Moderate non-exceptionalism and earthborn logic

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1. Introduction

Philosophers who strive to get a grasp on the nature of logic traditionally face two main challenges. One can be labeled as *the subject matter issue* – the problem concerning what logic is (ultimately) about. The other, closely related, can be labeled *the epistemological issue* – how we can gain logical knowledge. The epistemological disputes have often been, during recent years, framed as a controversy between adherents of *exceptionalism* and those of *non-exceptionalism*, resp. *anti-exceptionalism*.

Exceptionalists characteristically assume that logic is such a foundational discipline that empirical evidence cannot be relevant for truly logical studies – all genuinely logical knowledge is acquired *a priori*. Building logical theories, in their view, requires a very different kind of evidence and methods than those that are employed by the sciences. Non-exceptionalists, on the other hand, argue that logical methodology is much more continuous with the methodology of the sciences than logicians have traditionally tended to think. In his manifesto of anti-exceptionalism, Hjortland (2017, p. 632) writes:

> Logic isn't special. Its theories are continuous with science; its method continuous
> with scientific method. Logic isn't *a priori*, nor are its truths analytic truths. Logical
> theories are revisable, and if they are revised, they are revised on the same grounds
> as scientific theories.

We are very much sympathetic with this approach to logic. However, general anti-exceptionalist tenets provide only a very broad and open-ended framework, which can harbor very diverse conceptions. Hence we find it imperative to specify which version of non-exceptionalism is, according to us, on the right track. We are going to argue that adherents of non-exceptionalism shouldn't overlook features which distinguish logic from most scientific

disciplines. So we are going to argue for a position which might be perhaps called *moderate non-exceptionalism.*

We want to suggest that one cannot properly and convincingly answer the epistemological question unless they address the subject-matter issue, i.e. they make sufficiently clear what logic is (in their view) about and what is its *raison d'être*. The subject-matter issue and the epistemological issue are, we suggest, closely intertwined and it is hard to imagine that someone might present a credible account of the epistemology of logic without touching upon the subject matter issue. The two accounts should be congruent.

Unsurprisingly, there are different legitimate ways of conceiving both the nature of logic and its mission. Here we cannot do much more than lay our cards on the table without a proper justification of our position concerning the subject matter issue. We thus declare that our methodological background is *naturalism.*[1] We believe that within studies which aspire to the adjective *scientific* (in a broad sense), the preferable methodological approach is to be naturalist as far as possible, i.e. everywhere where a non-naturalist approach doesn't yield an explanation manifestly superior to the naturalistic one(s).

We furthermore declare that we, in accordance with naturalistic tenets, view logic as a theoretical discipline which our ancestors developed to describe, analyze, and upgrade the crucial vehicle of human reasoning: our (natural) languages and their artificially created extensions, such as the specific jargons of the sciences.[2]

For many centuries scholars active in the field of logic primarily reflected on how we reason in natural language, which is the primordial medium of overt reasoning, and gave (more or less systematic) advice how to do it better. However, during the last one and half centuries they developed a much more ambitious method – constructing artificial languages.[3] Such languages may occasionally serve as a new means of overt reasoning, but we insist that they are always parasitic upon natural language, which is the primary vehicle of natural reasoning and

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[1] Our understanding of *naturalism* is that of Quine (1969, 26): "Knowledge, mind, and meaning are part of the same world that they have to do with, and … they are to be studied in the same empirical spirit that animates natural science." Hence, we do not believe that studying logic necessitates any specific methods like *a priori* analysis or metaphysical inquiry.

[2] For a general defense of this account of logic, see Peregrin & Svoboda (2016; 2017) or Peregrin (2020).

[3] When we speak about artificial languages, we don't mean *bare* artificial languages consisting of mere lists of symbols plus formation rules, but rather languages with a "semantics" – be it specified in model-theoretic or proof-theoretic terms.

argumentation and which became this as a result of the natural evolution of specifically human communication and interaction with the world.

Beside the two kinds of languages – natural and formal – there are, and this is a crucial point of the position we want to promote, no other relevant items that would deserve the epithet "language". In particular, there is no transcendental "language in itself" – language of pure propositions or "sentences in itself" (Bolzano, 1837), of which our natural languages would be merely an imperfect rehash. (There is, we also presume, no *language of thought* unless it is identified and scrutinized by neurophysiology or at least empirical psychology – but we are not going to address this issue here.)

It is hard to guess how large a part of the scholars interested in the philosophy of logic would be inclined to accept the suggested naturalistic account of the subject matter and the mission of logic. We generally suppose that it is likely to be seen as plausible or even natural, rather than as controversial or path-breaking. But we dare say that by far not all of those who spontaneously lean towards the naturalistic position fully appreciate all the consequences of adopting this stance. The consequences are, we believe, highly relevant for the recent debate about the plurality of logics, to take one example.[4] Our position yields us a – more or less trivial – form of pluralism: there is an irreducible plurality of languages (both the natural and the artificial ones) and no "language in itself"; and there is a plurality of conflicting logical languages and no "genuine logic". And there is no neutral standpoint from which to adjudicate which logic is the correct one.[5]

Yet we can see that many current debates about the plurality of logics take a different direction – they do count on the phenomenon of a "genuine" logic. To quote Hjortland (2019, p. 253) again:

> No one is disagreeing about, say, whether the law of double negation is *classically valid*. It is, and that is uncontroversial. The disagreement is about whether or not it is *genuinely valid*.

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[4] See Beall & Restall (2006) or the special issues of *Synthese* (*Pluralistic Perspectives on Logic,* 2020) and *Inquiry* (*Logical Pluralism and Normativity*, 2020).

[5] What is the relationship between this plain variety of pluralism and the Beall-Restall variety? According to the latter, a single language can harbor a different version of consequence depending on the level of "counterfactual robustness" we choose. The version of pluralism inherent to our approach is less specific – it is compatible with their account, but we are not committed to this very version of pluralism.

We will take the problem of genuine validity as our first principal topic. We believe that the problem is a kind of neuralgic point of the debates as it is highly relevant both to the subject matter issue and to the epistemic issue. If we give up on the idea of genuine logic we are, we will argue, left with logic as a human project – a project launched primarily to assure that our communication can be, whenever it is desirable, subject to public control. This control can often reveal whose line of reasoning is correct and whose is mistaken. It, however, cannot always yield a univocal verdict. Logicians thus should be satisfied with the fact that they offer to the public (and to themselves) useful tools and standards which allow for (relatively) lucid communication. Logic thus can help us assure that even people who disagree won't talk past one another.

The paper proceeds as follows: In the upcoming section we turn our attention to the current discussions about the nature of logic which are characterized by the pursuit of "genuine" logic. We argue that such logic would require also a "genuine" language, the nature of which is quite unclear. We contend that it cannot be an artificial language, for artificial languages with interpreted logical constants already provide ready-made answers to the questions concerning "genuine" logic (but they are answers that we put into them and hence they are not really interesting), while languages without such an interpretation do not even let us formulate the questions.

In Section 3, we argue that neither can natural language play the role of the neutral medium, for this would either turn the examination of "genuine" logic into questions of empirical linguistics, or would make them collapse into questions as posed w.r.t. the artificial languages. In Section 4 we present further examples which illustrate the fact that the situation cannot be construed so that the "genuine" language of logic is natural language and the artificial logical languages are competing proposals trying to explicate its "genuine" logic. In Section 5, we then address the idea that what "genuine" logic necessitates is not really a language, but rather a system of propositions beyond languages. We argue that even this move does not bring us the desired resolution of the problem of genuine logic.

