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Notes on the nature of logic: an enactivist proposal

Notas sobre a natureza da lógica: uma proposta enativista

Abstract

Critics often defend that radical enactivism (REC) cannot scale up to explain more sophisticated cognitive activities as in logic and mathematics, which are often held to be constituted by representations. The naturalization of cognition proposed by this theory is then taken to be limited in scope. In order to offer a solution to the scope objection against it, I investigate how REC might be related to a broader pragmatist approach to examine the normativity of logic in the context of the existence of a great plurality of alternative logics. To tackle this problem, I aim at defending a comprehensive enactivist philosophical proposal based on the normativity of our ruled inferential practices. Accordingly, I defend an account of some important connections between logic and normativity, which refuses traditional representationalist, individualist, internalist and intellectualist views of logic and focuses on dynamic and embodied ruled interactions among cognitive agents with their environment. The interpretation to be developed here is that rational obligation should be taken as a normative obligation that binds us together and, in particular, that logical necessity should be taken as a kind of normative coercion, based on normative notions such as rules, authorizations, prohibitions and commitments. If logic, with several different non-classical systems, is mainly normative, and not descriptive, it is possible to naturalize it, meaning that logic is not a real challenge to REC.

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Resumo

Os críticos muitas vezes defendem que o enativismo radical (REC) não pode ser ampliado para explicar atividades cognitivas mais sofisticadas como na lógica e na matemática, que muitas vezes são consideradas constituídas por representações. A naturalização da cognição proposta por essa teoria é então tida como de escopo limitado. A fim de oferecer uma solução para a objeção de escopo contra ela, investigo como a REC pode estar relacionada a uma abordagem pragmatista mais ampla para examinar a normatividade da lógica no contexto da existência de uma grande pluralidade de lógicas alternativas. Para enfrentar esse problema, pretendo defender uma proposta filosófica enativista abrangente baseada na normatividade de nossas práticas inferenciais pautadas. Assim, defendo um relato de algumas conexões importantes entre lógica e normatividade, que recusa visões tradicionais representacionalistas, individualistas, internalistas e intelectualistas da lógica e se concentra em interações dinâmicas e governadas entre agentes cognitivos com seu ambiente. A interpretação a ser desenvolvida aqui é que a obrigação racional deve ser tomada como uma obrigação normativa que nos une e, em particular, que a necessidade lógica deve ser tomada como uma espécie de coerção normativa, baseada em noções normativas como regras, autorizações, proibições e compromissos. Se a lógica, com vários sistemas não clássicos diferentes, é principalmente normativa, e não descritiva, é possível naturalizá-la, significando que a lógica não é um verdadeiro desafio para o REC.

Palavras-chave: Normatividade da lógica, Enativismo Radical, Cognição Incorporada, Pluralismo Lógico

Introduction[1]

Several contemporary philosophers have been articulating tenets in pragmatism (broadly construed) to motivate the enactivist view as an alternative philosophical foundation for a comprehensive understanding of cognition, opposed to a far-reaching representationalist tradition (Heras-Escribano, 2021). This long-established representationalist tradition in philosophy of mind and cognitive science defends that cognition, wherever it is performed, is fundamentally content-involving, representation-loaded.

On the other hand, some enactivist contenders advocate that cognition is neither representational nor does it involve, as in usual internalist views, learning and processing informational contents that are used, stored and reused to get cognitive work done. On the contrary, some enactivists (as Varela et al. 1991; Noe, 2005; Hutto and Myin, 2013, 2017) usually call attention to the importance of inherited and embodied practices and social interactions so as to understand relevant topics in the nature of perception, intentionality and language, for instance. Contenders take seriously both evolving biological systems and situated individuals interacting in communities over time as preconditions for our cognitive activities, features often dismissed as not central in the representationalist and internalist tradition.

