such an important role in our reasoning. What I am now going to argue for is that it is the other way around: That it is material inferences this are the most important tool of all reasoning, the formal ones being just their shadows.

In the paper we have already started to discuss, Kuukkanen (2023) comes to the following conclusion:

The main conclusion of this paper is that material inference is not valid but that it is nevertheless a legitimate non-logical and non-formal inference.

In light of our exposition, this is true of pseudosynthetic inferences, and it is true in the sense that these inferences are usually valid merely *ceteris paribus*. But the effort to defend the legitimacy of inferences that are not valid *sensu stricto* strikes me as a misunderstanding of

¹² See Peregrin, Chapter (2014, Chapter 9) for a more detailed discussion.

the role of inference in our reasoning and in our coping with the world. The kind of inferences that really matter are the pseudosynthetic (and hence material) ones. They preserve our hard-won knowledge of how the world functions and how we get along with each other, which we have collected during the process of our coping with our environment. True, they are not hundred percent reliable, as they are merely *ceteris paribus*, but this is an (acceptable) price which must be paid for their usefulness.

The pseudoanalytic (including the formal) inferences, in contrast to them, are not very useful. They only provide the projection of what we already know to newly introduced strata of language (fraught with logical connectives). The fact is so well known that it has earned its own title; Hintikka (1973, p. 222) called it *the scandal of deduction*:

C. D. Broad has called the unsolved problems concerning induction a scandal of philosophy. It seems to me that in addition to this scandal of induction there is an equally disquieting scandal of deduction. Its urgency can be brought home to each of us by any clever freshman who asks, upon being told that deductive reasoning is 'tautological' or 'analytical' and that logical truths have no 'empirical content' and cannot be used to make 'factual assertions': in what other sense, then, does deductive reasoning give us new information? Is it not perfectly obvious that there is some such sense, for what point would there otherwise be to logic and mathematics? This question is apt to cause acute embarrassment, for no such sense has so far been defined in the literature. The only honest answer to our imaginary freshman's question is given by those few unregenerate logical positivists who are bold enough to deny the existence of any objective (non-psychological) sense in which deductive inference yields new information.

I do not think this is a scandal. That formal inferences – and more generally, pseudoanalytic ones – do not extend our knowledge is simply a fact. (Sometimes it's difficult to find out what is formally inferable from what, especially in mathematics, and hence discovering this might be a true extension of our knowledge; this, however, is obviously something different.) Some material inferences, especially the pseudosynthetic ones, in contrast to them, encode our crucial experiences with the environment.

Kuukkanen (2023, pp. 7–8) argues that material inferences construed thus are not valid:¹³

¹³ Kuukkanen also writes that Sellars (1953) "concludes that the inference that the streets will be wet from seeing rain is in fact 'merely the manifestation of a *tendency to expect* to see wet streets when one finds it raining, a tendency which has been hammered into the speaker by past experience'" and that "this kind of reasoning can only 'simulate inference,' since it is in fact 'a habitual transition of the imagination'". But it is enough to look in the paper to see that these are not Sellars' claims, but rather

[A]n inference of "x is an acid" from "x turns litmus paper red" would be based on experience that this is what has happened before—and can be expected to hold also in the future. Unfortunately, this suggestion is also problematic for reasons that are well known: the validity judgement seems to be based on inductive reasoning. It is obvious that experience alone does not make this inference valid, although experience makes this kind of inference psychologically plausible.

Is inductive reasoning incapable of supporting arguments that we need? There is the well-known criticism made by Karl Popper (shared by other thinkers¹⁴) that denigrates an inductive building of our theories of the world as a mere illusion. (Popper (2014) writes: "Induction, i.e. inference based on many observations, is a myth. It is neither a psychological fact, nor a fact of ordinary life, nor one of scientific procedure.") It is important to see that the criticism by Popper and his followers is based, among other things, on the very sort of deductivism that sees inference as inherently deductive and thus dismisses any inference short of being impeccable as a pseudoinference. The fact is that inductive logic and induction-based description of our epistemological achievements is flourishing (Gabbay, D. M., Hartmann, S. and Woods, J., 2011).¹⁵

Moreover, and this is crucial, inferences that are useful do not need to be valid. In fact, in view of *the scandal of deduction* we may conclude that useful inferences *cannot* be valid. True, they must be reliable in the sense of not leading us astray in situations that are likely to use them, but it is not necessary to require that they *never* lead us from true premises to a false conclusion.