Section 6 shows that Quine's argument to the effect that logic cannot be produced by convention does not threaten our account of the formation of logic(s). We can fully appreciate this if we distinguish the different concepts associated with the term "logic". We sort out the concepts in Section 7. Section 8 completes the picture that we have drawn. We argue that to fulfill its mission, logic must lay a claim to normative authority over our rational communication (and in a sense over our thought). It must set standards (within a given discourse) which, on the one

hand, respect the existing practice of full-fledged argumentation and, on the other hand, allow the practices to advance onto a new level of expressiveness and clarity. This implies that logic cannot be seen as a discipline that only aims to *explain* certain phenomena. Thus it cannot simply take over methods employed in disciplines that have purely descriptive (explanatory and predictive) aspirations. In particular, it cannot simply take over the abductive method which is sometimes given pride of place.[6] In this sense logic is both continuous with other scientific disciplines but also methodologically special. In Section 9, we then draw the conclusions of our investigations.

2. Genuine logic in a genuine artificial language?

Let us open the debate by mentioning two examples of argument forms that have been a source of controversies:

(NegAnt) $\dfrac{\neg P}{P \to Q}$

and

(DoNeg) $\dfrac{\neg\neg P}{P.}$

Both of the schemas have their advocates as well as their opponents. The counterintuitivness of the instances of the first one helped to stimulate the development of one of the early alternatives to classical logic – Lewis' *logic of strict implication* (Lewis 1918, 1920) (the appearance of which was one of the early stimuli of the discussions on the plurality of logics). Let us, however, focus on the second one – on the law of double negation considered in Hjortland's text. It is standardly taken for granted that this argument form is valid according to classical logic (CL), while not valid according to an intuitionistic one (IL).[7] When we – together with the bulk of

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[6] The method is discussed, e.g., by Williamson (2017), Hjortland (2019), or Martin (forthcoming).

[7] In this article, we will follow the terminological convention we used in Peregrin & Svoboda (2017) – we will speak about *(in)validity* in case of forms of arguments and about *(in)correctness* in case of full-fledged arguments (arguments consisting of meaningful declarative sentences or of propositions expressed by such sentences.) How important the distinction is can be shown by means of a simple observation: Logical analysis can demonstrate that a certain argument is correct (because it exhibits a valid form) but it normally cannot demonstrate that it is incorrect – even if its form is invalid the argument can be correct (and hence it is wrong to call it "invalid"), as it can, for example, exhibit a valid

logicians and philosophers – adopt this view, it is easy to neglect questions like: *What is the language in which the scheme (DoNeg) is actually formulated?* or *What is the negation about which it is supposed to tell us something?* We try to show that this is a kind of a "blind spot" of many discussions within the current philosophy of logic. We are convinced that answering these simple questions can spare us from devoting a lot of time to addressing some – in our view misconceived – questions over which a number of current, philosophically-minded logicians rack their brains.

As (DoNeg) is articulated in what looks like an artificial language, we might assume that it is perhaps either the language of CL or that of IL, hence that the symbol "¬" represents either classical negation or the intuitionistic one. But this obviously cannot be: if it were the language of CL, it would be valid, full stop; and if it were that of IL, it would be invalid. In neither case could we say that it is valid according to CL and invalid according to IL.[8]

Maybe we should see (DoNeg) as articulated within a language which is not yet either classical or intuitionistic? Maybe the meaning of "¬" is not fixed within the language in question – the symbol "¬" is yet to be interpreted.[9] But this would not work either. If "¬" is not interpreted at all, then the question whether (DoNeg) is valid becomes clearly pointless. What could we answer to the question whether we should accept a rule concerning an operator about which we know nothing? So we must at least assume that "¬" is a *negation*, though not yet that it is the classical one or the intuitionistic (or perhaps yet other) species. But what is a negation in such a generic sense?

We might consider delimiting the generic negation by means of what classical and intuitionistic negation have in common. This would amount to the answer that the "generic" negation is one that is fully delimited by intuitionistic axioms for negation (for they are contained in the

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[8] form in a more fine-grained logical language. (See Svoboda & Peregrin, 2016.) Hence claims on validity (unlike claims on correctness) are, in effect, always relative (with respect to a given logical system).

[8] The fact that we discuss an example marking the difference between these two concrete logics should not be seen as substantial. Historically, the disputes between CL and IL primarily concerned mathematics – the proponents of IL were not much interested in language outside of mathematics.

[9] The term "language" is, as we all know, ambiguous. It is sometimes used for merely a syntactic structure, so that classical and intuitionistic logic can be said to share the same language. More often, it is used to cover also a semantic interpretation: a language with incidentally the same vocabulary and syntax as English but with different semantics would be considered a different language, and the same holds for artificial languages. We should also see a grave difference between natural languages used for communication and the artificial languages that derive their entitlement to being called "languages" merely from the fact that they have some features which are also characteristic of natural languages.

classical axioms). But this obviously is not a generally acceptable solution. Various other existing logics employ operators standardly identified as negations, but by far not all the operators comply with all intuitionistic axioms. Consider *ex falso quodlibet*:

(EFQ) $\underline{P \qquad \neg P}$

$\qquad\quad Q.$

This is an argument valid in intuitionistic (and of course also in classical) logic, but is not valid in other kinds of logic, such as relevant ones – and yet we do not hesitate to call the $\neg$ of these logics negation.

Classical negation is characterized by the facts that (a) P and $\neg P$ cannot be both true (which is proof-theoretically rendered by (EFQ)) and (b) P and $\neg P$ cannot be both false (which is rendered by the fact that if both X, P and $X, \neg P$ entail Q, then X alone entails Q); but neither of these principles is retained by negations (the specific versions of $\neg$) across different logical systems. The search for "the lowest common denominator" of negation operators is, if we are not ready to dismiss well-established areas of logic, hopeless.[10] It seems that operators that we call *negation* are interconnected by the Wittgensteinian "family resemblances" only, without being instances of a uniquely determined kind: as "negation" is a merely a family resemblance term, "genuine" negation has no essence, it is just the bundle to which "negation" refers.

So it would seem that insofar as the validity of the argument scheme like (DoNeg) is a legitimate subject of dispute, it simply cannot be considered to be targeting an artificial language. It cannot target a fully-interpreted artificial language, for then its (in)validity would not be disputable; it cannot target an un-interpreted language, for there the (in)validity would be simply arbitrary; and it cannot target a semi-interpreted language in which we had a negation, though not yet a specific negation of any logical system – such "generic" negation is not available. So can it not be that (DoNeg) targets a natural language (or languages) – perhaps in an indirect way?

3. Genuine logic of a natural language?

The trouble with construing a scheme like (DoNeg) as targeting an unspecified prominent artificial language has turned out to be that there is apparently no artificial language suitable for

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[10] There is the well-known attempt by Johansson at a "minimal" negation (Johansson, 1936). However, proposals to go on striping it further to "preminimal" and "subminimal" versions soon followed (Dunn, 1999); so no version that would be commonly acceptable seems to be in sight.

this role. In particular, there is no "neutral" language containing negation which is not yet a *specific* negation. Now the idea might be: perhaps we can see (DoNeg) as targeting a natural language, the natural language thus playing the role of the "neutral" medium? Indeed, the explanation that (DoNeg) ultimately concerns natural language, the primordial vehicle of our reasoning, sounds quite plausible – it may seem that the whole discussion about pluralism in logic can be understood as concerning the question of how far different logics instruct us to accept different arguments in natural language.