Enactivist approaches incorporate biological insights into the discussion of cognition, by calling attention to basic facts about living organisms such as their perpetual activity of self-construction (autopoiesis), their need to be constantly adapting to the changing environment conditions (adaptivity), and their selective active responsiveness to specific aspects of the environment, creating their own world of significance (enaction). Following this trend, Hutto and Myin's (2013 and 2017) introduced REC, Radical Enactive Cognition (REC), to take the bold further step of proposing the complete removal of representational content in the explanation of cognition in basic minds, not only for simple organisms but also at human level. Consequently, the more conservative view that representational content is the mark of the cognitive should be rejected.

Accordingly, Hutto and Myin defend that we are witnessing an enactivist revolution in Philosophy of Cognition. There is a major change in concern

and procedures departing from a tradition that is centered on what can be called I-cognition, connecting well-known features of cognitive research such as internalism, individualism, intellectualism, meaning that all cognitive activities should be thought of as some kind of intellectual manipulation of internal representations.

Together with embodied, embedded, and ecological approaches, Hutto and Myin shaped the radical research program that has been successful in providing explanations for a wide variety of basic cognitive phenomena, as perception and action. However, a straight solution to a big challenge, the full naturalization of content and mental representations, requires, among other points, explaining how it is possible to get from informational foundations which are allegedly non-contentful and non-representational to a full theory of mental content using only the resources of an explanatory naturalism.

Here I will assume REC's account of cognition and some inferentialist lessons drawn mainly from Brandom's work (1994, 2000) concerning semantics to show a normative way to challenge the scope objection against REC. In what follows, I will apply the shift from I-cognition to E-cognition into contemporary discussion in Philosophy of Logic, by offering an enactivist approach to pave the way so as to deal with the nature of logic and the nowadays great plurality of alternative logics[2]. As Hutto and Myin put it: "Through their acquaintance with culture, some cognitive creatures acquire the capacity to think about the world in wholly new ways. Through mastering what are for them novel practices, they become capable of new forms of thinking of a unique kind." (2017, p. 138). These novel practices which should be mastered are embedded in a rich environment of normativity that renders the possibility of logical reasoning, and then, much later, of making it explicit and regimenting it in different formal logical systems[3].

I divided this work into three sections. The first section discusses philosophical problems concerning an alleged impossibility of REC to scale up and have an account of logic. The second section is devoted to examining an

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2 My discussion here is about the so-called epistemology of logic (for instance, about how to revise logic). It does not tackle metaphysical problems concerning logic, such as how many logics exist or which logic is the true logic. Although I do acknowledge the plurality of alternative logics, I will not address the dispute between logical monists and pluralists here.

3 Following Brandom (1994), I am assuming the following distinctions when I talk about logic. "Logic" as inferential practices, "logic" as logical vocabulary, which still has to with natural languages, and "logic" as formal and abstract systems. The background of my discussions will make clear to the reader, I hope, which concept of logic I am addressing in which context.

enactivist point of view to tackle the nature of logic. The third section tries to find the missing "launching platform" by discussing some important ways in which logic and normativity should relate.

Section I - On Philosophical Problems Concerning Radical Enactivism and Logic

A more radical approach to cognition, such as REC, often faces the so-called "scale-up problem", namely, the challenge of proving itself relevant for the investigation of traditional problems related to higher cognition levels involving concepts such as contentful information, representational states, symbolic thought, logic, mathematics etc. In order to show how to extend the enactivist revolution also to logic (or at least to logical vocabulary), we have to address the so-called "Scope objection" against REC. Some authors defend that REC does not scale up. RECers arguably cannot deal with more sophisticated human cognition that (also arguably) depends heavily on various ways of manipulating symbolic representations, such as arithmetic and logic. Hutto and Myin recognize the problem:

> "REC approaches dealing with most cases of bona fide cognition would be, accordingly, of limited value, on the assumption that they won't scale up. Call this the Scope Objection. It allows one to accept certain antirepresentationalist lessons learned from the lab and nature while safe in the knowledge that even if representations aren't needed to explain the most basic forms of cognition this doesn't pose an interesting threat to intellectualism" (Hutto and Myin, 2013, p.45)

In their later book from 2017, Hutto and Myin follow up on this scope problem by stating that:

> "Critics have argued the REC story, as sketched above, won't fly. But this is not because it is evolutionarily unsound; indeed, quite the contrary, it is because REC's naturalistically respectable resources are too crude to tell the story properly." (Hutto and Myin, 2017, p. 140)

I affirm, however, that REC can go further into current discussions on philosophy of logic. In order to do so, we must see that the "tip of the cognitive iceberg", where logical principles and rules are traditionally situated, should neither be intellectualist nor representationalist, meaning it is not a matter of

intellectually manipulating internal representations. In fact, a scale-up problem is just a problem if we have an inadequate image of logic. If logic is mainly a normative phenomenon, and not descriptive or representational, it is possible to naturalize it. Consequently, REC can coherently scale up, at least, to logic (or logical vocabulary) while relating to a relevant problem in the contemporary scenario of the philosophy of logic, namely: the great plurality of alternative logical systems.

RECers often commit to the idea that some embodied minds engaged in dynamical exchanges with their environment also loop into society and culture. Enactive cognition can and often does reach beyond the embodied mind so that when it comes to understand a great deal of higher cognitive activities involving logical and mathematical inferences, for instance, the right unit of analysis should require focusing not only on spatially and temporally distributed processes, but also on how they can be bounded up with our patterned and rule-governed practices, customs, and institutions.

Accordingly, Hutto and Myin present a way-out for the scope objection, although without suggesting it could be employed to handle the nature of logical cognition as well, as they say:

> "REC assumes that the normative practices required for claim making arose with the advent of special kinds of practices that were made possible by the establishment of sociocultural niches. (…) The trick to understanding the emergence of content is to understand the emergence of a special sort of normative sociocultural practice involving the use of public symbols. Thus, unless there is something deeply mysterious about social conformity and cultural evolution, there is nothing in the proffered explanation that introduces any inexplicable gap into nature". (Hutto and Myin, 2017, p. 146, my emphasis)

I advocate we should try to use this normative framework into the realm of logic too. In other words, in my reading, it is important to identify reasoning as a mundane practical activity we are engaged in when we argue or reason (orally or in writing), just as we are engaged in, say, cooking or carpentry. Then seeing logical systems as making explicit and regimenting this mundane activity from a specific viewpoint and as helping us advance it so that our communication in certain areas becomes more accurate, effective and compelling comes to me naturally. Unsurprisingly, this requires a lot of abstracting and schematizing, which is, nevertheless, guided by practical purposes.

It is easy to take logic as performing an authoritative power and to observe that we obey it, or at least, we should obey it. However, it is not obvious how we, as embodied entities, could explain the nature of the authority that compels us to obey reason as a cognitive activity. Why and how do we take logic as an authority and feel obliged to obey it and to correct our inferences using it as a canon? What is the nature of demanding for justification? In virtue of what do some embodied minds feel coerced by logic, in both practical and theoretical inferential activities? The power of logic can be taken, for example, as guiding our decisions for practical life and as the power to compel one to accept the conclusion of a proof. But how can some forms of reasoning compel some embodied minds to act and to infer?

The difficulties in telling a REC-friendly narrative to account for the nature of logic seems to be even more challenging in the contemporary context of a great diversity of alternative logical systems. To tackle these problems concerning the nature of logic from an enactivist point of view, we must make clear a pragmatist and constructivist philosophical agenda based on the notions of ruled practices and public agreements to understand the phenomenon of logic for embodied organisms in general, and, of logical necessity in particular.

Therefore, the right path to naturalization and RECtification of philosophical investigation connecting ruled practices and normativity can (surprisingly) be traced down to Frege (1897), as he seminally relates the nature of logic to the philosophical discussion on moral: "Logic has a closer affinity with ethics [than psychology]...Here, too, we can talk of justification, and here, too, this is not simply a matter of relating what actually took place or of showing that things had to happen as they did and not in any other way" (Posthumous Writings, p. 4).

In this view, rational obligation should be taken as a cognitive activity constituted by normative obligations of some special embodied minds and, in particular, that logical necessity should be taken as a kind of normative coercion, based on the notions of rules, authorization, prohibitions and commitments.