Einstein (1983, p. 28) once wrote: "So far as the laws of mathematics refer to reality, they are not certain. And so far as they are certain, they do not refer to reality." This is a deep observation. The quest for absolute impeccability leads us to the realm of *pure* mathematics emptied of any empirical content. Of course, pure mathematics is respectable and also capable of being put to practical use, but without contamination by some empirical

claims he ascribes to those who "deny that anything is really described by the phrase 'material rule of inference'" (p. 315).

¹⁴ Such as Miller (2015).

¹⁵ One of the contributors to the handbook, Alan Musgrave (2011), writes: "Popper famously declared that induction is a myth. (...) But is the thesis true? And, before we get to that, what precisely does it mean? Popper is a deductivist. He thinks that whenever we reason, we reason deductively or are best reconstructed as reasoning deductively. Most philosophers disagree. Most philosophers think that most reasoning is non-deductive."

knowledge (which necessarily compromises its impeccability) it cannot serve as a source of knowledge about our world.

Observation categoricals

Why do we need valid inferences? Because they let us reason from their premises to their conclusions; we are sure that if the former are true, then so is the latter. But it is clear that we can use also inferences that may lead us, in exceptional cases, from truth to falsity, if we have good reasons to believe that the exceptional circumstances do not obtain. It may be, for example, that the connection between the premises and the conclusion is *causal*, which means that the inference may fail should laws of nature change – but it is reasonable to expect that they will *not* change.

Moreover, it is only inferences that are not valid that are capable of encoding a truly nontrivial knowledge of the world. Valid inferences are trivial in the sense pointed out by the "scandal of deduction". According to Quine (1960; 1990), at the bottom of our language there must be some "observation sentences", sentences that are "directly and firmly associated with our stimulations". (It is not difficult to imagine that these evolved out of mere reactions to the stimulations.) These sentences provide for the most basic link between our language and the world.¹⁶ But this link, by itself, is only as useful as we can exploit it. And the most immediate way of exploiting it is, according to Quine, the formation of observation categoricals. (Quine's own example is "When a willow grows at the water's edge, it leans over the water".)

Quine (1995, p. 25) writes:

The survival value of the apes' cries, and of our ordinary observation sentences, lay in vicarious observation: we learn about what only someone else can see from where he sits. Observation categoricals bring us much more. They bring us vicarious habituation, vicarious induction. One gets the benefit of generalized expectations built up over the years by some veteran observer or even by that veteran's own informant long dead. Observation categoricals can be handed down.

Observational categoricals, of course, are based on a limited number of – at first merely a few – observations. Therefore, they are far from reliable. But their reliability keeps strengthening by being confronted with new cases and proving the robustness of the

¹⁶ Cf. Peregrin (2022).

regularities they encode (with those of them that do not withstand such confrontations being discarded).

Thus, our observation categoricals, according to Quine, lay the foundations of our coping with the world; they present constantly refined information concerning what to expect from the world. This is, needless to say, the vital basis of our knowledge of the world and, in view of the fact that they can be passed from generation to generation, of our cumulative culture.

It is also clear that observation categoricals are closely connected with the inferences of their consequents from their antecedent. Accepting *If A, then B*, is accepting the inference from *A* to *B*, be it because the conditional yields us the inference via *modus ponens*, or because the inference leads to the conditional as a means of making it explicit. Thus, observation categoricals and material inferences are two sides of the same coin. And we see that material inferences, as I propose to see them, not only may be useful, but are possibly the cornerstone of the whole edifice of our knowledge of the world.

Conclusion

We must get rid of the prejudice that what makes an inference "genuine" is its (general) validity, and that is inevitably the form of the inference that guarantees the validity. Formally valid inferences are guaranteed to be reliable, but so are some materially valid ones. Moreover, it is precisely this guaranty that makes valid inferences sterile to the point of uselessness. Therefore, we need also material inferences that are not valid, but lay the foundation of our knowledge of the world. It is them which, though imperfect, help us encode causal and other connections we need to cope with the world and predict our future.

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