An objection may be that, in general, there is no such thing as a "natural language" – there are various natural languages, like English, Urdu, Finnish, etc. It is clear that logic is not about a particular one of them. But it is equally clear that English negation has counterparts in other human languages – a language which would lack such means wouldn't be classified as a full-fledged language. So perhaps we can see relating a scheme like (DoNeg) to a particular language like English as an oblique means of relating it to what all natural languages have in common.[11]

In any case, it may seem that natural language can provide us with the neutral medium that we could not find among the artificial languages: a medium in which we could formulate a scheme like (DoNeg) before we come to decide whether it holds or not – whether the negation in it is classical or intuitionist (or perhaps still other). Is it so, then, that we should replace (DoNeg) with a scheme like

(EngDoNeg)   It is not the case that *X* is not *Y*

                 X is *Y*

or, alternatively,

(EngDoNeg*)   *X* is not un-*Y*

                 X is *Y*.

which concern English more explicitly? It is readily seen that this is not a promising strategy: researching whether (EngDoNeg) is valid in English would be an empirical enterprise having little to do with logic as standardly conceived. We would have to articulate a representative

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[11] Not that negation in a natural language like English would be a transparent matter (see, e.g., Zeijlstra, 2007). But let us take a pass on this problem here. Let us assume, just for the sake of the present argument, that there is something that can be called *negation* in English; and similarly there is in other languages.

collection of English arguments exhibiting the form[12] and then to test a large enough sample of English speakers asking them whether they are ready to accept the individual arguments of this form as correct (or carry out this kind of research using a representative corpus of English texts). Moreover, though in this way we would obtain the relevant data, it is not obvious that we would thereby obtain a clear verdict concerning the validity of the form[13].

Thus it seems that it is preferable to stay with (DoNeg). We may say that "¬" is meant to represent *the English negation* (whatever its inferential properties are). But this means, in effect, that we take (DoNeg) as a mere proxy of (EngDoNeg) (or some variant). This, however, leads us back to the situation where our problem becomes purely empirical. Alternatively we may say that "¬" is a negation of a specific logical system, let us say classical logic. But then it is an open question whether the regimentation of an individual instance of (EngDoNeg) by means of classically interpreted (DoNeg) is appropriate – whether such an regimentation fits well enough the intuitions of English speakers (or whether perhaps some other regimentation, like the one employing "¬" of intuitionistic or some other logic is preferable).

Hence, in order to construe (DoNeg) as targeting natural language (without being an empirical claim directly about natural language), we must find a criterion for deciding whether an expression of an artificial language, such as "¬", represents (appropriately) an expression (a word, a phrase, or a more complex idiom) of a natural language. Is it enough that the former was introduced with the *intention* to regiment the latter? If we do not mean just to tie logical symbols to natural language words or phrases, then the answer is no. Suppose we devise an artificial language introducing a sign which we intend to regiment the functioning of "not" in English; but we spectacularly fail to tailor the properties of the former to those of the latter. Does it make sense, then, to call the sign *negation*?

How do we recognize the constituent(s) of a given natural language which should be represented by the artificial signs of schemes like (DoNeg)? The adequacy of the representation is, apparently, established by the fact that the artificial signs are useful tools of regimentation

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[12] Where deciding which arguments do exhibit the form and which do not, of course, may often be far from a routine matter.

[13] Some logicians claim that natural language does not have any logic (Glanzberg, 2015), some even use this to underpin the thesis of "logical nihilism" (Cotnoir, 2018). Our view is that what is properly called *logic* is reached via a theoretical reflection characterized in greater detail in Section 6. Given this, logic, strictly speaking, is not something to be found in natural language. It is, nevertheless, plausible to presume that natural languages do harbor a (proto)logic (or perhaps slightly different (proto)logics).

or formalization of sentences containing the natural constituents. It seems, for example, plausible to say that (DoNeg) is a logical form of arguments like

(A1)   *It is not the case that this is not healthy*

   This is healthy

in which "¬" gets "linked" with "not" as well as with "it is not the case that".

Can we consider the argument form (DoNeg) as an adequate formalization of the argument (A1)[14]? Well, it seems natural, but to give a responsible affirmative answer we would need to know more about the symbols employed in (DoNeg) – note that if, for example, the symbol "¤" were used instead of the familiar "¬", we could ask exactly the same question. Given that *P* represents a sentence, what is "¬" (or "¤")? If it serves within the language in which (DoNeg) is formulated as, say, a certain necessity operator, (DoNeg) surely could not count as a logical form of (A1). Hence we need to know that "¬" is ... a negation? But we have already seen that the task of delimiting a generic logical negation is not feasible.

So what if we say that "¬" in (DoNeg) is the classical negation? Could we then take (DoNeg) as an appropriate form of (A1)? It depends on whether the "logical properties" of classical negation are close enough to those of English negation, in particular whether the regimentation leads to the (desirable) situation when intuitively correct English arguments are assigned classically valid logical forms and vice versa. Hence we would, again, need to know whether arguments like (A1) – in so far as their logical form is to be (DoNeg) – are correct from the perspective of competent speakers.

Is (A1) a correct argument? Is it taken for correct by those who understand it? We would have to ask those people.[15] Our estimate is that most of them would *not* say that (A1) is correct (some of them perhaps outright rejecting it as incorrect, some hesitating to give an unambiguous

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[14] The general criteria of adequacy of logical formalization represent a complex problem which we cannot – and fortunately need not – tackle here. We did it elsewhere (Peregrin & Svoboda, 2013).

[15] This is not, of course, to say that the correctness of *any* argument could be determined by a public poll. A lot of even minimally complex arguments may be correct despite the majority of speakers rejecting them or vice versa. But there are simple arguments the (in)correctness of which may be seen as constitutive of the meaning of the components they contain, and in their case there can be hardly any higher authority than the competent speakers (whose opinions, of course, need not have the same relevance – in case of some expressions the opinion of experts counts as more important than that of laypeople). There is, to be sure, no sharp boundary separating the "simple" from the "complex" arguments. But though logicians (or, for that matter, anybody else) can perhaps make us hold (A1) for (in)correct, this would not be a correction of a logical error, but rather a successful imposing of a specific meaning for "not" on speakers of English.

verdict and only a minority – involving a number of those who took classes in elementary logic – would be willing to straightforwardly claim that it is correct. (The reason is that "ordinary" people, we think, would assume that one can be somewhere "in between" healthy and not healthy.) But if our general guess is right, then this speaks against the assumption that (DoNeg) with negation interpreted classically can be taken as *the form* of (A1).

All in all, in order to use different logics to tell us what is entailed by what in English, we would need to know how the formulas of the relevant logical languages relate to English sentences – which formula renders the logical form of which sentence or which regiments it (most) appropriately. More generally, it turns out that the only way to link an expression of an artificial language to expressions of a natural one is to equip the former with a "logical behavior" which approximates the behavior of the natural one(s) to the extent that is required by the relevant logical enterprise.[16]

In sum, it seems that with respect to natural language we have three possibilities, none of which solves our problem, namely the question of which language (DoNeg) belongs to or talks about. One is to replace (DoNeg) by (EngDoNeg), whereby we reduce the problem to a question concerning rules followed – as a matter of fact – by speakers of a natural language. Another is not to carry out the replacement, but to stipulate fixed links of the elements of the artificial language to those of the natural one (e.g., to link "¬" to the various forms of English negation, like "not", "it is not the case that" or "un-"), which leads, in a roundabout way, to the same result. Or we can forge such links not purely stipulatively but by equipping the elements of the language of (DoNeg) with inferential roles which are matched by the inferential roles of natural expressions (so that "¬" may become linked to "not" because the inferential role of the former turns out to closely approximate that of the latter). But then we face the same problems we faced when we considered artificial languages: to be able to do so, we would have to interpret "¬" as a specific kind of negation (classical, intuitionistic, etc.).