We can make some philosophical remarks concerning the great diversity of non-classical systems, alternative to classical reasoning so as to evaluate how the REC agenda might help account for logic. Nowadays, we have different and legitimate non-classical logical systems with many different and interesting (local) applications. Some examples include nonmonotonic reasoning, belief revision, vagueness, constructive math, conflicting information, discursive dynamics, quantum world etc (Priest et al, 2015; Carnielli and Rodrigues, 2015, 2016; Marcos, 2004).

In this scenario, a first major question can be raised here. The existence of alternative logics raises the question of which one is correct or legitimate. Further, if any of them is correct, is it universally correct? It seems that, in the context of a great diversity of non-classical logics, traditional predicates as universality, priority, necessity should all be revised. In which sense we should ask why one logic should be taken as the canon for reasoning? Should any deviation from this paradigm mean no-reasoning?[4]

However, note that debates on a possible (or perhaps even desirable or inevitable) collapse of man-made logics into one unique logic (or some version of its "humanly best approximation") do not make much sense if we view individual systems created by logicians as tools which make explicit, streamline and regiment our mundane inferential practices and are designed to achieve certain objectives. Logicians who realize this are unlikely to devote their time to the dubious pursuit of genuine logic.

Another relevant problem in this scenario concerns arbitrariness. Is logic a matter of ad hoc convention and arbitrary choices of symbols and rules? Is it all about introducing different formalisms and choosing one of them for determined goals? How to be a pluralist concerning the relation of logical consequence without being a conventionalist? But note that if logic is just a matter of stipulating a formal system, we may overlook the comprehensiveness of the whole enterprise about bounds of rationality and cognition, as we may also ask if it is rational to reason non-classically. In other words, if we also legitimately reason non-classically, what does it mean to be rational? If we do have philosophical motivations in developing some of the non-classical approaches, they may be very heterogeneous. Take for instance Brouwer's solipsism (1907, 1908) and Priest's dialetheism (2006). If it is in some cases even more rational to reason non-classically (as in paraconsistent cases), could we integrate very heterogeneous philosophical motivations under one philosophical program?

Moreover, concerning the normativity of logic, one may say that being normative about correct reasoning is easy for a logical monist. If you believe that just one logic is correct or legitimate, any deviation from this canon is just not reasoning. Thus, the pressing question remains: how could we deal with the normativity of logic in the context of a great plurality of non-classical logics?

Using anti-realist and pluralist lessons, we may have a way-out that converges with an enactivist point of view. In order to do so, I apply Hutto and Myin's

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4 For a canonical discussion, see Beall and Restall (2005).

version of REC (2017) so as to have a comprehensive program to deal with both the nature of logic and a great plurality of alternative logical systems. Moreover, we should implement this way-out with inferentialist lessons. Content in REC's account should be taken as inferentially articulated. The sense of a proposition is not articulated by truth conditions, but through a net of incompatibilities and other material inferences, as Brandom defends (1994, 2000).

Inspired by Wittgenstein, and more recently by Brandom (1994, 2000), Peregrin (2006), and Hutto and Myin (2013, 2014, 2017), we should focus on normativity to tackle the nature of logic and the great plurality of alternative systems. This means to understand the connections between judgement, inference, action and reason under the phenomenon of normativity (ie. rule guidance, ruled governed practices). Does my enactivist agenda, by emphasizing normative vocabulary to tackle the nature of logic, have any real impact on the business of working logicians? Well, of course, it does not influence the work of those who try to establish whether certain theorems are provable in a certain formal system. But if one raises their eyes from this kind of business and asks what motivates us to deal with such issues, then there is an impact – the adoption of a certain perspective has a profound influence not only on the agenda of philosophy of logic, but of logic itself. I am convinced that a lack of appreciation of this issue may eventually lead logicians into a blind alley of pointless disputes.

As Hutto and Myin defend, we can defend "evolution as putting in place platforms that act as launchpads, not leashes. Beyond this, for the sociocultural emergence of content, we need to assume that our ancestors were capable of social processes by learning from other members of the species, and that they established cultural practices and institutions which stabilized over time." (2017, p. 139).