This makes room for considerations as to whether it is useful to employ, for the purposes of the regimentation of natural language sentences, a negation obeying (DoNeg), or rather one not obeying it. But this has little to do with considerations whether (DoNeg) is "really" valid and

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[16] Already Aristotle intentionally disregarded, within his projects of syllogistics, the fact that terms like "all" and "some" were not used unanimously by his fellows and assigned them determinate meanings according to which "some" meant "at least one" and "all" entailed "some", thus treating the terms as logical constants. Modern logicians introduce artificial signs that serve as logical constants but the purpose is the same – regimentation.

whether the "¬" in it represents "genuine" negation. In particular, after we saw, in the previous section, that (DoNeg) – as such – cannot be sensibly seen as telling us something nontrivial about an artificial language, we now see that it cannot be seen as telling us anything very nontrivial about a natural language either.

4. The status of logical operators – one more example

Let us take one more example. Caret (2017, p.741) writes:

> "A modal logic like S5 judges the argument 'Necessarily, *P*. Therefore, *P*.' to be valid because of the meaning it attributes to the modal operators. Classical logic, on the other hand, judges the same argument to be invalid simply because it does not recognize the modal operators as logical terms in the first place. There is no air of conflict between such divergent validity judgments."

This indicates that the "divergence of validity judgments" concerns arguments in natural language and that the role of the artificial languages of logic is merely auxiliary: they help us make the divergence explicit. What Caret claims[17] appears to be that arguments of the form

(EngNec)   *Necessarily P*

                      P

 can only be, within classical logic, formalized as

(Nec1)   *Q*

                      P

while in S5 they can be captured as

(Nec2)   □*P*

                      P.

This observation appears to be almost trivial: but is it? Imagine that someone puts forward

(Nec3)   ¬*P*

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[17] It is symptomatic that Caret talks about the *argument form* "Necessarily, *P*. Therefore, *P*" as if it were an *argument*. The failure to distinguish between the two may cause confusion. A careful classical logician would probably refuse to assess the *form* as it contains an expression that doesn't fit into the language of classical logic. However, when assessing an *argument* of the form she may conclude (seeing *necessarily* as an extralogical word) that it is *correct* but not *logically correct*.

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as a way of formalization of (EngNec) in classical propositional logic (CPL). Why we will reject this proposal? The first reaction would perhaps be "Because '¬' is not a necessity operator!" But this answer needs to be unpacked. What we really mean by such a response is something like "Because the logical (inferential) behavior of '¬' (as fixed by CPL) is too different from that of 'necessarily' in English". Hence to know which logical forms can be considered as forms of natural language arguments we already need to know a lot about logical behavior of the involved logical expressions (both the natural and the artificial ones) involved.

Thus, it is not the case that different logics "judge" natural language arguments instantiating argument forms like (EngNec) (be it with an "air of conflict", like when we entertain the perspectives of different modal logics, or without it, like when we settle on using S5 or CPL). We already need to presuppose a lot about the correctness of natural language arguments to be able to say that necessarily can be sensibly regimented by "□" but not by "¬" (or by the "□" of S4 rather than "□" of S5).

The resulting picture, then, is the following: Expressions in natural language have various inferential roles – each of them has its way of functioning within arguments. By constructing our formal languages we approximate the inferential roles of "logical" expressions in terms of artificial signs, the inferential roles of which are exactly and explicitly fixed.[18] Some such approximations are generally better than others, some may help us see, for example, some subtle differences in the common usage of specific "topic neutral" expressions which we classify (to some extent conventionally) into logical vocabulary.[19] In any case, we should keep in mind that what counts are the goals with which we carry out our logical enterprises – in some cases we may value simplicity, in others we need a more complex apparatus which improves on the working of natural language.

The artificial languages are self-encapsulated: nothing inherent to the language of intuitionistic logic makes intuitionistic negation a rival of the classical one; the two go past each other.[20] The

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[18] More about this inferentialist account of logical vocabulary can be found in Peregrin (2014) or Murzi & Steinberger (2017).

[19] That the category of logical expressions is somewhat fuzzy was already explicitly admitted to by Bernard Bolzano (1837); and later also by Tarski (1936).

[20] In the sense of Quine (1986)'s famous dictum "change of logic, change of subject".

situation changes when we use them as prisms through which to look at a natural language.[21] Then we can compare them with respect to how well they manage to explicate the phenomena that interest those who want to scrutinize reasoning. In particular, we can compare classical, intuitionistic, or other negation with respect to how they approximate the ways in which negation works in English (or other languages).

Hence, do not intuitionistic and classical logics compete in telling us what is entailed by what? Is it not so that while classical logic tells us that (A1) is a correct argument, intuitionistic logic tells us that it is not (or at least that it needn't be)? [22] Not really. To be able to use classical or intuitionistic negation to tell us something about the phenomenon we can call *natural language negation*, we would have to know that the former is a reasonable approximation of the latter, and to know this we would have to know that the inferential role of the former within its language is close enough to that of the latter (within its one). In particular, we would have to know, given that (DoNeg) is valid (in classical logic) or invalid (in intuitionistic one), whether (EngDoNeg) is valid or invalid in English. (True, this may turn out to be indeterminate and thus open up some room for alternative specifications by means of different logics. But take heed: this is not telling us what "really" holds.) Thus, instead of logic telling us whether we should accept (EngDoNeg) or not, we would have to know whether we accept it or not before we can use a logic to analyze it. (The same, of course, holds for other logical expressions – including the most discussed case of those that constitute conditional sentences – "implications".)

5. Propositions to the rescue?

It seems at this point that the central question around which the problem whether (DoNeg) is valid revolves is: To which language the scheme (DoNeg) belongs? We have argued that if we want to treat the scheme as valid with respect to classical logic and not valid with respect to intuitionistic one, the language cannot be an artificial language we have produced, and we have also argued that it cannot be a natural language. But maybe the problem is that we concentrate too much on languages when we should in fact look beyond them at the domain of propositions

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[21] The difference between seeing formal languages of logic as self-contained structures and seeing them as such prisms or models of natural languages is discussed by Peregrin (2020).

[22] Arguments, as we know, can be legitimately ascribed different logical forms, and the fact that one of the forms is invalid doesn't exclude that its other (typically more fine grained) form is valid.

– meanings that, properly interweaved, constitute systems of our beliefs, but which are not dependent on our languages.[23]

It is a common bit of wisdom that sentences of natural languages can be plausibly ascribed logical forms; and the artificial languages of logic have been conceived, at least partly, to represent the relevant logical forms in a more transparent manner. So perhaps considering the nature of (DoNeg) we should not concentrate on the language in which it is couched, but rather on what is presented by the language – on the relevant propositions (meanings of sentences) especially on the propositions which have the form of its premise. It is natural to expect that such particular propositions, if we assume that they have a certain form,[24] will contain the kind of negation we seek: the authentic negation which needn't (perhaps even cannot) be identified in terms of how it functions within arguments (i.e. in the way in which negations of common logical systems are typically delimited).

However, propositions are – no matter how they are exactly delineated – quite tricky entities (by all means significantly trickier than sentences) and it is not easy to address them directly. We should perhaps, for safety's sake, immediately admit that it is questionable whether the sentences making up the argument (A1) represent propositions at all (because of the indexical "this"), and hence if we want to see an argument as consisting of propositions, whether (A1) is an argument at all. Thus, let us consider an argument which looks more textbook-like:[25]

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[23] We should notice that *formal* languages of logic are (unlike *formalized* ones, like that of Peano arithmetic) unable to express propositions at all (like the language of propositional logic) or only very specific, "trivial" propositions like $\exists x(x=x)$ of classical predicate logic with identity. (Formulas like $P \land Q$ or $\forall x \exists y R(x,y)$, with uninterpreted P, Q and R, do not express any specific propositions.) Thus, rather than languages they are mere language forms.

[24] There are many ways of explicating the term "proposition", including as "a class of possible worlds", etc. Such propositions, then, do not have the kind of form we talk about. Here we focus on more traditionally conceived propositions viewed as structured entities that characteristically bear a given (unchangeable) truth-value. On the other hand, the term "proposition" is also used in a more mundane sense. Propositions in this sense are "that which two sentences in different languages must have in common in order to be correct translations each of the other" (Church, 1956, p.25). We call such propositions *sentential propositions*, while the propositions belonging to pure thought (pure reasoning) we will call *pure propositions*. (We don't mean to suggest that these two accounts are the only ones associated with the term "proposition".) While it seems obvious that pure propositions as constant bearers of truth-values can't be vague or unclear, sentential propositions can.

[25] Note, however, that as the name "Socrates" certainly does not pick up a unique individual, the contrast with (A1) is not so sharp as it may *prima facie* seem.

(A2)   *It was not the case that Socrates was not healthy*

       Socrates was healthy.

Now the question is: Is (A2), conceived as consisting of propositions, correct? The positive answer would follow, e.g., if the premise were to involve (two occurrences of) *classical* negation. But how can we decide which negation(s) the premise involves? Perhaps, being confronted with a proposition, we can *see* what kind of negation it contains? Or perhaps we can at least *see* that it contains a negation and investigate what kind of negation it is?

Independently of whether we are friends or foes of the kind of phenomenology that takes some things as immediately given to our understanding, it is not at all clear what "seeing a (classical) negation" could be like. Does negation have a specific "look and feel"?[26] We know from common languages that very different sign patterns can play the role of negation, i.e. be conventionally used as a means of denying, refusing, contradicting – hence, that the decisive matter is the function, not the stuff which enacts it. So perhaps we see the function? But is this something other than that in learning English we have learned how "not" or "it is not the case" functions and, now being confronted with it, we understand it in the sense of recalling the function? If it is the same thing, then the crucial matter is the overt functioning of the public sign; while if it is something different, then identifying negation is something mysterious that cannot be reasonably discussed.

And this brings us to the ultimate stumbling block of the propositional approach: To be confronted with a proposition via being presented with a sentence, we would have to know which proposition is represented by the sentence. Especially being confronted with "It was not the case that Socrates was not healthy", we need to know whether the proposition contains classical or intuitionist negation, or perhaps only a certain "generic" one (and indeed whether it contains one kind of negation or two). Otherwise, we don't know how it is inferentially related to other propositions. It is hard to imagine how else we could find this out, save by finding out about the inferential role of "not" and choosing the part of the proposition accordingly. This means that we are back again to the inferential roles of expressions.

There is one last (desperate) position to which the exponent of the realm of propositions may want to retreat. She may claim that as there is only one "genuine" negation, the realm contains only it and none of its counterfeit rivals. Thus the whole problem is researching the realm and

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[26] Cf. Peregrin (2010). As adherents of naturalism we are very suspicious of explanations that involve supernatural perception or insight into a supernatural realm.

finding out which negation is "genuine". But, needless to say, this is a position which trivially evades any attempt at its discrediting.

The moral, then, is that switching from sentences to propositions does not bring about any practical gain. Whatever propositions are (whichever – perhaps venerable – theory of propositions you embrace), you can address individual propositions and deal with them only in terms of sentences – and this makes the kinds of problems we are addressing here reappear with a vengeance.

6. Is logic anchored in the natural world?

We have seen that (putative) logical laws like (DoNeg) must be articulated in a certain language. This holds, at least, unless we wish to claim that logical laws needn't feature any logical constants or that logical constants can (and in fact do) exist independently of languages. We cannot imagine either of these options to be true. Negation, for example, typically takes a sentence of a language – or perhaps a proposition expressed by the sentence – and transforms it into another sentence (proposition). Now according to our naturalistic view, there are only two kinds of languages – natural and artificial ones. And as logically correct argumentation is surely older than any of the artificial languages, we are surely entitled to believe that the original home of (proto)constants like negation must be the natural ones (or more precisely their prehistoric versions).

Indeed natural languages do involve logical vocabularies, which, however, from the viewpoint of current logic, appear far from "well behaved". Deciding whether a certain word or phrase is logical is often controversial and the relevant expressions are governed by rules that are not quite determinate and perhaps also not exceptionless. On the other hand, the systems of sentences equipped with rules of inference that are nowadays called *logics* have been designed purposefully. They typically strive to balance intuitions of their authors concerning what follows from what – intuitions which were formed in the process of their mastering their mother tongues – with much more specific intuitions concerning how an elegant, comprehensible and efficient calculus should look like. If the outcome stands the test of public criticism and shows its qualities, it gains the status of a (more-or-less) established logical theory. From the methodological point of view we may say that such logical theory is in reflective equilibrium (see Peregrin & Svoboda, 2017). Given this, logical laws as we know them from today's logic are our creation and so, naturally, are their crucial constituents – logical constants. If we admit

that the formation of logical theories is a result of such a (sometimes complex and sophisticated) balancing, rather than of a kind of *a priori* insight or enlightened creativity, we have a picture of logic as an integral part of the natural world.

Russell once claimed that logic is concerned with the real world just like zoology is, only in a more abstract and general way.[27] This may look similar to what we claim, in that we also say that logic concerns the real world. However, in contrast to Russell we do not think that logical truths differ from the truths of the natural sciences only by being much more general. We think that they are truths concerning a very specific partition of the world, namely human linguistic activity.

An objection which is often raised against such a construal of logic is the following: We humans cannot *fabricate* logic (by "convention"). Therefore, there must be a logic that is independent of us, a "genuine" logic. This, in a nutshell, is an argument that may be in the background of the minds of the proponents of the "genuine" logic. It is also often held that a clear shape was given to the argument by Quine (1936).[28] But we agree with those who think this argument fails to support the inevitability of "genuine" logic.

Quine argued that logic cannot be produced by explicit convention (because for such convention to become effective we already need a logic). This argument, we agree, is successful. We cannot produce logic out of the blue by fiat. However, it does not follow that logic cannot be man-made. It means that man cannot make it by convention or stipulation.

How else can we come to have a logic than by introducing it by convention? Well, in the same way in which we have come to have a language. It is also hard to imagine that we could produce language by explicit convention – for such a convention would already *require* a language.[29] Yet we do have a language, and we do not see this fact as in any way mysterious. Though we do not have any direct evidence regarding the origins of our language, we do see ways in which it could have come into existence: it evolved as a social institution grounded in psychological and social dispositions and skills acquired by our predecessors.

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[27] Russell (1919, p. 169-70).