Accordingly, we must shift constructivist discussions on logic from usual epistemic notions (as knowledge, belief and information) to normative notions (as authorizations, prohibitions and rules). Although it avoids conventionalism about logical principles, since those notions are not subjective nor arbitrary, it allows for a revision. The reason for the possibility of revision is that the plurality of logics should be grounded in the plurality of our daily (inferential) practices. We may have different and conflicting principles and reason very distinctly in different contexts. Dummett's (1978) influential anti-realism concerning logic and language focuses on epistemic notions, which are based on individual cognitive capacities of a rational agent. I want to reject this individualist approach and emphasize normative and deontological notions for social

agency, cooperation, collaborative and regulative joint activities, or, in other words, ruled practices, that is, sort of games, where trained abilities, competences and capacities play a central role. The epistemic and normative programs are independent, but compatible indeed, as they endorse a constructive framework to deal with an overly complex phenomenon as logical inferences.

My normative approach is original, as motivations for non-classical logics are very heterogeneous (e.g., Brouwer's solipsism, Priest's dialetheism). The recent literature about logical pluralism (see Beall and Restall 2005) very often neglects some relevant philosophical issues such as *Handlung, Praxis* and normativity.

A notable exception has been proposed by Field 2009: an anti-realist and relativist approach. According to him, the core concern of classical logic (and many non-classical logics) is to be characterized in terms of legitimacy of belief, not in terms of necessary truth preservation.

Brandom (1994 and 2000) himself emphasizes normative vocabulary to tackle the nature of logic, as prohibition and authorization, violation, permission, obligation, respect, obedience. However, he seems not to advance any further concerning logical principles and the legitimacy of alternative logics.

In what follows, I propose an enactivist approach to logic in which we are expressing and preserving commitments using logical vocabulary, and not legitimate beliefs or truths.

Section 2 - An enactivist point of view to tackle the nature of logic

In order to develop the enactivist view to challenge the scope objection, I propose four ingredients to approach the nature of logic with a normative stance. As we will see, this normative view can be used to accommodate the need for a social launching platform so as to arouse higher cognitive activities, as Hutto and Myin point out.

The first element to tackle the nature of logic from a REC point of view should be what we may call logical anti-realism. Logical vocabulary does not need to relate to any particular state of affairs in the world but to *our* criteria or norms in order to evaluate descriptions and actions in the world. When we are doing logic, we are not really talking about facts and truth, but addressing our criteria to evaluate facts and truth. Logical principles do not need to represent anything in reality, since we do not primarily use logical principles to describe facts, but to correct, to regulate our actions, perception, practical interactions, theoretical investigations and exchange of information..

The second ingredient in our agenda should be logical expressivism, as logical rules should *show, express, make explicit* possible forms of representing our world and possible ways to interact with it. In this view, logical systems express some of our public commitments and norms which are already articulated in our daily rational discussions and practices.

The third point follows from endorsing logical expressivism. We must defend an inferentialist variant of enactivism, which means to defend that understanding and meaning in higher cognitive activities is primarily connected to inferences and not to any particular representation or reference to special objects in the world. Practices of some cognitive agents, as several of human beings' cognitive activities, that means, the rich ways through which we enact in the world, are always inferentially articulated and can be publicly tested and controlled. Our practices are already constituted by prohibitions and authorizations that constitute the space of reasons, as Brandom (1994, 2000) points out. In order to operate within "the logical space of reasons", one must be at home with normative discourse, responsive to reasons as such, sensitive to standards of correctness and appropriateness. According to Sellars: "The essential point is that in characterizing an episode or a state as that of *knowing,* we are not giving an empirical description of that episode or state; we are placing it in the logical space of reasons, of justifying and being able to justify what one says" (1997, §36). One point must be stressed here: We do not have to reject representation altogether. There is rather a inversion of priority, that is, for our view we do not start pressuposing representation, but inference, or better put, inferential practices. According to Brandom (1994), we just have representations, if we already master various inferences. An inferentially articulated content is a precondition for representations to exist. This represents, in my view, a possible way-out to the scope objection.