[28] Thus Sider (2011, p. 115): "The status in contemporary philosophy of logical conventionalism and the related doctrine of 'truth by convention' is curious. On the one hand, few people self-identify as logical conventionalists. If pressed on why not, I suppose most would gesture at Quine's famous critique in 'Truth by Convention'."

[29] As Russell (1921) put it: "[w]e can hardly suppose a parliament of hitherto speechless elders meeting together and agreeing to call a cow a cow and a wolf a wolf" (p. 190).

Now we suggest that the explanation of the origins of logic is no more mysterious. In fact, as we see it, logic co-evolved with language. Our human languages, during their evolution, came to contain a certain skeletal structure involving expressions facilitating denying, expressing conditional dependences, general quantification, etc. This structure is not the same in all languages, but there was enough of a similarity across languages that allowed for creating its idealized models – the formal languages of logic. Thus we came to fabricate a logic without having fabricated it by explicit convention.

Warren (2017; 2020, Chapter 7) meticulously anatomizes Quine's argument, with a similar conclusion: though logic cannot be built out of nothing by explicit convention or stipulation, it does not follow that logics are not man-made, or, if we accept that conventions can be implicit, that the logic we embrace is not conventional. Warren's (2020) monograph argues at length that logic is conventional (as is also, for that matter, mathematics).

We are basically in the same boat with Warren; we even think that the *artificial* languages of logic are based on explicit conventions in the most straightforward sense of stipulations. Despite this we think that the words *convention* and *conventionalism* may be seriously misleading: natural languages, which are the cradle of (proto)logical vocabulary, evolved in a way which has little to do with a stipulation. And though Warren is aware of this, we think that his stress on the conventionality of logic is likely to lead many readers astray.

7. Three senses of "logic"

We suggest that to understand contemporary philosophical debates about the nature of logic properly, we need to carefully distinguish between different meanings commonly associated with the term "logic".[30] We must distinguish three principal senses of the word: (1) logic as a natural phenomenon, (2) logic as a name of a discipline, (3) logic as a (complex) apparatus built and used within the discipline.[31]

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[30] In history of philosophy the term was used to bear a number of further meanings, and in today's everyday discourse it is used in many ways and contexts, often to loosely suggest a kind of implicit rationality or coherency.

[31] Priest (2014) presents a similar threefold division of logic. He reiterates the medieval division talking about *logica docens* (which is basically our sense (2)) and *logica utens* (which is our (1)); and adds his own invention, *logica ens*, which concerns "what is actually valid: what really follows from what". Needless to say, we have no room for this sense in our theory: our sense (3) is something utterly different.

We have already indicated that our languages came to contain a certain (not strictly delimited) skeletal structure whose existence is associated with a certain part of their expressive means, in particular with terms which are topic-neutral (not associated with a specific discourse) and play a central role in argumentation. The terms belonging to these specific vocabularies, together with the rules that govern them, form an essential component of fully developed natural languages. The resulting structures establish what we may call their *natural logics*.

When we speak about *logic as a discipline*, we refer to a certain cluster of theoretical studies which have developed over many centuries and taken different shapes (addressed different questions) in different cultures. In recent centuries, logic conceived as the discipline founded in ancient Greece dominated the scene. During the last century the discipline significantly limited the number of issues which were discussed in so-called *traditional logic*, which developed the tradition founded by Aristotle. Thanks to its mathematization, logic as a discipline is today commonly identified with what used to be called *symbolic* or *formal* logic.

This development, unsurprisingly, affected what we mean when we talk about logical theories – logics in the third contemporary sense of the term. Classical predicate logic is the paradigmatic example of such a theory, but present day logic (discipline) abounds with a large number of less or more established logics (theories, calculi). And it is not easy to say (find an agreement on) which *formal languages* (alternatively *formal systems* or *formal calculi*) deserve the proud title *logic*. Surprisingly, this is not a big issue in contemporary debates on logic (discipline). Logicians developing the theories are usually tolerant about using the term "logic" and philosophers engaged with logical issues do not deliver generally accepted criteria for deciding where the borderline between logical and extralogical formal theories should be drawn. The long-lasting concentration on the formal issues has led to a point where a number of logicians identify logic with what we can call *the apparatus – or machinery – of logic*. Many of them would perhaps be surprised if they were asked what logic (discipline) is about and their answer might be something like: about formal systems.

If we look at the preceding discussion from the perspective of the just outlined differentiation of the contemporary uses of the term "logic", we can see that natural logic can be said to be called *conventional* only if we want to admit that conventions are embodied in the extant practice of speakers of natural languages.[32] Still, natural logic governs our talking and writing.

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[32] It is even possible to consider the phrase "implicit convention" as a case of *contradictio in adjecto*. As Quine asks: "What is convention when there can be no thought of convening?" (Quine, 2008, p. xi).

This does not mean that it is superimposed on humans from without – it developed as an inherent part of human communicative activities and in this sense it is a human product. We might perhaps say that (any) natural logic is "genuine" in the sense that there is no logic prior to it. But this is a sense of "genuine" that is different from that which is important for contemporary debates: within them, logic is genuine in the sense that it is *the unique authentic* logic (a formal system).

It may perhaps seem natural to suppose that logic as a discipline should aim at developing logical theory that is genuine in this sense. This might be a reasonable task if we were entitled to assume that there is something like a genuine reasoning independent of what we humans do. That there is such reasoning may be a matter-of-course for philosophers who take the existence of (a rational) God for granted. It is quite plausible to assume that if there is genuine reasoning, there is a genuine logic. If we could compare our logical systems with such logic we would, it seems, be in position to identify the true (genuine) negation and decide whether (DoNeg) containing it is valid. But: if all of us were in this position we wouldn't have any disagreements as to the right logical system; and if some of us were in this position – *viz.* if they acquired the knowledge of which logic is the genuine one without acquiring the justification of this knowledge –, they would have no means to convince the unprivileged ones. Hence, we suggest that the sound methodological stance is to assume that there is no genuine logic. It now becomes a question of how can we cope with this hypothesis. We believe that the right strategy consists in developing *useful* logical theories – such that would serve as plausible models of the general patterns of argumentation – and impose their principles as standards of writing and talking. We don't need to be sure that we employ *the right* logic. What we really need is to use *a* logical theory that can be adopted as a standard.[33] Mutual agreement (possibly backed up by an authority) as to which logic we are employing helps to guarantee that our communication is sensible and we don't talk past each other. We can secure the desirable consensus only by viewing the chosen logic (a system) as normative (with respect to a discourse in question).

We might perhaps say that logical truths of natural logics are something like "covertly conventional", but this would not help elucidate the situation in any way. Logical truths of formal or formalized languages are ("overtly") conventional in the sense that they are established by definitions. But we are convinced that the space within which logicians can sensibly introduce their conventions is quite limited (similarly as is limited the space for explicit conventions posited by linguists dealing with grammar, morphology, phonology, etc.). Cf. Warren (2020, Chapter 7).

[33] We should perhaps stress once again that only theories which are tried and true deserve the status of *logical* theory. For details cf. Peregrin & Svoboda (2017).

8. Moderate non-exceptionalism and the normativity of logic

Let us return to the two main problems of the philosophy of logic we identified at the beginning of the article: *the subject matter issue* and *the epistemological issue*. How does our moderate non-exceptionalism treat them?

The subject matter of logic as a discipline is, according to us, the complex of the most general rules of human reasoning – not as some abstract ideal, but as it *de facto* takes place in the natural world of specifically human linguistic interaction, especially in argumentation.[34] It is, however, necessary to keep in mind that logic, unlike the sciences, is not only (or not even primarily) a descriptive and explanatory enterprise. It is also (and perhaps primarily) a technology. It is a toolbox that aims to make something that we people do be more effective.