Finally, we must prioritize proof theory over model theory. Once we are stressing logical vocabulary as normative, our focus should be set on the nature of rules and norms and how they constitute the meaning of our logical vocabulary. This means to emphasize proof-theoretical vocabulary, that is, our focus should be on ruled inferences and in their applications and not on truth, models and satisfaction, as we are primarily dealing with practical knowledge, know-how, training and mastering of several dynamical features of reasoning and ruled use of logical operators.

Therefore, the right question about the nature of logic amongst so many alternative logical systems, from an enactivist point of view, should not be what true logic is. Nor how many true logics do we have. It is rather: what are

the best inferential practices of some embodied rational agents in a particular context (both natural and social)? Note that we should change the vocabulary from truth about something to the role or function that logical expressions play in our mundane lives. However, we do not need to defend that we have a plurality of rationalities, since we have a plurality of logics. Rather, I would say that being rational (like us) is indeed to dynamically coordinate and master various heterogeneous ways of reasoning, conforming them to numerous selective environmental pressures (both natural and social ones).[5]

Here we must defend what one may call full anti-cartesianism: cognition and reasoning are not a matter of an entity consuming and manipulating representations, but should be thought of as special capacities of some situated and embodied animals (deontologically) engaging in a permanent and dynamical exchange with other animals in selective parts of their environment. Deontology here is important to render the normative stance. Normativity is crucial to understand the nature of logic in an enactivist framework while dealing with the scope objection.

What I am proposing here is, in a sense, an anthropological and naturalized approach to logic as a normative phenomenon. In other words, it is to take logic as a phenomenon grounded in (highly) heterogeneous normative practices of embodied rational beings. For that we can re-state a strong anti-realist thesis concerning the very nature of deontology. I reject in this view that there are prohibitions/authorizations (rules and instructions) in the world without human beings (or any rational agent). There is no such thing as a "real or true rule" in nature. Rules, prohibitions and authorizations are always bound to our space of reasons, the numerous ways we engage in justification and inferential practices (Sellars 1997; Brandom 1994, 2000).

It is noteworthy that literature on revision of logical principles often uses normative vocabulary to tackle philosophical problems concerning the possibility of alternative logics, such as entitlement, commitment, respect, authority, obligation, obedience etc. As a consequence of my normative proposal to logic, "must be", "have to be", "necessarily" should be taken as "ought to". Common wisdom would say that the former are logical notions and the last

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5 This is a point of convergence between my view and Rolla's paper (2021) on rationality. He goes further and makes a distinction between reason (which is representation-hungry) and rationality (a more general skill that requires flexibility and adaptation). However, Rolla does not use inferentialist and expressivist lessons to motivate this distinction and seems to have a different notion of normativity, independent from a Brandomian tradition. A full account of the divergences between our views are outside the scope of this paper.

one is a deontological notion. But it is decisive to see that they do not differ in nature. Both notions should be taken as normative, as we will see below.

Section III - Logic and normativity (or trying to find the launching platform)

My strategy to deal with the scale-up problem concerning REC view is to naturalize logic. In my proposal, in order to naturalize logic, we should emphasize its normativity, meaning to primarily understand logic as a sophisticated normative phenomenon and not as a refined representational enterprise. If logic is primarily normative, and if we have a way to naturalize normativity, we can naturalize logic as well[6]. The interpretation here is that rational obligation should be taken as normative obligation and, in particular, that logical necessity should be taken as a kind of normative coercion, based on the normative notions of rules (prohibition, authorization, respect, authority, commitment etc.) If we can naturalize the latter, we can naturalize the former.

In a relevant sense, this strategy is against Carnap's tolerance principle (1937). In his conventionalist approach, Carnap famously states that "in logic there are no morals. Everyone is at liberty to build his own logic, i.e. his own language, as he wishes. All that is required of him is that, if he wishes to discuss it, he must state his methods clearly, and give syntactical rules instead of philosophical arguments" (Carnap 1937, §17).

We may have at least two readings of Carnap's conventionalist view. A negative one leading to tolerance, that is, from a logical point of view, we cannot say a logical system is strictly forbidden. But we may also have a positive reading: one which leads to freedom, meaning everything, any decision, any introduction of a new logical system is possible. This Carnapian view can render some theoretical virtue as it allows plasticity and innovations in logic. However, Carnap's tolerance principle is a (large) open door for conventionalism and arbitrariness. Note that conventions alone do not coerce anybody. Mere configurations on a piece of paper do not compel us to draw any consequence. No disposition of signs per se on a piece of paper has itself a normative power or pragmatic force to guide our inferential practices. What is missing here is the normative context or the space of reasons where those practices take place.

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6 Note that this a conditional argument. I am not defending that we can naturalize normativity, but if we can do it, we can naturalize logic as well. See Silva et al (2020) for more details about how to naturalize language in a REC perspective using Brandomian inferentialism and Wittgensteinian insights.

Despite Carnap, I am in good company. For instance, Frege (1897), as we saw, seminally relates the nature of logic to the philosophical discussion on moral and freedom because in all of them we are talking about justification. Other influential authors suggested something in this direction, such as Peirce ("logic is the ethics of thinking"), Wittgenstein (1984, pp. 128, 131, 175), and Field (2009).

But the major challenge for my normative reading is: what is the nature of logical necessity? This view imposes a change in the way we traditionally think about logical necessity. What does it mean that B follows from A (in a given system)? What does it mean, "to follow from"? In what sense an inference compels us to judge the truth of a conclusion from the assumption of the truth of the premises?

Logical necessity, I assert, has its roots in the rational obligation compelled by our urge, as rational beings, in following agreed rules that arise from a long period of interactions over time. Logical consequence is a relation that makes explicit determined relations of authorization and prohibition inherent in (and constituted by) complex inferential practices of agents in communities. Practices are always inferentially articulated as they are bound and constituted by a space of reasons (Brandom 1994, 2000).

A direct consequence is a kind of relativism[7], meaning that different communities may have different norms. Furthermore, we may have heterogeneous norms in the same communities. Additionally, an individual may vary their reasoning according to pressures in their environment and to the nature of their needs, interests and tasks. As needs, interests and tasks may be similar, they do not vary much if some environmental pressures are the same, the various ways we might reason in different contexts may also largely converge[8].

The measure of logicality or rationality of specific ways of reasoning is not a reality independent of us; it is based on what is accessible for us thinking beings. We judge the measure of logicality of our theories by their usefulness, by the extent to which they help us attain our goals (which are not

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7 It is important here to draw a stronger distinction between conventionalism and relativism. Relativism concerning the logical consequence relation means that this should not be taken as absolute. It should always be relative to a particular context or formalism. Conventionalism instead involves arbitrariness and random decision without any mandatory normative constraint. To point to something, as the second Wittgenstein noted, is relative to the way our species points to middle sized objects, but it is not a conventional feature. It is related to our natural history, but it is not conventional. For a conventionalist, there is, in principle, no constraint for the choices we can make to create a new formalism.

8 See Rolla 2021 for some interesting examples based on empirical research in cognitive psychology.

always clearly given in advance), e.g., the goal of relative reliability and public control of our ways of reasoning and argumentation in particular areas of discourse. As logical expressivists, we do need to have to make logic be much different from language in an important sense: once we get concepts articulated by the normative statuses in our natural languages, we can make them explicit in our logical systems.

Thus, my reading matches up with the scenario of present-day logic, which accommodates numerous (sometimes diverging) theories and whose development does not seem to promise anything like eventual convergence of all the knowledge and its culmination in a single comprehensive theory.

A new interpretation of Frege's realist approach to truth preservation was already proposed by Brandom (1994, 2000) and Peregrin (2006), and it plays a relevant role in challenging the scope objection against REC's naturalistic credentials. Brandom defends some inferentialism in the *Begriffsschrift* (1879), for instance. There, the main notion in logic is not truth, but inference. According to Brandom's reading of Frege, a *Begriffsschrift* should *make explicit* inferential relations in terms of assertible content. As a consequence, preservation of truth should be taken as preservation of commitment[9].