The position of logic can perhaps be usefully compared to the position of another discipline – economics. The natural phenomenon of the economic life of different societies – individual economies (which due to globalization are perhaps merging into one economy) – are natural phenomena. People participating in the interaction intuitively understand principles that govern all the relevant activities concerning production of goods and the related business. They often have some – though unreflected – insight into what is going on and which principles hold. Economics as a theoretical discipline strives to capture and articulate economic laws and also provides methods that allow for advancing the activities onto a new level by providing tools and techniques that those who had only a natural understanding of economic life couldn't dream of.

We are convinced that logic, similarly as economics, is non-exceptional in that the only world it has to do with is the natural world. Its subject matter is not in an otherworldly sphere of pure reason, of ideal entities or of Platonic propositions. The primary subject matter is that which we have subsumed under the term *natural logic*.[35] However, while economics differs from the

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[34] Logic, of course, does not target argumentation in its entirety – it restricts itself to cases where logical vocabulary plays the crucial role. And despite the fact that it targets *de facto* argumentation, it generally operates on a more abstract level than disciplines such as critical thinking or the theory of argumentation.

[35] It is worth pointing out that this is a simplification – there is no single natural logic. Languages can to some extent differ in their logical build-up. There are, for example, logically relevant differences between languages that employ definite and indefinite articles and those which don't; or between the ways languages treat quantification (Bach et al., 2013). The differences are not so serious to make their

natural sciences in that it is much less able to make reliable predictions, in the case of logic making (testable) predictions does not even seem to be a reasonable goal.

This is not to say that logic does not have to do with mathematical entities, such as sets, functions, etc. – entities that can be seen as inhabitants of some ideal or Platonic realm. However, such entities are not its primary subject matter but rather theoretical constructs that serve – sometimes more, sometimes less successfully – as *tools* of the theory.[36] The modern accounts based on the heavy use of mathematical models have turned out to be enormously useful and fruitful, but we must not forget that they are what they are: *models*.[37] They should not be seen as an independent subject matter which logic is designed to study – just like analogically sophisticated models of economic interaction are not to be mistaken for the subject matter of economy, though they may form a "world" of their own.

Let us now move on to the epistemological issue. The general features of our conception can be perhaps further elucidated by confronting them with widely discussed theories based on different grounds, such as that of Paul Boghossian (Boghossian, 1996; 2000). Boghossian's project, in fact, is somewhat orthogonal to our approach – he strives to answer questions that do not really arise within our account of the epistemology of logic. Especially, Boghossian wants to find the answer to the question of whether it is "possible for us to know the fundamental logical truths *a priori* " (Boghossian 2000, p. 229). We feel an urge to complement the question, to specify "the fundamental logical truths" *of which language* are in question. We are interested in the question as to what is the epistemic status of either the (proto)logical truths of natural languages or those of the languages that logicians have developed. Thus, the logical truths in the focus of our attention are those expressed by sentences like "Reinhold reached the summit, hence someone reached the summit", or those expressed by formulas like, e.g., "$\forall x(\neg\neg Px \rightarrow Px)$" of classical predicate logic (or perhaps interpreted formulas like "$((F(r) \vee S(r)) \wedge \neg S(r)) \rightarrow F(r)$", where r stands for Reinhold and F and S for the properties of being fit, resp. being strong). Boghossian's ambition, on the other hand, is to find a convincing argument

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sentences mutually untranslatable, but they affect the perception of the (natural) logical structure of sentences and they also may influence the selection of issues to be addressed.

[36] This, of course, doesn't exclude the relevant mathematical structures from the purview of logic – and hence seeing them as a legitimate object of its study. We, however, should appreciate the importance of the question as to what makes some mathematical structures (rather than others) interesting for *logic*. The answer, we think, is that they are capable of functioning as useful models of overt (publically accessible) human reasoning.

[37] The view that formal logic essentially offers models of reasoning is put forward, e.g., by Shapiro (2001).

to the effect that we – rational thinkers – can be *a priori* justified in holding fundamental logical beliefs like *modus ponendo ponens* as such, not their imperfect reflections in man-made languages. He apparently holds that the principal medium in which such truths are articulated is the language of thought (Boghossian 2000, p. 250). We don't see any convincing evidence that such a language exists; and even if it does, we do not see how we could access it and make it an object of our study.

As we have suggested, the question that is crucial for our account of the epistemology of logic – as a distinctive discipline – is the question *How can we develop a good logical theory*? What concerns us in the present context is especially the question *Is such a process substantially different from those by which are developed good scientific theories?* And our answer is: Not really. Like the sciences, logic is concerned with phenomena within the natural world. Its data are facts concerning the correctness of inferences as they can be extracted from the ways people argue and reason and how they assess correctness of arguments. Like the sciences, logic interconnects data to form models that envisage the relevant structures, displayed, in a not so recognizable way, by the data.

In contrast to the case of the natural sciences, however, the data for logic are often "gappy": not by far are all arguments in natural languages determinately correct or incorrect. For the logical vocabulary in languages like English, it holds (analogously like for the rest of its vocabulary) that the meaning of its constituents is determined by their use in communication or, more precisely, by the (often somewhat indeterminate) rules which govern their standard usage. Therefore, building the models is a much more creative enterprise and opens room for what we have characterized as seeking a reflective equilibrium (Peregrin & Svoboda, 2017).

Thus logic is not epistemologically exceptional as concerns the formation of its theories. It is exceptional in the sense that 1) the data on which logical theories are built are by their nature specific – normative (logic focuses on rules, or proto-rules, already present within our discursive practices) and not completely determinate; 2) in the case of logic, the creation of theories is not the whole story. While we don't impose our scientific theories on their subject matter, we do impose our logical theories on real communication whenever clarity, exactness, and mutual understanding are of the utmost importance. While scientific theories aim at capturing certain phenomena and at providing us reliable predictions, logic aims at amending and improving the same enterprise that constitutes its subject matter – argumentation. For accomplishing this task, logicians must, of course, properly understand the actual functioning of generally successful argumentation – one which not only reliably establishes some

conclusion on the basis of some grounds (premises) but also is generally convincing for parties in communication. As the phenomena in question are neither fully determinate nor rigid, their modeling requires a lot of schematization and streamlining. This accounts for the peculiar character of the project of logic: the irreducible plurality of its theories and the reflective equilibrium as the point they aspire to converge to. Once there were high hopes that logic might assume an essential role in the formation of a perfect language, but as soon as these hopes vanished, the adopting of the plurality appeared to be the only realistic option which duly reflected the recent development of the field of study.

Consider the status of logical laws. For centuries of development of (European) logic they were commonly seen as perfect and eternal – they were to be discovered. Then there appeared a new logical system presented by Gottlob Frege which evolved (not as smoothly as some present-day logicians tend to think) into classical first-order logic. Those who adopted the new logic were in a way forced to throw away the logical square – the paradigmatic representation of the rigid and everlasting logical laws. Universal affirmative statements no longer entailed their particular affirmative counterparts. Not many scholars, however, took this as testimony that Aristotle was wrong and his syllogistics were "bad logic" that distorted the reasoning of many generations. Aristotelian logic was not thrown away. The natural conclusion of this development would be that there is nothing like genuine universal affirmatives (a genuine form of universal affirmative statements) – the purported "natural kind" of statements is not quite homogenous and we can model logical behavior of such statements in alternative ways. The more common outcome surprisingly was that logicians simply accepted the new interpretation of universal affirmatives as the (current and eternal) orthodoxy.

The lesson should, in our view, have been that we can live with two different logics which both provide respectable standards for our communication. (This, of course, doesn't mean that the standards provided by different logics are equally useful across different discourses. We need logic(s) to serve different purposes.) Since Frege's time, logical theories have multiplied beyond the imagination of those who spent their lives under the tutelage of Aristotelian logic (and most likely beyond Frege's imagination). Still, we witness attempts to pinpoint definite logical laws – true principles of (true) reasoning (reasoning as such). We suggest that in the actual world there is nothing like pure reasoning. Though we may sometimes have an impression that we reason with language-independent concepts or ideas and make inferential steps that do not rest on any specific language, we should not forget that the only reasoning that really counts must be publically available and open to objections. Thus the only media of any

articulated reasoning are natural and artificial languages of our making.[38] And even if there were an otherworldly realm where things were otherwise, those who declare themselves to have access to it cannot publicly establish this realm as a firm footing for logic – for any legitimate "verification" would have to happen again in the natural world.

9. Conclusion

We may summarize the conception of logic that we are advocating with three theses:

1. The core of the subject matter of logic is implicit general rules governing argumentation in natural languages (and their explicit, artificial extensions). Any logic stems from the natural (proto)logic embedded in a natural language (though the path from natural logic to logic proper is usually not quite straightforward).

2. The methodological principles which govern the formation of logical theories are not principally different than those governing the formation of scientific theories – epistemologically, logic is not exceptional. As logic is a discipline aiming at an enhancement of a certain human activity, namely argumentation or reasoning, there is no reason to expect that its study will necessitate tools substantially different from those we use for the study of other human activities, and indeed of anything in the world that surrounds us.

3. Logical theories are tools yielding standards that are not imposed on us from without but which we can impose on ourselves when we need to ascertain that our communication will be efficient and reliable. The theories are not mere descriptions of the relevant human activities, they yield tools that can be used to make the activities more efficient. From this viewpoint, logic is not only a scientific theory, but also something of a technology.

The picture of logic we have outlined is likely to be opposed by many contemporary logicians, as well as by many philosophers engaged with (meta)logical issues.[39] One reason is that, by far, not everyone working in logic and its related philosophy takes naturalism as an obvious methodological principle. Another reason is that the focus of attention of many of logicians is

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[38] By saying this we don't want to suggest that all mental processes we tend to associate with reasoning have the character of a kind of "inner talk". We only insist that insofar as we see reasoning as a process of moving from premises to conclusions, both the premises and the conclusions have to assume a kind of linguistic shape.

[39] This concerns not only those who argue explicitly that logic has to come to rest on metaphysics (Zalta, 2011; McSweeney, forthcoming), but, as we argued, also all those who believe in "genuine logic", for there is no naturalistic way to get hold of it.

on the various artificial languages of modern logic, which are sometimes seen as superseding natural languages. Investigation of these languages yields sophisticated theories which are formally fruitful and interesting. The theories appear to be quite detached from natural languages (and often they truly are). Moreover, as we have already suggested, some logicians have an urge to assume (even if only tacitly) that there is something like a "genuine" logic that is beyond (or above?) all such man-made systems but which is, however, ever better approximated by them.[40] This prevailing picture, which has been adopted by many logicians, naturally affects the common perspective on *the epistemological issue* – the problem of what, if anything, is special about logical knowledge and about the methods for gaining it.

If the kind of knowledge logicians are after concerned internal features of artificial languages, relations between them and their relationship to some heavenly "genuine" logic, we would unavoidably have to conclude that logic is exceptional – methodologically different from the sciences. Logical laws would not be rooted in the earthly world (at least not more than mathematical laws) and the expected method of logic aspiring to reveal them would probably have to involve a specific kind of "*a priori* analysis" by which we can penetrate into some otherworldly realms.

In contrast to this, we argue that the subject matter of logic is entirely present within the natural world: it embraces human argumentation and reasoning as an overt social activity, its rules and its vehicles – full-fledged languages. If we focus on the question that asks on which methodological principles the successful logical theories are built and assessed, we will find that a large part of the methodological principles and processes factually employed is parallel to the ones employed in natural and social sciences. This supports the view that logic is not exceptional (or not that exceptional).

On the other hand, we are also convinced that the answer to the question of whether logic is exceptional (or to what extent it is exceptional) is closely connected with what one views as the *raison d'être* of logic as a discipline. If one adheres to the traditional picture which we dare call *Aristotelian*, then logic is primarily a technology – its theories are designed to allow for the upgrading of our communication (especially overt reasoning and formation of various theories)

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[40] It is worth noting that here the term "logic" is used in yet another way than were the three understandings that we distinguished above. This logic is neither a natural phenomenon nor a theory. Perhaps we should also have distinguished using the term as a name of a supernatural phenomenon (after all, that such logic exists was rather commonly assumed – or even taken for granted – during the history of European logic) but we, being naturalists, are reluctant to admit such phenomena.

towards greater reliability and expressive power. If, however, one adheres to a picture within which logic that primarily aims at revealing specific eternal truths (standards of perfect reasoning) or at a study of structures of a certain kind, then it is natural to suppose that logic is special (at least as special as mathematics).

We think that logic is indeed an *organon*. The primordial goal of logic is not gaining knowledge (neither of the world, nor about our languages, nor about artificial spaces established by definitions) but providing useful tools suitable for upgrading our communication, especially letting us express ourselves clearly and to talk clearly about issues about which it is difficult or even impossible to talk in natural languages.[41] (Introducing standards concerning mathematical proofs can serve as an example.) The knowledge we thereby gain is more like the knowledge of a technology – we strive to be familiar with the tools we have created to be able to use them effectively. The very concept of logical knowledge is thus somewhat tricky and potentially confusing due to its various interpretations.[42]

We have pointed out that *epistemically*, logic is *not* special. Its "mission", however, is significantly different from those of the natural sciences. Logical theories are not meant to reveal objectively valid laws governing rational reasoning, but to identify and fix the rules that do, as a matter of fact, work for us or that might work for us in the future. Logical theories also clearly cannot be employed to make testable predictions concerning processes of reasoning or argumentation. Logic, at least logic belonging to the tradition which originates with Aristotle, has a practical and normative role – it helps us to get oriented in our communication. The standards fixed by logical theories are, we suggest, to a certain extent conventional and their appropriateness depends on the discourse in question. They are not normative in a strong sense. No logical theory, no matter how sophisticated it can be, can bind us to reason – form our arguments – strictly according to its standards. The normativity of logic is instrumental – we impose the standards established within logical theories as our tool. Using the tool not only

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[41] Admittedly, what counts as belonging to natural language develops. Some originally logical constructs have been integrated into the vocabularies of natural languages. Phrases like "material implication" or "exclusive disjunction" are comprehensible to a majority of educated English speakers.

[42] There is little doubt that we can (and do) have knowledge that concerns internal structures of individual logical theories as well as knowledge concerning their mutual relationships. In our view, however, we cannot have real knowledge of which logical theory (or theories) are the "right" ones; we, nevertheless, do have some methodological mechanisms that eliminate theories which do not deserve the label "logical". For discussion of criteria that underpin such mechanisms see Peregrin & Svoboda (2017).

helps to prevent misunderstandings and confusions in our communication but also enhances our expressive capacities. It allows us to make clear distinctions which those who are not equipped with an inventory of logical theories simply cannot make.

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