Therefore, language and logic connect because they are central normative phenomena. To assert something is to commit to the truth of some propositional content and to the consequences and incompatibilities of that content. The content is articulated by the inferential net that we must master in order to use language properly. Failing to understand the transmission of commitment in a logical inference is failing to reason and to understanding inferences whatsoever.

According to logical expressivism, logic expresses the inferential relations which hold good in our daily language and inferential practices. Meaning is determined by inferential articulations as we enact and classify things in the world, because our enaction in the world should be seen as inferentially dense in multiple authorizations and prohibitions. To understand the meaning of a concept is to *master* the use of a word, that is, to understand what is prohibited and authorized by the use of linguistic expressions, in other words, it is to master inferential transitions.

The inferential transitions below are considered correct in our mundane exchanges.

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9 In a pragmatist view, truth should be taken as a command to assent.

1. From "Nemo is a fish" to "Nemo is an animal".
2. From "Today is Monday" to "Today is not Sunday".
3. From "This is red all over" to "It is not blue all over.".
4. From "Now it is 25 degrees Celsius" to "Now it is not 26 degrees Celsius".

Here it is important to see the decisive expressive role that logical vocabulary plays in our lives. Logical vocabulary enables us to *express* rules that already articulate meaning and daily inferences by introducing conditionals, negations, existentials and universals, for instance. Logical vocabulary makes inferential rules of our conceptual and linguistic practices explicit.

After using logical vocabulary, we can say things like: "Every fish is an animal"; "No object which is all over red can be all over blue."; "No day can be both Monday and Sunday"; "Two degrees of temperature cannot be ascribed simultaneously to a particular place and time".

Accordingly, those are rules vindicating the previous inferential transition we make in our daily linguistic practices we consider correct.

In turning logic more mundane and enactive, we may lose several classical features such as transitivity, reflexivity and monotonicity. But we can recover them in regimented formal systems. Our daily inferential practices are highly non-monotonic and thus already non-classical (Dutilh Novaes 2015, 2016).

Moreover, concerning revision of logic, I believe logical expressivism and (enactivist) inferentialism, as I am defending here, render the possibility of public control, justification, correction and development of logics, avoiding the kind of conventionalism presented in Carnap's view. If we get the right formalism, we can change practices and by changing practices we can change formalisms as well.

Concluding notes

What are we, then? What is rationality? (as asked by Rolla, 2021) In an enactivist proposal, such as the one defended by RECers, a possible answer should be: what is special about us is not what we have inside our minds, but what we can do in the world. We are beings who give each other rules, norms, criteria to evaluate things, to reason, to infer, to act in a highly unstable and mysterious world. We make this world intelligible to us as we enact in it. We live in a dense network of authorizations and prohibitions that set up an intricate and rough map of compatibilities and incompatibilities.

Using this suggestion, I argued for a way-out to the scope objection concerning logic. We can scale up REC, at least, concerning logical principles and vocabulary. A scale-up problem is just a problem if you have an inadequate image of logic. If logic is primarily a normative phenomenon, and not a descriptive one, it is possible to naturalize it. I offered a comprehensive account of the nature of logic emphasizing pragmatist, enactivist, and normative features to understand the plurality of alternative logical systems. This account should be anti-realist, anti-intellectualist, pluralist, but not conventionalist.

Using Hutto and Myin's account of the emergence of content in nature, we have a launching platform to make the nature of logic compatible with an enactivist approach. In my view, practices and language must already be inferentially articulated, constituted by the rules of our space of reasons. That is, our practices, the inferential ones too, should be seen as full of commitments, authorizations, and prohibitions.

Normativity is not a consequence of being logical, but it is the other way around. We are logical in virtue of our normativity and not vice-versa. We give each other rules to judge and to do things in the world. We must make the world intelligible for us.

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